University of Minnesota Twin Cities
2018-20 Graduate Courses

This document serves as an official historical record for a specific period in time. The information found is subject to change without notice. Colleges and departments make changes to their degree requirements and course descriptions frequently. More information is available at catalogs.umn.edu.

For current information, refer to:

- Program search: z.umn.edu/publicprogramsearch
- Course search: z.umn.edu/publiccoursecatalog
- University policies: policy.umn.edu

University of Minnesota Twin Cities
3 Morrill Hall, 100 Church St. S.E., Minneapolis MN 55455
Check the University Catalogs website at www.catalogs.umn.edu for the most current course information. The courses in this catalog are not offered every semester. To find out whether a course is offered during a particular semester, consult the class schedule at z.umn.edu/publicclasssearch.

Course Designators

In conjunction with course numbers, departments and programs are identified by a 2-, 3-, or 4-letter designator prefix (e.g., CE for Civil Engineering, POL for Political Science, ECON for Economics). When no designator precedes the number of a course listed as a prerequisite, that prerequisite course is in the same department as the course being described.

Course Numbers

- **0xxx**...Courses that do not carry credit toward any University degree.
- **1xxx**...Courses primarily for undergraduate students in their first year of study.
- **2xxx**...Courses primarily for undergraduate students in their second year of study.
- **3xxx**...Courses primarily for undergraduate students in their third year of study.
- **4xxx**...Courses primarily for undergraduate students in their fourth year of study; graduate students may enroll in such courses for degree credit. 4xxx courses can be counted for a Graduate School degree if the course is taught by a member of the graduate faculty or an individual appointed to Limited Teaching Status (LTS).
- **5xxx**...Courses primarily for graduate students; undergraduate students in their third or fourth year may enroll in such courses.

Course Symbols

The following symbols are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **=**...Credit will not be granted if credit has been received for the course listed after this symbol.
- **&**...Concurrent registration is required (or allowed) in the course listed after this symbol.
- **#**...Approval of the instructor is required for registration.
- **%**...Approval of the department offering the course is required for registration.
- **@**...Approval of the college offering the course is required for registration.
- **,**...In prerequisite listings, comma means “and.”
- **1-4 cr [max 6]**...The course can be taken for 1 to 4 credits and may be repeated for up to 6 credits.

Abbreviations

The following abbreviations are used throughout the course prerequisites of most University catalogs to denote common and recurring items of information.

- **Prereq**...Course prerequisites.
- **cr**...Credit.
- **div**...Division.
- **DUS**...Director of undergraduate studies.
- **equiv**...Equivalent.
- **fr, soph, jr, sr**...Freshman, sophomore, junior, senior.
- **H**...Honors. Courses with an H following the course number satisfy honors requirements.
- **V**...Honors and Writing Intensive. Courses with a V following the course number satisfy both honors and liberal education writing intensive requirements.
- **W**...Writing Intensive. Courses with a W following the course number satisfy the writing intensive requirement for liberal education.
- **A-F only**...A-F grade basis only; course may not be audited or take pass/fail.
- **A-F or Aud**...A-F grade basis, or course may be audited for no grade.
- **S-N only**...S-N grade basis only (pass/fail), course may not be audited or taken A-F.
- **S-N or Aud**...S-N grade basis (pass/fail), or course may be audited for no grade.
- **No Grade**...No grade will be given for the course; typically used for laboratory components of courses.
- **OPT No Aud**...Student selects the grading option; course may not be audited.
- **Stdnt Opt**...Student selects the grading option; course may be audited.

Course Listing Sample

Xology (Xolo)

Xology and Diometrics

**College of Liberal Education**

**Xolo 5101. Methods in Xology. (3-4 cr [max 8 cr]; A-F only. Prereq-3578 or #)**

Historical, numerical, sociological, and Freudian methods of research in xology with applications to contemporary problems.

Credit will not be granted if credit has been received for the course listed after this symbol.
ACCT 5101. Intermediate Accounting I. (4 cr. ; A-F or Audit; Every Fall & Spring) Valuation, measurement, reporting issues related to selected assets/liabilities of firm. Theory underlying accounting issues. Applying accounting principles. prereq: Grade of at least B- in 2050, mgmt major or mgmt grad student, accounting certificate, select non mgmt students

ACCT 5102. Intermediate Accounting II. (; 4 cr. ; A-F or Audit; Every Fall & Spring) Basic valuation problems encountered in financial reporting. Focuses on valuation of liabilities. Accounting for leases, pensions, and deferred taxes. Introduces consolidated financial statements. prereq: 5101 [mgmt or grad mgmt student]

ACCT 5125W. Auditing Principles and Procedures. (WI; 4 cr. ; A-F or Audit; Every Fall, Spring & Summer) Concepts of auditing internal control/financial statements in accordance with generally accepted auditing/professional standards established by Public Company Oversight Board (PCAOB) and American Institute of Certified Public Accountants (AICPA). Writing Intensive course. prereq: [3101 or 5101 or 5100 or 6100], [acct major or grad mgmt student]

ACCT 5126. Internal Auditing. (; 2 cr. ; A-F or Audit; Every Fall & Spring) Financial/operational auditing. Standards. Managing the function. prereq: 2050

ACCT 5135. Fundamentals of Federal Income Tax. (; 4 cr. ; A-F or Audit; Every Fall, Spring & Summer) U.S. federal system of taxation. Concepts of gross income, deductions, credits. Analysis of structure of Internal Revenue Code, its provisions with respect to specific areas of law. Interrelationships between legislative, judicial, and administrative authority. Methods, tools, and techniques to conduct tax research. prereq: [2050 or MBA 6030], [mgmt or grad mgmt student]

ACCT 5160. Financial Statement Analysis. (; 2 cr. ; A-F or Audit; Every Fall & Spring) Interpretation/analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings (e.g., in investment/credit decisions), prereq: [5100/6100 or 3101/5101], [accounting or finance major]

ACCT 5180. Consolations and Advanced Reporting. (2 cr. ; A-F or Audit; Every Spring & Summer) Theory underlying preparation of consolidated financial statements, as well as mechanical computations needed to prepare statements. prereq: 5101, 5102 recommended, or MBA 6030. MBA students must register A/F grade base.

ACCT 5201. Intermediate Management Accounting. (2 cr. ; A-F or Audit; Every Fall & Spring) This course is an in-action course. The course explores the topic of management accounting in greater depth. The course expands introductory course material via special emphasis on decision making, problem solving skills and exploration of accounting's role within overall management. The course is an in-action class. We will have a project working on a business case from a firm as the final assessment for the course. prereq: 3001, acct or finance major

ACCT 5236. Introduction to Taxation of Business. (; 2 cr. ; A-F or Audit; Every Fall & Spring) Introduction to the income tax laws governing the taxation of corporations, partnerships, limited liability companies, limited liability partnerships, and S corporations. Students will also increase their knowledge and skills related to tax research by writing research memorandums. prereq: 5135, acct major

ACCT 5310. International Accounting. (; 2 cr. ; A-F or Audit; Every Fall & Spring) Causes/hist of international differences in design of financial accounting/reporting systems, efforts to harmonize them into worldwide system. Role/impact of currency translation on financial statements. International Accounting Standards, conceptual framework. prereq: 5101; 5102 or concurrent registration is required (or allowed) in 5102 recommended

ACCT 5420. MAcc directed study. (1-4 cr. ; Student Option; Every Fall, Spring & Summer) Internship or directed study in Master of Accountancy degree program. prereq: MAcc student


ACCT 6100. Financial Statement Analysis. (; 4 cr. ; A-F only; Every Fall) Overview of asset/liability valuation, income measurement. How economic events are reported in the financial statements of a firm. Accounting theory/standard-setting process from perspective of users of financial statements. prereq: MBA 6030, MBA student


ACCT 6140. Managerial Economics. (; 3 cr. ; A-F only; Every Fall & Spring) N/A prereq: MBA 6030, MBA 6035

ACCT 6201. Control and Incentives. (; 4 cr. ; A-F only; Every Fall & Spring) Design of activity-based costing, performance measurement, and incentive systems to support strategy of firm. Use of accounting measurements in balanced scorecard, economic value-added, and decentralized decision making. Information issues in design of incentive systems. prereq: MBA 6235; micro economics recommended

ACCT 6320. Current Topics in Accounting. (; 1-4 cr. ; A-F only; Periodic Fall & Spring) Topics vary. prereq: MBA 6130, MBA student

ACCT 6335. Advanced Managerial Accounting. (; 2 cr. ; A-F or Audit; Every Spring) Topics of current interest. Detailed treatment of concepts learned in core. Application of concepts in complex settings. Harvard cases. prereq: MBA 6035 or MBA 6235

ACCT 6601. Internal Control. (4 cr. ; A-F only; Every Fall) Internal control from management's perspective. Application of COSO Internal Control?Integrated Framework and Enterprise Risk Management?Integrated Framework. prereq: MAcc grad major


ACCT 6603. Advanced Auditing. (4 cr. ; A-F only; Every Fall) Auditing of derivatives, business combinations, fair value instruments, and other accounting topics. Evaluating the discipline of forensic accounting.

ACCT 6604. Advanced Management Accounting. (2 cr. ; A-F only; Every Fall) Advanced Management Accounting will expose students to the application of management accounting from a strategic perspective. Students will deepen their knowledge and understanding of management accounting? s role in areas such as sustainability,
ACCT 6605. Negotiations for Financial Executives. (2 cr.; A-F only; Every Spring) In Negotiations for Financial Executives, students will develop an individual negotiating style and learn to adapt their negotiating style to various situations. Students will learn the methods and frameworks for negotiating effectively: preparation, setting high expectations, listening, and a commitment to ethics. During the course, students will have opportunities to apply the preparation model to plan a negotiation and actually apply their knowledge in a live case situation.

ACCT 8801. Topics in Empirical Research I. (2 cr.; [max 4 cr.]; Student Option; Every Fall & Spring) Capital-markets stream of empirical research in accounting. Accounting earnings and stock prices, earnings-based security valuation (theoretical and empirical), estimation of earnings-based risk measures, market anomalies, and related topics from corporate finance. Econometric techniques in market-based empirical research/application to data analysis. Prereq: Business admin PhD student or instr consent

ACCT 8802. Topics in Empirical Research II. (2 cr.; Student Option; Every Fall & Spring) Empirical capital markets research topics course. The course is designed to include current research topics in capital markets that are cutting-edge and topics in the instructor's area of expertise. Topics will vary with each offering.

ACCT 8803. Topics in Empirical Research III. (2 cr.; A-F only; Every Fall & Spring) The course is designed to include current research topics in Empirical Research that are cutting-edge and topics in the instructor's area of expertise. Topics will vary with each offering.

ACCT 8804. Empirical Research Topics II. (2 cr.; Student Option; Every Fall & Spring) Current research topics that are cutting-edge and in instructor's area of expertise. Topics in the area will vary.

ACCT 8811. Information Economics I. (2 cr.; Student Option; Periodic Fall & Spring) Asymmetric information, incentives, and contracts. Moral hazard, adverse selection, reputation, and signaling phenomena. Applications to accounting such as transfer pricing, budgeting, cost allocations, performance measurement, audit pricing. Prereq: Business admin PhD student or instr consent

ACCT 8812. Information Economics II. (4 cr.; Student Option; Every Fall & Spring)

ACCT 8813. Information Economics III. (2 cr.; A-F only; Every Fall & Spring) Asymmetric information, incentives, and contracts. Moral hazard, adverse selection, reputation, and signaling phenomena. Applications to accounting such as transfer pricing, budgeting, cost allocations, performance measurement, audit pricing.

ACCT 8821. Capital Markets I. (2 cr.; Student Option; Every Fall & Spring) Auction markets; price formation in experimental asset markets; experimental studies of information transfer and capital market efficiency; experimental tests of strategic behavior, trust, and reciprocity.

ACCT 8822. Capital Markets II. (2 cr.; Student Option; Every Fall & Spring) Heuristics and biases in information processing, auditor judgment, mental accounting, and decision aids.

ACCT 8823. Capital Markets III. (2 cr.; A-F only; Periodic Fall & Spring) PhD seminar course concentrating on current topics in Capital Markets.

ACCT 8831. Analytical Research Topics I. (2 cr.; Student Option; Every Fall & Spring) The course is designed to include current analytical research topics that are cutting-edge and topics in the instructor's area of expertise. Topics will vary with each offering.

ACCT 8832. Analytical Research Topics II. (2 cr.; Student Option; Every Fall & Spring) The course is designed to include current analytical research topics that are cutting-edge and topics in the instructor's area of expertise. Topics will vary with each offering.

ACCT 8833. Topics in Analytical Research III. (2 cr.; A-F only; Periodic Fall & Spring) PhD seminar course focusing on current topics in Analytical Research

ACCT 8892. Readings in Accounting. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Readings appropriate to an individual student's program or objectives that are not available in regular courses. Prereq: Business admin PhD student or instr consent

ACCT 8894. Research in Accounting. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Individual research on an approved topic appropriate to student's program and objectives. Prereq: Business admin PhD student or instr consent

Addiction Studies (ADDS)


ADDS 5031. Applied Psychopharmacology. (2 cr.; A-F only; Every Fall & Spring) Categories of psychoactive drugs. Medicines to treat mental disorders. Substances such as alcohol, nicotine, cocaine, and marijuana. What occurs physiologically when someone takes a psychoactive drug.


ADDS 5051. Methods and Models II: Cognitive Behavioral Therapy. (2 cr.; A-F only; Every Fall, Spring & Summer) Components of cognitive model. Assessment, case formulation, automatic thoughts, core beliefs, cognitive restructuring, behavior change elements, therapeutic relationship. Learn, practice, master key concepts.

ADDS 5061. Foundations of Group Work. (3 cr.; A-F only; Every Fall & Spring) Designing/facilitating therapy groups. Intra-/inter-personal dynamics, leadership skills, developmental aspects, ethical issues. Application to therapy of chemically addicted individuals. Lectures, discussion, experiential exercises, small groups, readings.

ADDS 5071. Foundations of Co-occurring Disorders. (2 cr.; A-F only; Every Fall, Spring & Summer) Understanding mentally ill/chemically abusive or dependent client. Intervention, advocacy, education, support for client/those part of his/her environment. Social, environmental, multicultural factors that contribute resources for these clients.

ADDS 5081. Multicultural Foundations of Behavioral Health. (3 cr.; A-F only; Every Fall & Spring) What is culture? How might culture, cultural practices, and history be significant in the use/abuse of substances? How is culture relevant to the attitudes/practices in the prevention/treatment of substance use/abuse? Multicultural counseling and cultural competence in addiction counseling. People as individuals. Clinician's own cultural worldview/other cultural worldviews.

ADDS 5091. Assessment and Treatment Planning I. (3 cr.; A-F only; Every Fall, Spring & Summer)
Core addictions counseling. Clinical assessment, case management, documentation treatment planning, ethical issues. Students begin process of securing internship.

ADPY 5121. Professional Seminar 1. (1 cr.; S-N only; Every Fall, Spring & Summer) Prepares students for successful entry into field of substance use disorder counseling by focusing on facets that are critical to their professional development. Through discussions, experiential learning activities, guest lectures and site visits, students gain further understanding of the internship placement process and requirements, settings that fit their individual training and career goals. Requirements for initial licensing and renewal, the testing process, models of professional development, the importance of professional advocacy and associations, self-care and requirements and benefits of clinical supervision. Professional ethics, including state rules, statutes, codes of conduct and regulations for practitioners and agencies are also addressed. Students will also develop their job search skills and apply them to secure a field placement for the internship seminar.

ADPY 5224. Integrating Spirituality in Counseling Practice. (2 cr.; A-F only; Every Fall, Spring & Summer) Knowledge/skills of counseling students/practitioners in professional competencies for addressing spiritual/religious issues. Lecture, discussion, experiential exercises/readings to advance cognitive, interpersonal/practical skills. Treatment of persons with co-occurring disorders.

ADDS 5950. Special Topics. (1-4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Special topics in addiction studies. prereq: dept consent

ADDS 5993. Directed Study. (1-3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) Directed study. prereq: dept consent

ADDS 5994. Directed Research. (1-3 cr. [max 9 cr.]; A-F only; Every Fall, Spring & Summer) Directed research. prereq: dept consent

ADDS 5996. Internship in Behavioral Health. (1-4 cr. [max 16 cr.]; S-N only; Every Fall, Spring & Summer) Supervised field work experience. Practical application of substance abuse counseling. Assessment, treatment planning, case management. prereq: [5001 or 5011], [5021, 5003 or 5031], [5002 or 5041], [4001 or 5091], and ADDS 5121 (for students admitted Sp 15 and later) Department permission required.

ADPY 5515. Neuropsychology: University Hospitals. (3-9 cr.; O-N or Audit; Every Fall) ADPY 7109. Adult Psychiatry: Duluth. (6 cr.; H-N or Audit; Every Fall & Spring) This externship in adult psychiatry provides a clinical exposure to the broad spectrum of psychiatric problems encountered in the general practice of psychiatry. The student has the opportunity to see and evaluate the various psychiatric syndromes from a hospital-based psychiatric unit. The program emphasizes an understanding of the psychodynamics, family interaction, sociological issues, and general life stresses precipitating the psychiatric picture. Subsequent treatment possibilities also are stressed, and the student has an opportunity for participating in treatment efforts at the hospital. In addition, the student may attend seminars and staff activities at St. Luke’s Hospital & Regional Trauma Center, Miller-Dwan Hospital, the Medical Center, and St. Mary’s Hospital in Duluth also are used. Efforts are made to tailor this course to the wishes of the student when it is feasible. prereq: SPECIAL INSTRUCTIONS: Students must contact the UMD Department of Family Medicine, 10 University Drive, Duluth, MN 55812 [218-726-7916] at least one month prior to quarterly cancel/add deadline.

ADPY 7121. Descriptive Psychiatry. (2 cr. [max 4 cr.]; H-N or Audit; Periodic Fall) Psychiatric diagnoses encountered in physical-disabilities/psychosocial work settings. Clinical presentations of common diagnoses. General diagnostic criteria. Intervention alternatives. prereq: [OT or PT] student, instr consent

ADPY 7500. Psychiatry Externship. (4 cr.; H-N only; Every Fall, Spring & Summer) This course is a requirement for all third year medical students. Its goal is to prepare medical students to recognize, diagnose, and care for patients with psychiatric disorders encountered in most medical practices.

ADPY 7502. Elective Rotation In Addiction Medicine. (6 cr.; H-N or Audit; Every Fall & Spring) Elective rotations are offered in a variety of substance abuse treatment settings. Our program is innovative and flexible, using interventions from many schools. Each treatment plan is fully individualized, and may include 12-step approaches, Rational Recovery, social learning theory, and psychiatric care. Designed for students of any specialty. prereq: AdPy 7-500

ADPY 7503. Elective Experience in Research in Addiction Medicine. (3-6 cr.; H-N or Audit; Every Fall & Spring) A variety of clinical research projects offer the student excellent opportunities for developing research skills, as well as a deeper understanding of the addiction process. Ongoing projects include research on medical complications of alcoholism, treatment of alcohol and other drug dependence, brain imaging, neuropsychological testing and impairment, case management, and homelessness and alcohol/drugs. Other projects are available or possible and can be arranged. prereq: Approval of course director

ADPY 7505. Assessment and Treatment of Torture Victims. (2 cr.; H-N or Audit; Every Fall, Spring & Summer) How to assess/treat survivors of political torture. As part of an interdisciplinary team, students have patient contact, participate in special projects. Two-week field experience. prereq: 7500, MED 7500, med sr

ADPY 7512. Psychiatry Consultation/Liaison. (4 cr.; H-N only; Every Fall, Spring & Summer) The student is teamed with a resident and staff who supervise progressive participation in service activities. Case-directed teaching is complemented by seminars with assigned readings and service conferences.

ADPY 7514. Substance Abuse and Associated Psychiatric Disorders. (6 cr.; H-N or Audit; Periodic Fall & Spring) The student works with patients with substance use and/or abuse disorders. The student's involvement covers a spectrum of services including inpatient, intensive outpatient program, partial hospitalization, outpatient program, and outpatient follow-up. Supervision is conducted by Senior G-4 Resident and Staff. prereq: Approval of course director

ADPY 7516. Chemical Dependency Services. (2 cr.; H-N only; Every Fall, Spring & Summer) The student's time is spent primarily in group therapy and lecture settings in the adult chemical dependency unit. The student will meet with the medical director during the rotation.

ADPY 7518. Geriatric Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer) See patients 60+ years/their families. Evaluate brain-behavior complications of medical/neurological illness.

ADPY 7530. Psychiatry Scholarly Work. (4 cr.; H-N only; Every Fall, Spring & Summer) The student arranges a program with a faculty supervisor. Choosing the supervisor and the content of the course is the student's responsibility and must be approved by the faculty supervisor and course director. The student arranges a program with a faculty supervisor. Choosing the supervisor and the content of the course is the student's responsibility and must be approved by the faculty supervisor and Dr. Mackenzie.

ADPY 7535. Clinical Practice of Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer) The various clinical experiences provide opportunities for diagnostic evaluation and treatment for a range of psychiatric disorders in adults and/or children, including bipolar and unipolar affective disorders, anxiety disorders, adjustment disorders, attentional disorders, personality disorders and some psychotic disorders.

ADPY 7640. Essentials of Interdisciplinary Health Care. (1 cr.; H-N or Audit; Periodic Fall & Spring) Knowledge/skills to work successfully in interdisciplinary health care. Web-based course.

ADPY 7910. Adult Psychiatry Medical Residency. (6 cr.; [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Adult psychiatry medical residency.
ADPY 7911. Psychiatry PGY-1 at VA Medical Center. (3 cr. [max 24 cr.]; H-N or Audit; Every Spring & Summer) Introduction to wide variety of psychiatric topics. Lectures by invited speakers and by clinical/psychiatric faculty. prereq: PGY-1 psychiatry resident, dept consent
ADPY 7930. Adult Psychiatry Medical Fellowship. (. 6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Adult psychiatry medical fellowship.
ADPY 7952. Geriatric Psychiatry Fellowship VA Med Ctr. (. 8 cr. [max 24 cr.]; H-N or Audit; Periodic Fall) Fifth year fellowship in geriatric psychiatry at VA Medical Center. prereq: Psychiatric resident/fellow, dept consent
ADPY 7971. Consultation Liaison Psychiatric Fellowship. (. 8 cr.; H-N or Audit; Every Spring & Summer) Fifth year fellowship in consult-liaison psychiatry. prereq: C-L fellow/psychiatric resident, dept consent
ADPY 7972. Psychiatric Child Fellowship: Year I. (3 cr. [max 24 cr.]; H-N or Audit; Every Fall, Spring & Summer) First year of two-year fellowship in child/adolescent psychiatry, PGY-4 level. prereq: Psychiatric resident/fellow, dept consent
ADPY 7973. Chemical Dependency Fellowship. (. 8 cr. [max 24 cr.]; H-N or Audit; Every Spring & Summer) Fifth year fellowship in addiction psychiatry medicine. prereq: Psychiatric resident/fellow, dept consent
ADPY 7974. Eating Disorders Fellowship. (. 8 cr. [max 24 cr.]; H-N or Audit; Every Spring & Summer) Fifth year fellowship in psychiatry eating disorders at Fairview-University Medical Center. prereq: Psychiatric resident/fellow, dept consent
ADPY 7981. Psychiatric Child Fellowship: Year 2. (. 8 cr. [max 24 cr.]; H-N or Audit; Every Spring & Summer) Second year of two-year fellowship in child/adolescent psychiatry, PGY-5 level. prereq: Psychiatric resident/fellow, dept consent
ADPY 8205. Special Assignments. (1-16 cr.; Student Option; )
ADPY 8206. Research. (. 1-16 cr.; Student Option; Every Spring & Summer)
ADPY 8249. Clinical Neuropsychopharmacology. (. 1-15 cr.; Student Option; Periodic Fall) The course is designed for a two-day presentation, four hours one afternoon, followed by eight hours the next day, to include the following subject matter: introduction to neurotransmitter theory and mechanism of action of psychotropic drugs; evaluation of anxiety states and use of antianxiety agents; clinical picture of depression, use of antidepressants, and principles of drug combinations; schizophrenia diagnosis, use of antipsychotic drugs, antiparkinson medication, parkinson side effects of neuroleptics, and tardive dyskinesia; clinical evaluation of epilepsy and use of anticonvulsants; neuropathology of sleep, prescription of hypnotics and sedatives, and significance of over-the-counter sleep aids; use of anorexiants, over-the-counter appetite suppressants, and opiate analgesics; geriatric psychopharmacology; classification of drug side effects and principles of drug interaction; abused drugs; and ethnopsychopharmacology. prereq: Resident status or 3rd- or 4th-yr med student or 8248 for grad students
ADPY 8970. Directed Studies. (. 1-24 cr.; Student Option; Every Spring & Summer)

Aerospace Engineering and Mechan (AEM)

AEM 5247. Hypersonic Aerodynamics. (3 cr.; A-F or Audit; Spring Odd Year) Importance/properties of hypersonic flow. Hypersonic shock and expansion-wave relations. Local surface inclination methods. Approximate/exact methods for hypersonic inviscid flow fields. Viscous flow: boundary layers, aerodynamic heating, hypersonic viscous interactions, computational methods. Hypersonic propulsion and vehicle design. prereq: 4202 or equiv, CSE grad student
AEM 5253. Computational Fluid Mechanics. (3 cr.; A-F or Audit; Every Fall) Introductory concepts in finite difference and finite volume methods as applied to various ordinary/partial differential model equations in fluid mechanics. Fundamentals of spatial discretization and numerical integration. Numerical linear algebra. Introduction to engineering and scientific computing environment. Advanced topics may include finite element methods, spectral methods, grid generation, turbulence modeling. prereq: [4201 or equiv], [CSci 1113 or equiv]. CSE grad student
AEM 5321. Modern Feedback Control. (. 3 cr.; Student Option; Every Fall) State space theory for multiple-input-multiple-output aerospace systems. Singular value decomposition technique, applications to performance/robustness. Linear quadratic gaussian and eigenstructure assignment design methods. Topics in H[infinity] symbol. Applications. prereq: 4321 or EE 4321 or ME 5281 or equiv
AEM 5333. Design-to-Flight: Small Uninhabited Aerial Vehicles. (3 cr.; A-F only; Periodic Spring) Designing, assembling, modeling, simulating, testing/lying of uninhabited aerial vehicles. Rapid prototyping software tools for vehicle modeling. Guidance, navigation, flight control, real-time implementations, hardware-in-the-loop simulations, flight tests. prereq: [4202, concurrent registration is required (or allowed) in 4303W, 4601] or equiv, instr consent
AEM 5401. Intermediate Dynamics. (. 3 cr.; A-F or Audit; Every Fall) Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications. prereq: CSE upper div or grad, 2012. Math 2243
AEM 5451. Optimal Estimation. (. 3 cr.; Student Option; Fall Even Year) Basic probability theory. Batch/recurve least squares estimation. Filtering of linear/non-linear systems using Kalman and extended Kalman filters. Applications to sensor fusion, fault detection, and system identification. prereq: [[MATH 2243 or STAT 3021 or equiv], [4321 or EE 4231 or ME 5281 or equiv]] or instr consent
AEM 5501. Continuum Mechanics. (. 3 cr.; Student Option; Every Fall) Concepts common to all continuous media; elements of tensor analysis; motion, deformation, vorticity; material derivatives; mass, continuity equation; balance of linear, angular momentum; geometric characterization of stress; constitutive equations. prereq: CSE upper div or grad, 3031, Math 2243 or equiv or instr consent
AEM 5503. Theory of Elasticity. (. 3 cr.; A-F or Audit; Every Spring) Introduction to the theory of elasticity, with emphasis on linear elasticity. Linear and nonlinear strain measures, boundary-value problem for linear elasticity, plane problems in linear elasticity, three dimensional problems in linear elasticity. Topics from nonlinear elasticity, micromechanics, contact problems, fracture mechanics. prereq: 4501 or equiv, Math 2263 or equiv or instr consent
AEM 5581. Mechanics of Solids. (. 3 cr.; Student Option; Fall Even Year) Continuum mechanics in one dimension: kinematics; mass, momentum/energy, constitutive theory. Wave propagation, heat conduction, Strings. Euler-Bernoulli theory. 3-D deformations/stress. Topics from fracture mechanics, structural stability, vibrations, thin films, layered media, smart materials, phase transformations, 3-D elastic wave propagation. Elasticity, viscoelasticity, plasticity. prereq: 3031 or equiv, [Math 2373 or equiv], [Math 2374 or equiv], [CSE grad student]
AEM 5651. Aeroelasticity. (. 3 cr.; A-F or Audit; Every Fall) Static aeroelastic phenomena, torsional divergence of a lifting surface control surface reversal. Aeroelastic flutter, unsteady aerodynamics. Problems of gust response, buffeting. Design project. prereq: 4202, 4301, [grad student or CSE upper div]
AEM 8000. Seminar: Aerospace Engineering and Mechanics. (. 1 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring) To be determined prereq: DGS consent
AEM 8201. Fluid Mechanics I. (. 3 cr.; Student Option; Every Fall) Mathematical and physical principles governing the motion of fluids. Kinematic, dynamic, and thermodynamic properties of fluids; stress and deformation; equations of motion; analysis of rotational and irrotational inviscid incompressible flow; two-dimensional and three-dimensional potential flow. prereq: 4201 or equiv, Math 2263 or equiv
AEM 8202. Fluid Mechanics II. (3 cr.; Student Option; Every Spring) Analysis of incompressible viscous flow; creeping flows; boundary layer flow. prereq: 8201

AEM 8203. Fluid Mechanics III. (3 cr.; Student Option; Every Fall) Analysis of compressible flow and shock waves; method of characteristics for one-dimensional unsteady flow and for two-dimensional steady flow. prereq: 8202

AEM 8207. Hydrodynamic Stability. (3 cr. max 4 cr.; Student Option; Periodic Fall) Theory of hydrodynamic stability. Stability of shear flows, rotating flows, boundary layer, two fluid flows, fingering flows, Rayleigh-Taylor instability, Kelvin Helmholtz instability, capillary instability, convective/absolute stability. Methods of linear stability, normal modes, energy theory of stability, nonlinear perturbation, bifurcation theory, transition to turbulence. prereq: 8201

AEM 8211. Theory of Turbulence I. (3 cr.; Student Option; Periodic Fall) Reynolds equations, methods of averaging, elements of stability theory and vortex dynamics; description of large vortical structures in mixing layers and boundary layers; horseshoe vortices; flow visualization. prereq: 8202

AEM 8212. Theory of Turbulence II. (3 cr.; Student Option; Periodic Fall) Prandtl's mixing length theory applied to classical boundary layer, pipe, jet, and wake flows; prediction methods used at Stanford Conference; law of wall; law of wake; K-epsilon method. prereq: 8211

AEM 8213. Turbulent Shear Flows. (3 cr.; A-F or Audit; Periodic Fall) Equations of motion for turbulent flow. Isotopic/homogeneous turbulence. Free shear flows. Wall turbulence, elements of vortex dynamics. prereq: 8201, 8202

AEM 8221. Rheological Fluid Mechanics. (3 cr.; Student Option; Periodic Fall) Methods of solution for flows of simple fluids with general constitutive equations. Topics from viscometric flow, extensional flow, perturbations of the rest state with steady and unsteady flow, secondary flow. prereq: 8201 or 5501 or instr consent

AEM 8231. Molecular Gas Dynamics. (3 cr.; Student Option; Periodic Fall) Kinetic theory of gases. Boltzmann equation, Maxwell-Boltzmann distribution, collisions, transport properties. Introduction to quantum mechanics. Statistical thermodynamics, classical/quantum statistics. Partition functions and thermodynamic properties. Irreversible thermodynamics. prereq: [4201 or equiv, [4203 or equiv], [ME 3324 or equiv]

AEM 8232. Physical Gas Dynamics and Molecular Simulation. (3 cr.; A-F or Audit; Periodic Spring) Molecular description of gas dynamics. Kinetic theory, transport theory, quantum mechanics for internal energy partitions, statistical thermodynamics. Finite rate chemical kinetics. Emphasis on link to continuum fluid dynamics. Overview of numerical simulation techniques for the Boltzmann equation with emphasis on direct simulation Monte Carlo. prereq: AEM 8231

AEM 8241. Perturbation Methods in Fluid Mechanics. (3 cr.; Student Option; Periodic Fall) Method of matched asymptotic expansions presented through simple examples and applied to viscous flows at high and low Reynolds numbers and other problems in fluid mechanics and applied mathematics. prereq: 8202 or instr consent

AEM 8251. Finite-Volume Methods in Computational Fluid Dynamics. (3 cr.; Student Option; Periodic Spring) Development of finite-volume computational methods for solution of compressible Navier-Stokes equations. Accuracy, consistency, and stability of numerical methods; high-resolution upwind shock-capturing schemes; treatment of boundary conditions; explicit and implicit formulations; considerations for high performance computers; recent developments and advanced topics. prereq: 4201 or 8201 or equiv, CSci 1107 or equiv


AEM 8256. Nonlinear Waves in Mechanics. (3 cr.; Student Option; Periodic Fall) Theory of kinematic, hyperbolic, and dispersive waves, with application to traffic flow, gas dynamics, and water waves. prereq: 5501 or instr consent

AEM 8271. Experimental Methods in Fluid Mechanics. (3 cr.; Student Option; Periodic Fall) Overview of computer organization, including external communications and A/D, D/A conversion. Measurement techniques, such as pressure measurements and hot-wire and laser Doppler anemometry. Signal processing and uncertainty; computer control of experiments. prereq: 4201, instr consent

AEM 8295. Selected Topics in Fluid Mechanics. (1-4 cr. max 8 cr.; Student Option; Periodic Fall; Spring & Summer) Includes individual student projects completed under guidance of a faculty sponsor. prereq: dept consent

AEM 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

AEM 8400. Seminar: Aerospace Systems. (1 cr. max 4 cr.; S-N or Audit; Every Fall & Spring) Developing program of research in aerospace systems. Discussions of current research/ topics of interest. prereq: Aerospace Eng grad student


AEM 8421. Robust Multivariable Control Design. (3 cr.; Student Option; Periodic Spring) Application of robust control theory to aerospace systems. Role of model uncertainty/ modeling errors in design process. Control analysis and synthesis, including $H_{inf symbol}$ and $H_{inf symbol}$ optimal control design and structural singular value [Greek letter nu] techniques. prereq: 5321 or equiv

AEM 8423. Convex Optimization Methods in Control. (3 cr.; A-F or Audit; Periodic Fall) Practical aspects of convex optimization methods applied to solve design/analysis problems in control theory. prereq: 5321 or EE 5321 or equiv

AEM 8426. Optimization and System Sciences. (3 cr.; A-F or Audit; Periodic Fall) Review of probability concepts and random variables, nonlinear stochastic differential equations and their numerical solutions, Monte-Carlo simulations, Gauss-Markov process, stochastic dynamic programming, and optimal control of practical uncertain dynamical systems. prereq: 5321 or 5431, CSE grad student


AEM 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

AEM 8451. System Identification: Theory and Applications. (3 cr.; A-F or Audit; Periodic Spring) Modeling methods for dynamic systems using measurement data, or in combination with first principles, based on theory of systems/signals. Primary emphasis on linear systems for control system design/simulation applications. Examples from aerospace applications. prereq: 4321 or equiv

AEM 8495. Advanced Topics in Aerospace Systems. (1-4 cr. max 32 cr.; A-F or Audit; Every Fall, Spring & Summer) Individual student projects completed under guidance of a faculty sponsor. prereq: dept consent
AEM 8500. Research Seminar in Mechanics of Materials. (1 cr.; [max 12 cr.]; S-N or Audit; Every Fall & Spring) Seminars given by students, faculty, and visitors on topics drawn from current research. prereq: instr consent

AEM 8511. Advanced Topics in Continuum Mechanics. (3 cr.; [max 6 cr.]; A-F or Audit; Periodic Fall) Constitutive equations; invariance and thermodynamic restrictions. Nonlinear elasticity theory; exact solutions, minimization, stability. Non-Newtonian fluids; viscometric flows, viscometric functions, normal stress. Other topics may include reactive and/or nonreactive mixtures, nonlinear plasticity, and deformable electromagnetic continua. prereq: 5501 or instr consent

AEM 8521. Advanced Topics in Elasticity. (3 cr.; A-F or Audit; Periodic Fall) Contact stresses, finite deformations, and other topics. prereq: 5503

AEM 8523. Elastodynamics. (3 cr.; A-F or Audit; Periodic Fall) Waves and vibrations in rods, beams, and plates; dispersion; volume and surface waves; reflection; energy theorems; vibrations of bounded media and relation to technical theories; elements of nonlinear waves, inelastic waves, and stability of motion of elastic systems. prereq: 4581 or 5501 or instr consent


AEM 8531. Fracture Mechanics. (3 cr.; A-F or Audit; Periodic Fall & Spring) Theories of mechanical breakdown. Kinetic rate theories and instability considerations; formation of equilibrium cracks and circular crack propagation under pulses; statistical aspects of strength and fracture of micromolecular systems; time and temperature dependency in fracture problems and instability of compressed material systems. prereq: 5503 or instr consent

AEM 8533. Theory of Plasticity. (3 cr.; Student Option; Periodic Fall) Theory of permanent deformation of ductile metals; bi-linear material models, Drucker's three bar truss, and other examples; 3-D continuum formulation, yield surfaces, hardening rules, and material stability; slip line theory. Prandtl punch solution; single crystal plasticity. prereq: 5203 or instr consent

AEM 8541. Mechanics of Crystalline Solids. (3 cr.; Student Option; Periodic Fall) Atomic theory of crystals and origins of stress in crystals. Relation between atomic and continuum description; phase transformations and analysis of microstructure; effects of shear stress, pressure, temperature, electromagnetic fields, and composition on transformation temperatures and microstructure; interfacial energy in solids. prereq: 5501 or instr consent

AEM 8551. Multiscale Methods for Bridging Length and Time Scales. (3 cr.; A-F or Audit; Periodic Spring) Classical/emerging techniques for bridging length/time scales. Nonlinear thermoelasticity, viscous fluids, and micromagnetics from macro/atomic viewpoints. Statistical mechanics, kinetic theory of gases, weak convergence methods, quasicontinuum, effective Hamiltonians, MD, new methods for bridging time scales. prereq: Basic knowledge of [continuum mechanics, atomic forces], familiarity with partial differential equations, grad student in [engineering or mathematics or physics]

AEM 8595. Selected Topics in Mechanics and Materials. (1-4 cr.; [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Includes individual student projects completed under guidance of a faculty sponsor. prereq: dept consent

AEM 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) To be determined prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

AEM 8777. Thesis Credits. Master's. (1-18 cr.; [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

AEM 8880. Plan B Project. (1-3 cr.; [Student Option; Every Fall, Spring & Summer] Satisfies project requirement for Plan B Master's degree. May appear on M.S. program but does not count toward 20-credit minimum in the major field. Topic arranged by student and advisor; written report required. prereq: Grad aerospace engineering or mechanics major, dept consent

AEM 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

AFRO 5103. World History and Africa. (3 cr.; A-F or Audit; Fall Even Year) Contributions of African American thinkers to making of African history/strategies to rework theoretical/analytical foundations of world history. Writings/intellectual networks of major thinkers whose historical/ethnicographic works on Africa spanning nineteenth to twentieth century. prereq: Grad student or instr consent


AFRO 5181W. Blacks in American Theatre. (WI; 3 cr.; Student Option; Periodic Spring) Historical survey of significant events in the development of American Black theatrical tradition; essays, plays, playwrights, and theatres from early colonial references to Black Arts Movement.

AFRO 5182W. Contemporary Black Theatre: 1960-Present. (WI; 3 cr.; Student Option; Spring Even Year) Essays, plays, playwrights, theatres that have contributed to contemporary Black theatre from beginning of Black Arts Movement to present.

AFRO 5191. Seminar: The African American Experience in South Africa. (3 cr.; Student Option; Periodic Fall & Spring) Ideological, political, religious, and cultural ties that have informed African American and black South African relations from late 18th century to present.

AFRO 5406. Black Feminist Thought. (3 cr.; Student Option; Periodic Spring) Critically examine spatiality of African descendant women in Americas/larger black diaspora. Writings from black feminist/queer geographies, history, contemporary cultural criticism. Recent black feminist theorizing.


AFRO 5625. Women Writers of Africa and the African Diaspora. (3 cr.; Student Option; Spring Even Year) Works of black women writers from Europe, Africa, South America, and the Caribbean. Novels, drama, films, and essays.

AFRO 5627. Seminar: Harlem Renaissance. (3 cr.; Student Option; Every Fall) Review Harlem Renaissance from variety of perspectives. Literary, historical, cultural, political, international. Complex patterns of permeation/interdependency between worlds
inside/outside of what W.E.B. Du Bois called "the Veil of Color." prerequisite: Grad student or instr consent

AFRO 5866. The Civil Rights and Black Power Movement, 1954-1984. (3 cr.; A-F or Audit; Every Fall)

AFRO 5910. Topics in African American and African Studies. (2-4 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer) Topics vary by instructor.

AFRO 5932. The Production of Knowledge, Negotiating the Past, and the Writing of African Histories. (3 cr.; A-F or Audit; Periodic Fall & Spring) Recent scholarship on social history of Africa. Focuses on new literature on daily lives of ordinary people in their workplaces, communities, households. prerequisite: Grad student or instr consent

AFRO 5993. Directed Study. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Guided individual reading/study for qualified seniors and graduate students. prerequisite: instr consent

AFRO 8202. Seminar: Intellectual History of Race. (3 cr.; Student Option; Every Fall & Spring) Shifting and contested meanings of "race" from the "Age of Conquest" to the present. Starting from the proposition that race is not a fixed or stable category of social thought or being, the seminar seeks to ascertain how and why Western ideas about race have changed.

AFRO 8554. Seminar: Gender, Race, Nation, and Policy—Perspectives from Within the African Diaspora. (3 cr.; Student Option; Every Fall & Spring) Interdisciplinary analysis of U.S. domestic and foreign policies as they affect Africans and peoples of African descent in the diaspora. Intersections of gender, race, nation, and class. prerequisite: instr consent

AFRO 8802. Seminar: Orientalism. (3 cr.; Student Option; Periodic Fall & Spring) Recent arguments related to Orientalism as a trend in modern literary and cultural criticism.

AFRO 8910. Topics in Studies of Africa and the African Diaspora. (3 cr.; max 9 cr.; Student Option; Every Fall & Spring) Topics specified in Class Schedule.

AFEE 5110. Foundations of Agricultural Education. (3 cr.; A-F only; Every Fall) This course explores historical and philosophical foundations and current structures of school-based agricultural education programs. Students will understand, value, and apply strategies to implement and manage the integrated program model of agricultural education.

AFEE 5111W. Agricultural Education: Methods of Teaching. (WI; 4 cr.; Student Option; Every Fall) Use of teaching resources; principles of teaching and learning; problem-solving techniques; lesson plan construction for large group, small group and individual investigations; student management; and assessment.

AFEE 5112. Agricultural Education Organization and Curriculum for Youth. (3 cr.; Student Option; Every Spring) Development of community school program in agriculture, agribusiness, and environmental science. Program to meet graduation outcomes and determine student needs.

AFEE 5114. Agricultural Education Teaching Seminar. (1 cr.; Student Option; Every Spring) Reflective learning on teacher preparation experience; identify issues and problems facing the discipline; needs for continual preparation and program adjustment.


AFEE 5118. Strategies for Managing and Advising the FFA Organization. (2 cr.; A-F or Audit; Every Spring) Principles and techniques to advise an FFA chapter. Historical and philosophical basis of FFA, organization and structure. Integration with classroom instruction, public relations, recruitment, and administration of FFA chapters.

AFEE 5220. Special Topics in Agriculture Education and Extension. (1-3 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer) Content varies by offering.

AFEE 5231. Agricultural Education Curriculum K-12. (2 cr.; A-F or Audit; Periodic Fall) Philosophy, organization, and administration of instruction in agricultural education programs at the elementary, middle, and high school levels.

AFEE 5233. Advanced Procedures in Teaching Agricultural Education. (2 cr.; A-F or Audit; Periodic Fall) New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

AFEE 5235. Experiential Learning in Agricultural Education. (2 cr.; Student Option; Periodic Fall & Spring) The organization and administration of agricultural experience programs for middle and secondary level students: career exploration, improvement projects, experiments, placement in production/business/community settings, entrepreneurship. Current state and national programs and resource material.

AFEE 5280. Current Issues for the Beginning Agricultural Education Teacher. (1-3 cr.; Student Option; Every Spring) Reflection, analysis on current problems and issues confronting beginning teachers of agricultural education. Issues in teaching methods, classroom and program management, discipline, curriculum, FFA and SAЕ development, school-to-work relationships.

AFEE 5697. Teaching Internship: School and Classroom Setting. (2 cr.; Student Option; Every Fall) Part-time supervised teaching experience in a school. Seminars on managing student's learning in context of work and human resource education programs in contemporary schools and on becoming a reflective educator. prerequisite: WHRE 5696 for initial licensure program

AFEE 5698. Teaching Internship. (2-8 cr.; max 16 cr.; Student Option; Every Spring) Teaching experience in a school system that provides programs to grades 5-12. prerequisite: Admission to initial licensure program

AFEE 5993. Directed Study in Agricultural Education and Extension. (1-4 cr.; max 8 cr.; Student Option; Every Fall, Spring & Summer) Topics may be chosen to permit study of areas within education or to supplement areas of inquiry not provided in the regular course structure.

AFEE 5995. Integrating Paper—Master of Education: Agricultural and Extension Education. (1-5 cr.; A-F or Audit; Every Fall, Spring & Summer) Students prepare a paper dealing with issues in agricultural education applied to professional responsibilities. AFEE 5995 can be taken for 1-5 credits, and students can enroll for two semesters for a combined max total of 5 credits.

AFEE 8090. Seminar: Agricultural Education and Extension. (1-3 cr.; max 6 cr.; Student Option; Periodic Fall & Spring) Topics on various aspects of agricultural education. Prepare, present, and critique a report. prerequisite: AgEd grad student

AFEE 8094. Research in Agricultural Education and Extension. (1-6 cr.; A-F or Audit; Every Fall, Spring & Summer) Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies. prerequisite: AgEd student doing Plan B research, dept consent
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

AGRO 5021. Plant Breeding Principles. (3 cr.; Student Option; Every Fall)
This course is intended for advanced undergraduate students and graduate students that are either (1) not plant breeding majors, who will benefit from a basic understanding of how genetics is applied to plant improvement; or (2) plant breeding majors lacking prior coursework in plant breeding. The objective of this course is to develop an understanding of the underlying principles, ideas, and concepts important to applying genetic principles to plant breeding, evaluating breeding methods, and enhancing genetic progress and efficiency.

AGRO 5121. Applied Experimental Design. (4 cr.; Student Option; Every Spring)
Principles of sampling methodologies, experimental design, and statistical analyses. Methods/procedures in generating scientific hypotheses, organizing, initiating, conducting, and analyzing scientific experiments using experimental designs and statistical procedures. prereq: Stat 5021 or equiv or instr consent

AGRO 5311. Research Methods in Crop Improvement and Production. (1 cr.; S-N or Audit; Every Fall & Summer)
Demonstrations and discussions of techniques in crop improvement and/or production research. Presentations integrate biotechnology with traditional breeding methods; production sessions emphasize ecologically sound cropping systems. prereq: applied plant sciences grad

AGRO 5321. Ecology of Agricultural Systems. (3 cr.; A-F or Audit; Every Spring)
Ecological approach to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applied. prereq: [3xxx or above] course in [Agron or AnSc or Ent or Hort or PiP or Soil] or instr consent

AGRO 5431. Applied Plant Genomics and Bioinformatic. (3 cr.; Student Option; Every Fall)
Analysis, interpretation, visualization of large plant genomic datasets. Basic computer programming, analyzing large-scale genomics to answer basic/applied biological questions, understanding limitations of each application, presenting concise visual findings from large-scale datasets. prereq: Grad student or [undergrad with genetics course

AGRO 5580. Publishing in Plant Science Journals. (2 cr.; S-N only; Every Fall)
Organizational/writing skills for reporting research results in a peer-reviewed journal manuscript. Publication process; choosing your journal; characteristics of good scientific writing; ethics, plagiarism, and authorship; stating your objectives; writing the different components of a manuscript; citing literature; use of tables and figures; proofreading. Written manuscript ready for submission to a plant science journal. prereq: instr consent

AGRO 5999. Special Topics: Workshop in Agronomy. (1-6 cr.; Student Option; Every Fall, Spring & Summer)
Workshops on various topics in agronomy and plant genetics. Presenters/faculty may include guest lecturers/experts. Topics specified in class schedule.

AGRO 8005. Supervised Classroom or Extension Teaching Experience. (2 cr.; S-N or Audit; Every Fall & Spring)
Classroom or extension teaching experience in one of the following departments: Agronomy and Plant Genetics; Biosystems and Agricultural Engineering; Horticultural Science; Plant Pathology; or Soil, Water, and Climate. Participation in discussions about effective teaching to strengthen skills and develop personal teaching philosophy. prereq: Grad SENG major, instr consent

AGRO 8023. Evolution of Crop Plants. (3 cr.; A-F or Audit; Spring Even Year)
Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today. prereq: 9 grad cr in ag or bio science

AGRO 8202. Breeding for Quantitative Traits in Plants. (3 cr.; Student Option; Spring Odd Year)
Principles and concepts of population and quantitative genetics/application in designing and implementing a plant breeding program/ theory, experimental approaches, and evidence that form the basis for these concepts and breeding strategies. prereq: [5201, STAT 5021] or instr consent

AGRO 8241. Chromosomal and Molecular Genetics of Plant Improvement. (3 cr.; Student Option; Spring Even Year)
Mixture of classical/current info in molecular plant genetics, biotech, and genomics. Students devise experiments in breeding, genetics, genomics, physiology, cellular/molecular biology, and other areas. prereq: Introductory Genetics course

AGRO 8900. Advanced Discussions. (1-3 cr.; max 36 cr.; Student Option; Periodic Fall & Spring)
Special workshops or courses in applied plant sciences for graduate students only.

Akkadian (AKKA)

AKKA 5011. Elementary Akkadian I. (3 cr.; Student Option; Periodic Fall)
Introduction to cuneiform script. Basics of Old Babylonian morphology and syntax. Written drills, readings from Hammurabi laws, foundation inscriptions, annals, religious and epic literature. prereq: Adv undergrads with instr consent or grades

AKKA 5012. Elementary Akkadian II. (3 cr.; Student Option; Periodic Fall)
Continuation of 5011. Readings include The Gilgamesh Epic, The Descent of Ishtar, Mari Letters, Annals of Sennacherib and Essarhaddon, Sargon II. prereq: 5011

American Indian Studies (AMIN)

AMIN 5107. The Structure of Anishinaabemowin, the Ojibwe Language. (3 cr.; A-F or Audit; Periodic Fall)
Analysis of grammatical structures of Anishinaabemowin. prereq: 3104

AMIN 5141. American Indian Language Planning. (3 cr.; A-F or Audit; Periodic Fall)
Planning for maintenance/revitalization of North American indigenous languages. Condition/status of languages. Documentation, cultivation, literacy, education. prereq: 3103 or 3123 or instr consent

AMIN 5202. American Indians and the Supreme Court. (3 cr.; Student Option; Periodic Fall & Spring)
Seminar explores the role and the practice of the US Supreme Court as a policy-making institution when dealing with indigenous nations and their citizens. Analysis of theoretical, behavioral, political, and institutional perspectives. Student work includes reading and textual analysis, leading discussions, analytical research paper.

AMIN 5402. American Indians and the Cinema. (AH,DSJ; 3 cr.; A-F or Audit; Every Spring & Summer)
Representations of American Indians in film, historically/contemporary. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMIN 5409. American Indian Women: Ethnographic and Ethnohistorical Perspectives. (DSJ,HIS; 3 cr.; Student Option; Fall Even Year)
Comparative survey of ethnographic/ethnohistorical writings by/about American Indian women.

AMIN 5412. Comparative Indigenous Feminisms. (GP; 3 cr.; Student Option No Audit; Periodic Fall & Spring)
The course will examine the relationship between Western feminism and indigenous feminism as well as the interconnections between women of color feminism and indigenous feminism. In addition to exploring how indigenous feminists have theorized from 'the flesh' of their embodied experience of colonialism, the course will also consider how indigenous women are articulating decolonization and the embodiment of autonomy through scholarship, cultural revitalization, and activism.

AMIN 5890. Readings in American Indian and Indigenous History. (3 cr.; Student Option; Periodic Fall & Spring)
Students in this course will read recently published scholarship in American Indian and Indigenous history that takes up pressing research questions, promises to push inquiry in new directions, and that theorizes important interventions in our thinking to understand where the field is situated and moving. Reflecting the instinctively interdisciplinary nature of American Indian and Indigenous history, readings will be drawn not just from the discipline of history but across other disciplines such as Anthropology, American Studies, Geography, Literature, Political Science, and Legal Studies. As well, readings will include scholarship that reaches out to embrace the Global Indigenous studies turn. prereq:
Analysis of central theoretical work in the field and survey of key methodologies. prereq: grad AmSt major or instr consent or dept consent


AMST 8232. Cultural Fallout: The Cold War and Its Legacy, Research. (3 cr.; Student Option; Every Fall & Spring) Student produce a research paper on history/culture of Cold War era as it developed in United States after World War II. Research projects build upon readings from 8231. prereq: 8231

AMST 8239. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Readings. (3 cr.; Student Option; Every Fall) Social, cultural, and artistic modes of self-expression. Intellectual analysis of people in the United States identified as female or male or as members of groups defined by race, ethnicity, class, or sexual orientation. prereq: instr consent

AMST 8240. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development. (3 cr.; max 9 cr.) Social, cultural, and artistic modes of self-expression and intellectual analysis of people in the United States identified as female or male and/or as members of group defined by race, ethnicity, class, or sexual orientation. prereq: instr consent

AMST 8249. Popular Culture and Politics in the 20th Century: Readings. (3 cr.; Student Option; Periodic Fall) Popular arts in their political/social context. Issues of race, gender, class, and nationalism. prereq: instr consent

AMST 8250. Popular Culture and Politics in the 20th Century: Research Strategies. (3 cr.; Student Option; Periodic Fall) Popular arts in their political/social context. Focuses on issues of race, gender, class, and nationalism. prereq: 8239 or instr consent

AMST 8259. Literature, History, and Culture: Research Strategies. (3 cr.; Student Option; Periodic Fall & Spring) Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture. prereq: instr consent

AMST 8260. Literature, History, and Culture: Topical Development. (3 cr.; Student Option; Periodic Fall & Spring) Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture. prereq: instr consent

AMST 8288. Working in the Global Economy: Readings. (3 cr.; Student Option; Periodic Fall) Debates about global economy's consequences for American culture/character. Effects of global capitalism on factory work, service sector, pink-collar, and factory work in multinational corporations and professional/managerial positions inside/outside U.S. borders. How work is lived through race, class, gender, and nation.

AMST 8289. Ethnographic Research Methods: Research Strategies in American Studies. (3 cr.; Student Option; Periodic Spring) Students conduct an empirical research project, write a final paper. Assumptions/practices of positivism, reflexive science, and feminist methodology. Issues surrounding politics/ethics of feminist research. Dilemmas in practice of fieldwork, oral histories, reading, and writing. prereq: 8288 or instr consent

AMST 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

AMST 8401. Practicum in American Studies. (3 cr.; S-N or Audit; Periodic Fall & Spring) Training in teaching undergraduate courses in American studies. prereq: instr consent

AMST 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

AMST 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.) No Grade Associated; Every Fall, Spring & Summer x prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

AMST 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.) No Grade Associated; Every Fall, Spring & Summer (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

AMST 8801. Dissertation Seminar. (3 cr.; S-N or Audit; Every Fall & Spring) Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it. prereq: AmSt doctoral student beginning dissertation work

AMST 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.) No Grade Associated; Every Fall, Spring & Summer (No description) prereq: Max 18 cr per semester or summer; 24 cr required

AMST 8920. Topics in American Studies. (3-4 cr.; max 12 cr.) (Student Option; Every Fall & Spring) Topics specified in Class Schedule.

AMST 8970. Independent Study in American Studies. (1-9 cr.; Student Option; Every Fall, Spring & Summer)
Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments. 

prereq: instr consent, dept consent

Anatomy (ANAT)

ANAT 5095. Advanced Problems in Anatomy. (1-6 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer)
Exceptional projects that do not easily fit within confines of other ANAT offerings. Examples include but not limited to individual teaching or research projects. prereq: one or more ANAT classes, instr consent

ANAT 5150. Human Gross Anatomy. (5 cr.; A-F only; Every Fall)
Human cadaveric dissection based on traditional preparation, lab dissection, review sections, radiographic analysis, clinical correlations. Taught by regions. Extremities, torso, head/neck. Assessment by midterm/final written/practical examinations. prereq: instr consent, For Medical Students, or Graduate students enrolled in an appropriate graduate program as determined by instructor.

ANAT 5525. Anatomy and Physiology of the Pelvis and Urinary System. (1-2 cr.; A-F only; Every Spring)
Two-day intensive course. Pelvis, perineum, and urinary system with cadaveric dissection. Structure/function of pelvic and urinary organs, including common dysfunction and pathophysiology. Laboratory dissections, including kidneys, ureters, urinary bladder, pelvic viscera and perineum (male or female), pelvic floor, vascular and nervous structures. Grand rounds section. prereq: One undergard anatomy course, one undergrad physiology course, instr consent

ANAT 5999. Head and Neck Anatomy. (3 cr.; A-F or Audit; Every Fall & Summer)
A preclinical project course that can be individually arranged between the student and a faculty member for credit in areas not covered by regular courses. May include clinical/ basic science research, library research or special projects.

ANES 7183. Anesthesiology Advanced Elective. (4 cr.; H-N only; Every Fall, Spring & Summer)
The experience will build on the basics learned in rotation 7181, and include greater utilization of manual skills such as starting i.v. catheters, endotracheal intubation, and a greater understanding of physiology and interpretation of data from multiple simultaneous monitors.

ANES 7184. Rural Externship in Clinical Anesthesiology. (0-3 cr.; H-N only; Every Fall, Spring & Summer)
Students shadow surgical medical director in all aspects of patient care and administrative duties. Care of patients in OR. Clinic visits. Riding with paramedics. Meeting with CEO of hospital for strategic planning.

ANES 7185. Anesthesia Advanced Elective - VA. (4 cr.; H-N only; Every Fall, Spring & Summer)
This 4-week advanced rotation is focused on the medical student who is interested in pursuing a career in anesthesiology and/or desires additional anesthesia experience in managing medically complex patients undergoing middle to high-risk surgery. Students will have the opportunity to care for the aging veteran population. There will be an emphasis on managing patients with multiple co-morbid conditions undergoing cardiac and vascular surgery. Additionally, medical students will learn more advanced concepts during cases that include ENT, thoracic, and abdominal surgery. The medical student will develop skills including placing peripheral intravenous catheters, endotracheal intubation, arterial lines, and central lines. The medical student will develop a greater understanding of physics of fluids/gases, cardiac physiology, hemodynamics and pulmonary physiology, ventilator management and interpretation of data from multiple simultaneous monitors. They will function at the level of a sub-intern and will be given advanced responsibilities consistent with their level of knowledge and skill.

ANES 7186. Clinical Practice in Anesthesia. (15 cr.; H-N or Audit; Every Fall & Spring)

ANES 7286. Directed Study Anesthesia Project: Clinical. (1-15 cr.; H-N or Audit; Every Spring)

Animal Science (ANSC)

ANES 7910. Anesthesiology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

ANES 7930. Anesthesiology Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

ANES 8269. Research in Anesthesia. (1 cr.; Student Option; Every Fall & Spring)
ANSC 5091. Research Proposals: From Ideas to Strategic Plans. (Wt; 3 cr.; Student Option; Every Fall & Spring)
You have a great research idea, now what? How do you turn your idea into a proposal? It has been said paraphrasing Edison, that innovation is one percent inspiration, ninety-nine percent perspiration. In this course, we will start with and inspiring idea and sweat our way to develop a research proposal. The students will go through a step-by-step process that starts choosing and defining a research idea, then proceeding to do literature reviews and to the development of hypothesis, aims, objectives and a research strategy. The aim of this course is to provide students with tools to understand the structure of scientific reports and proposals, literature searches and basic data interpretation. The student will learn about different research approaches and how to achieve consistency in their research projects. We will guide students in how to begin and develop a written research proposal that will satisfy the requirements of their advisers, institution and funding organizations. prereq: There are no prerequisites, however, having taken ANSC 3011 Statistics for Animal Science is desirable.

ANSC 5099. Special Workshop in Animal Science. (1-4 cr.; [max 12 cr.]; Student Option; Every Spring)
Topics vary. See Class Schedule or department. Topics may use guest lectures/experts. prereq: instr consent

ANSC 5200. Statistical Genetics and Genomics. (4 cr.; Student Option; Fall Even Year)

ANSC 5305. Companion & Wild Species Reproduction. (2 cr.; A-F only; Every Spring)
Principles of reproductive physiology specific to domesticated companion canine and feline species as well as avian species. These principles discussed in the context of the management of breeding and reproductive diseases in companion species as well as conservation management in wild species. prereq: instr consent

ANSC 5555. Applied Livestock and Poultry Microbiology. (2 cr.; A-F only; Spring Even Year)
This applied microbiology course is intended to provide theoretical basis and hands-on experience to students on major pathogenic bacteria colonizing livestock and domestic poultry. This course will provide skills to the students who seriously consider farm animal and poultry microbiology research and/or teaching in their careers. Pathogenic bacteria in livestock and poultry such as Listeria monocytogenes, Escherichia coli O157: H7, and Salmonella, fungal microorganisms (Aspergillus), and beneficial microorganisms such as Lactobacillus, will be discussed. In addition, the course will introduce feed testing methods (Bacteriological Analytical Manual (BAM) methodology), common antibacterials/antibiotics used for decontamination and disinfection, and the emerging alternatives to antibiotics with a perspective on bacterial antibiotic resistance. In a flipped class room format, the students will gather necessary information provided by the instructor, listen to short lectures on the methods and mechanisms, participate in demonstrations, and apply it in a typical BSLL2 laboratory set up under supervision. All students should undergo BSLL2 training prior to enrollment. Online training takes approximately 5-6 hours. Not more than 4 students will be allowed for each session due to BSLL2 pathogenic microbiology space restriction, access to RAR facilities, and some non-conventional microbiological methods. Special health conditions, pregnancy, and immunocompromised situations must be consulted with the instructor prior to enrollment. The students must obtain clearance from RHOC for their tetanus vaccination status.

ANSC 5625. Nutritional Biochemistry. (3 cr.; Student Option; Every Fall)
Overview of biochemical molecules and pathways important in nutritional events. prereq: BIOG 3021 or instr consent

ANSC 5626. Nutritional Physiology. (3 cr.; A-F only; Every Spring)
Whole body macronutrient metabolism as it relates to etiology of metabolic diseases. Signaling between tissues to control homeostasis. How dysregulation of crosstalk can lead to metabolic diseases. How diet, exercise, or starvation impact metabolism. Regulation of food intake and energy expenditure. Designing/analyzing/interpreting research data.

ANSC 5700. Cell Physiology. (4 cr.; A-F only; Every Fall)
Cell Physiology involves the study of control mechanisms involved in maintaining homeostasis with respect to a variety of parameters including regulation of pH, volume, nutrient content, intracellular electrolyte composition, membrane potential, receptor signaling and aspects of intercellular communication. The first half of this team-taught course is organized in a partially on-line format where students learn from on-line materials and then take an on-line quiz each week before meeting with the instructor to review key concepts in class. The second half of the course is presented in lecture format. Student evaluation is based on quiz scores, in-class exams and graded problem sets.

ANSC 8111. Genetic Improvement of Animals. (3 cr.; Student Option; Periodic Fall)
Application of population genetics to livestock breeding; selection index theory and practice; basis of relationships and covariances among relatives; and selection based on multiple sources of information. prereq: instr consent

ANSC 8121. Linear Model Methods. (3 cr.; Student Option; Periodic Fall)
Techniques and statistical tools for analysis of data. Matrix manipulation, least-squares procedures, correction for environmental factors, estimation of components of variance, and standard errors of estimates. prereq: Stat 5021

ANSC 8134. Ethical Conduct of Animal Research. (2 cr.; A-F or Audit; Every Fall)
Ethical considerations in use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition/use of animals for laboratory, observational, epidemiological, and clinical research. Regulatory requirements, bases for what is deemed proper conduct. Societal impact on scientific investigations utilizing animal subjects. prereq: Grad student or prof school student or instr consent

ANSC 8141. Mixed Model Methods for Genetic Analysis. (2 cr.; max 4 cr.; A-F or Audit; Spring Odd Year)
Theoretical foundation of genetic prediction, selection index theory, best linear unbiased prediction, multivariate mixed models, estimation of variance components using maximum/restricted maximum likelihood methods, genomic prediction/variance component estimation. prereq: 5200 or CMB 5200 or equiv

ANSC 8194. Research in Animal Genetics. (1-3 cr.; Student Option; Every Fall, Spring & Summer)
Research in quantitative genetics, cytogenetics, molecular genetics, and other areas related to animal breeding. prereq: instr consent

ANSC 8211. Animal Growth and Development. (3 cr.; Student Option; Every Spring)
Whole body growth of animals, bone, and adipose tissue; structure, function, differentiation, and development of tissues; mode of action of hormones, growth factors, and growth promoters. prereq: instr consent

ANSC 8294. Research in Muscle Chemistry and Physiology. (1-3 cr.; Student Option; Every Fall, Spring & Summer)
Research in selected areas. prereq: instr consent

ANSC 8311. Animal Bioenergetics. (3 cr.; A-F or Audit; Every Fall & Spring)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Integrated systems approach to energy metabolism of animals. Application of classical techniques of calorimetry and comparative slaughter. Development of systems for expressing energy content of feeds, and techniques for measuring whole body and organ metabolism of specific nutrients. prereq: instr consent; BioC 4331 recommended

ANSC 8312. Protein Metabolism. (3 cr.; A-F or Audit; Periodic Fall) Basic and applied concepts of protein metabolism in farm animals. prereq: BioC 4331

ANSC 8320. Concepts and Developments in Nutritional Physiology. (4 cr.; max 6 cr.; A-F or Audit; Every Spring) Review and critical evaluation of pertinent scientific literature. prereq: instr consent

ANSC 8330. Concepts and Developments in Animal Nutrition. (3 cr.; max 6 cr.; A-F or Audit; Every Fall) Review, critical evaluation of recent research reports. prereq: instr consent

ANSC 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

ANSC 8340. Concepts and Developments in Swine Nutrition. (2 cr.; max 4 cr.; A-F or Audit; Every Fall & Spring) Review and critical evaluation of scientific literature. prereq: instr consent

ANSC 8344. Mechanisms of Hormone Action. (2 cr.; Student Option; Fall Even Year) Major signal transduction, apoptosis. Topics incorporate pharmacology, biochemistry, and cell biology of hormone action in relevant physiological systems. Lectures on basic principles. Specialized lectures. Discussion of primary literature. prereq: Course in biochemistry or cell biology or instr consent

ANSC 8394. Research in Animal Nutrition. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Research in selected areas: topics and animal species determined by consultation. prereq: instr consent

ANSC 8411. Physiology of Reproduction. (3 cr.; A-F or Audit; Periodic Fall) Emphasis is on gametogenesis, conception, and implantation. prereq: 3305 or equiv

ANSC 8421. Physiology of Fertilization and Gestation. (3 cr.; Student Option; Periodic Fall) Physiological events occurring during gametogenesis; capacitation and fertilization; period of the embryo; period of the fetus; and parturition. prereq: 3305 or instr consent

ANSC 8431. Immunoreproduction. (3 cr.; Student Option; Periodic Fall) Blood groups and polymorphic proteins affecting reproduction; immunoglobulin formation; antigens of semen, ova, and genital secretions; immunopathology; maternal-fetal incompatibility; and antibodies to hormones. prereq: 3305 or instr consent

ANTH 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

ANTH 8451. Reproductive Endocrinology. (2 cr.; A-F or Audit; Periodic Fall) Hormonal regulation of mammalian reproductive cycles and seasonal patterns; nutritional and stress effects on reproductive endocrinology; mechanism of hormone action. prereq: 3305 or 3327 or equiv, BioC 3021

ANTH 8494. Research in Animal Physiology. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Individual research under faculty direction. Topic determined by consultation: a specialized aspect of a thesis problem or an independent problem of mutual interest to graduate student and adviser. prereq: instr consent

ANTH 8510. Graduate Seminar. (1 cr.; max 12 cr.; Student Option; Every Fall & Spring) Students attend seminars and lead a seminar, giving oral presentation of scientific data. Public speaking skills. Preparing visuals for scientific presentations. Audience critiques of presentations. prereq: instr consent

ANTH 8594. Research in Animal Science. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Research including experimental studies in disciplines associated with animal production and research, with emphasis on interdisciplinary studies. prereq: instr consent

ANTH 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) x prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ANTH 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

ANTH 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 16 cr per semester or summer; 24 cr required

ANTH 8990. Curricular Practical Training. (1 cr.; max 2 cr.; S-N only; Every Fall, Spring & Summer) Industrial work assignment involving animal science. Review/approval by faculty member and director of graduate studies. Final report covering work assignment. prereq: AnSc grad student, dept consent

ANTH 5008. Advanced Flintknapping. (3 cr.; A-F or Audit; Periodic Fall) Hands-on training in techniques of advanced stone tool production, artifact reproduction, and lithic experimental design for academic/artistic purposes. prereq: [3008 or 5269] or instr consent

ANTH 5009. Human Behavioral Biology. (3 cr.; A-F or Audit; Every Spring) In-depth introduction to, and critical review of, human behavioral biology, examining the approaches in anthropology and related fields. Classic texts/recent empirical studies of humans and other species. Theoretical underpinnings of this new discipline/how well theoretical predictions have been supported by subsequent research.

ANTH 5015W. Biology, Evolution, and Cultural Development of Language. (SOCs, WI; 3 cr.; Student Option; Every Spring) Language in pre-historic humans. Brain/vocal tract structure. How gossip/music shaped human communication.

ANTH 5021W. Anthropology of the Middle East. (GP, WI, SOCS; 3 cr.; Student Option; Fall Even Year) Anthropological field methods of analyzing/interpreting Middle Eastern cultures/societies.

ANTH 5027W. Archaeology of Prehistoric Europe. (HIS, WI; 3 cr.; Student Option; Every Fall) How archaeologists/historians analyze/interpret artifacts to develop knowledge about formation of European society, from earliest evidence of human occupation to Roman Period. Interpreting archaeological evidence from specific sites to understand broad trends in human past.

ANTH 5028. Introduction to Historical Archaeology. (3 cr.; A-F or Audit; Periodic Fall & Spring) Emphasizes research approaches. Documentary research, oral history, probate inventories/acculturation, integration of documents/archaeological data, analysis of community patterning, social analysis of architecture, foodways, artifact identification, mean ceramic dating, industrial archaeology, estimation of social status with cemetery data, sampling, report writing.

ANTH 5031W. Ethnographies of Science. (WI; 3 cr.; A-F only; Spring Even Year) Ethnographic, historical, and sociological accounts of scientific practice. How facts are constructed/negotiated. Social, cultural, and political influences on scientific methods. How scientific projects articulate with hierarchies of race/gender. International differences in scientific practice. prereq: Sr or grad student or instr consent

ANTH 5041. Ecological Anthropology. (3 cr.; Student Option; Periodic Fall) Concepts, theories, and methods of ecological anthropology (cultural ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine
ANTH 5122. Anthropology of Religion. (3 cr.; A-F only; Fall Odd Year)

The course examines the diachronic evolution of religion as well as its role in human behavior. Religion as a social institution, implicit or explicit cultural practice.

ANTH 5123. Primate Evolution. (3 cr.; A-F only; Fall Odd Year)

Evolutionary history of primates. Particular focus on origin/diversification of apos/Old World monkeys. A prior prerequisite course in biological anthropology or archaeology.

ANTH 5121. Business Anthropology. (2 cr.; Student Option; Every Spring)

Anthropological/ethnographic understandings/research techniques. Pre-Req: MBA student.

ANTH 5128. Anthropology of Education. (3 cr.; Student Option; Spring Odd Year)


ANTH 5221. Anthropology of Material Culture. (3 cr.; A-F or Audit; Periodic Fall)

The course examines material culture as a social creation studied from multiple theoretical and methodological perspectives (e.g., social anthropology, archaeology, primatology, history of science). The course examines the changing role of material culture from prehistory to the future.

ANTH 5244. Interpreting Ancient Bone. (4 cr.; A-F or Audit; Every Fall)


ANTH 5255. Archaeology of Ritual and Religion. (3 cr.; Student Option; Fall Even Year)

The course discusses evidence for the origins of religion and its diverse roles in human societies over millennia. It focuses on how artifacts and architecture are essential to religious experience. It asks: What constitutes religion for different cultures? Why is religion at the heart of politics, social life, and cultural imagination?

ANTH 5269. Analysis of Stone Tool Technology. (4 cr.; A-F or Audit; Fall Even Year)

The course offers practical lab experience in analyzing archaeological collections of stone tools to learn about human behavior in the past. Students gain experience needed to get a job in the cultural resource management industry.

ANTH 5401. The Human Fossil Record. (3 cr.; A-F only; Fall Even Year)

Fossil evidence paleoanthropologists use to reconstruct human evolutionary history. Taxonomy, phylogeny, behavior, ecology, tool use, land use, and biogeography. Examination of fossil casts, readings from primary/secondary professional sources. Prereq: 1001 or instr consent.

ANTH 5402. Zooarchaeology Laboratory. (3 cr.; A-F only; Every Fall)

How archaeologists reconstruct the past through the study of animal bones associated with artifacts at archaeological sites. Skeletal element (e.g., humerus, femur,ibia), and taxon (e.g., horse, antelope, sheep, bison, hyena) when confronted with bone. Comparative collection of bones from known taxa.

ANTH 5403. Quantitative Methods in Biological Anthropology. (4 cr.; Student Option; Fall Even, Spring Odd Year)

Quantitative methods used by biological anthropologists. Applying these methods to real anthropometric data. Lectures, complementary sessions in computer lab. Prereq: Basic univariate statistics course or instr consent.

ANTH 5405. Human Skeletal Analysis. (4 cr.; Student Option; Every Spring)


ANTH 5412. Comparative Indigenous Feminisms. (GP; 3 cr.; Student Option No Audit; Periodic Fall & Spring)

The course will examine the relationship between Western feminism and indigenous feminism as well as the interconnections between women of color feminism and indigenous feminism. In addition to exploring how indigenous feminists have theorized from ‘the flesh’ of their embodied experience of colonialism, the course will also consider how indigenous women are articulating decolonization and the embodiment of autonomy through scholarship, cultural revitalization, and activism.

ANTH 5442. Archaeology of the British Isles. (3 cr.; A-F only; Every Fall)


ANTH 5444. Archaeological Ceramics. (4 cr.; A-F only; Every Spring)

Ceramics as material, technology, and cultural/social trace. Methods of assessing technology/use. Research, design, and interpretation of ceramic analyses. Students work with collections and propose/answer a research question about a ceramic assemblage.

ANTH 5450. Spatial Analysis in Anthropology: Research Design and Field Applications. (3 cr.; Student Option No Audit; Spring Even Year)

This advanced undergraduate and graduate course introduces students to spatial analyses essential to anthropological ethnography, archaeology, and historical ecology. It builds on introductory courses at UMN, providing students an opportunity to learn anthropological applications of spatial analysis methods, including: research design, field mapping, database management, digital survey platforms, GIS analyses, and integration of quantitative and qualitative (ethnographic and historical) data. The structure of the course will follow the trajectory of a typical doctoral-level anthropological project, from pre-field data acquisition and preparation, to in-field data collection, post-field analysis, and presentation. Students who take this course will master skills that are crucial for successful anthropological spatial analysis in the field and laboratory.

ANTH 5501. Managing Museum Collections. (3 cr.; A-F or Audit; Fall Even Year)

The care and maintenance of collection objects and their associated information are a crucial part of both the sciences and the humanities. This course is designed to provide foundations and practical experience with many of the issues faced by those responsible for museum collections: conservation, legal issues, organization and classification, digitization, accessibility, and policies and procedures. The course includes lectures by museum professionals, field trips to local facilities, and hands-on activities. Credit will not be granted if credit has been received for ANTH 3501.

ANTH 5601. Archaeology and Native Americans. (DSJ; 3 cr.; Student Option; Fall Even Year)

Historical, political, legal, and ethical dimensions of the relationship of American archaeology to American Indian people. Case studies of how representational narratives about Native people are created through archaeology; responses by Native communities; and the frameworks for collaborative and equitable archaeological practice. Professional ethics in archaeology/heritage studies in American contexts.

ANTH 5980. Topics in Anthropology. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
ANTH 8001. Ethnography, Theory, History. (3 cr.; A-F or Audit; Every Fall)
Introduction to foundational concepts, methods, and ethnographic work. Emphasizes theories that have shaped 20th-century thinking in cultural anthropology. Connection of these theories to fieldwork and contemporary issues.

ANTH 8002. Ethnography: Contemporary Theory and Practice. (3 cr.; A-F or Audit; Every Spring)

ANTH 8004. Foundations of Anthropological Archaeology. (3 cr.; Student Option; Every Spring)
Theoretical foundations of anthropological archaeology in historical and contemporary perspective. prereq: 8001, 8002

ANTH 8005. Linguistic Anthropology. (3 cr.; Student Option; Fall Even Year)
Introduction to literature of anthropological linguistics.

ANTH 8009. Prehistoric Pathways to World Civilizations. (3 cr.; Student Option; Every Spring)
How did complex urban societies first develop? This course addresses this question in ten regions of the world including Maya Mesoamerica, Inca South America, Sumerian Near East, Shang Civilization in East Asia, and early Greece and Rome.

ANTH 8111. Evolutionary Morphology. (3 cr.; Student Option; Periodic Fall)

ANTH 8112. Reconstructing Hominin Behavior. (3 cr.; A-F or Audit; Spring Even Year)
Consider major hypotheses regarding evolution of human behavior. Evidence/arguments used to support or reject hypotheses. Consider link between bone biology/behavior. Archaeological record for more holistic understanding of evidence.

ANTH 8113. Primate Evolution. (3 cr.; A-F only; Fall Odd Year)
Evolutionary history of primates, with particular focus on origin/diversification of apes/Old World monkeys. prereq: Anthropology doctoral student

ANTH 8114. Biological Anthropology Graduate Program Seminar: Behavioral Ecology of Primates. (3 cr.; A-F or Audit; Fall Odd Year)
Course focuses on the behavioral ecology of primates, including humans, with a focus on how the evolution of social behaviors relates to ecology. The course serves as one of three Biological Anthropology Graduate Program Seminars, which provide training in the foundations of biological anthropology. For Biological Anthropology graduate students, the take-home exam for this course will stand as one of the three required Preliminary Papers. Students outside of Biological Anthropology are welcome to enroll pending permission of the instructor. prereq: Anthropology graduate student or instr consent.

ANTH 8120. Problems in Culture Change and Applied Anthropology. (3-6 cr.; Student Option; Periodic Fall & Spring)
Comparative studies of change in cultural systems. Impact of global processes on local cultures. Roles of anthropology and anthropologists in policy, planning, implementation, and evaluation.

ANTH 8201. Humans and Nonhumans: Hybrids and Collectives. (3 cr.; Student Option; Periodic Spring)
Social life as consisting of relationships not only among human beings, but also between humans and nonhumans: animals, plants, environments, technologies, etc. Focusses on hybridity, its role in formations of collective life.

ANTH 8203. Research Methods in Social and Cultural Anthropology. (3 cr.; Student Option; Every Fall)
Classic and current issues in research methodology, including positivist, interpretivist, feminist, and postmodernist frameworks. Methodology, in the broadest sense of the concept, is evaluated. Students conduct three research exercises and set up an ethnographic research project. prereq: Grad anth major or instr consent

ANTH 8205. Economic Anthropology. (3 cr.; Student Option; Periodic Fall & Spring)
Theoretical foundations of economic anthropology examined through critical readings of traditional, classical, and contemporary authors. Ethnographic puzzles of material life and issues of ecological degradation, development, market expansion, gender, and transglobal processes.

ANTH 8207. Political and Social Anthropology. (3 cr.; Student Option; Periodic Fall & Spring)
Western concepts of politics, power, authority, society, state, and law. Cross-cultural approaches to these concepts in historical perspective. Major theoretical frameworks and current problems and positions in social and political anthropology. Ethnographic classics and new directions.

ANTH 8213. Ecological Anthropology. (3 cr.; Student Option; Periodic Fall & Spring)
Seminar on method, theory, and key problems in ecological anthropology and human ecology. Examines approaches in light of human practices, interactions between culture and the environment, global environmental change, and our understanding of human dimensions of ecosystem-based management.

ANTH 8215. Anthropology of Gender. (3 cr.; Student Option; Periodic Fall & Spring)
Comparative, cross-cultural approach to gender. Focuses on various theories (e.g., feminist, postmodernist, psychoanalytic) of power, gender, authority, and femininity and masculinity. Gender ambiguity and issues of sexuality. prereq: Grad anth major or instr consent

ANTH 8219. Grant Writing. (2 cr.; Student Option; Periodic Fall & Spring)
Students draft a research proposal in their area of interest. Seminar involves reading and evaluating proposals, learning about funding and process of submitting proposals, nuts of bolts of composing a proposal, and ethics of research in anthropology. prereq: Grad anth majors preparing to submit research grant proposals next academic yr

ANTH 8220. Field School. (6 cr.; Student Option; Every Summer)
Advanced field excavation, survey, and research. Intensive training in excavation techniques, recordation, analysis, and interpretation of archaeological materials or prehistoric remains.

ANTH 8230. Anthropological Research Design. (3 cr. [max 6 cr.]; A-F or Audit; Periodic Fall & Spring)
Training seminar on research development, coordination, grant management, field/ laboratory research management, fundraising. prereq: Anth grad student or instr consent

ANTH 8244. Interpreting Ancient Bone. (4 cr.; A-F or Audit; Periodic Fall & Spring)
How anthropologists use fossil bones to answer questions of past human diet, behavior, and environments. Skeletal element and species identification (of humans, large mammals). Students analyze small assemblage of bones for class project. Scientific method, data analysis using computers. prereq: instr consent

ANTH 8333. FTE: Masters. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

ANTH 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

ANTH 8510. Topics in Archaeology. (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Seminar examines particular aspects of archaeological methods and/or theory. Topics vary according to student and faculty interests.

ANTH 8555. Master's Project Credits. (3 cr.; S-N only; Every Fall, Spring & Summer)
Student may contact the department for more information.

ANTH 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr;
APST 5170. Topics in Apparel Studies. (3 cr.; A-F or Audit; Fall, Spring & Summer) In-depth investigation of specific topic, announced in advance.

APST 5193. Directed Study in Apparel Studies. (1-4 cr.; A-F or Audit; Fall, Spring & Summer) Independent study in apparel studies under tutorial guidance. prereq: instr consent

APST 5218. Fashion, Design, and the Global Industry. (3 cr.; A-F only; Every Fall) Relationship of fashion, dress, and culture to time, place, and design. Focuses on fashion centers, fashion industry, and globalization. Chinese fashion industry as case study.

APST 8170. Topics in Apparel Studies. (1-3 cr.; A-F or Audit; Fall & Spring) In-depth investigation of a topic announced in advance. prereq: Varies with topic

APST 8180. Professional Seminar. (1-2 cr.; A-F or Audit; Fall & Spring) Professional development issues/trends.

APST 8193. Directed Study. (1-3 cr.; A-F or Audit; Fall & Spring) Directed study in apparel studies. prereq: instr consent

APST 8222. Plan B Master's Project. (3 cr.; S-N or Audit; Fall & Spring) Plan B master's project. prereq: DHA master's student, instr consent

APST 8267. Dress and Culture. (3 cr.; A-F or Audit; Fall Even Year) Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of dress and textiles within a specific world region. prereq: 4212 or instr consent

APST 8268. Behavioral Aspects of Dress. (3 cr.; A-F or Audit; Fall Odd Year) Research and social science theories as applied to appearance/dress as manifestations of human behavior.

APST 8271. Retailing: Strategic Perspectives. (3 cr.; A-F or Audit; Fall Even Year) Selected topics in the field of retailing. Students extend their thinking regarding consumer behavior to strategic retail management.

APST 8272. Digital Consumers: Theories in Retail and Consumer Studies. (3 cr.; A-F or Audit; Spring Odd Year) Reviews range of critical theories in retail/consumer studies to explore issues in multi-channel retailing environments. Exposure to breadth of topics in multi-channel retailing. Practical research experience. prereq: DES 8102 or equivalent quantitative methods class

APEC 5321. Regional Economic Analysis. (3 cr.; Student Option; Every Fall) Statistical and econometric techniques for applied economists. Theory and application of multivariate regression model using data sets from published economic studies. Emphasis on use of statistical techniques to understand market behavior. prereq: Math 1272, Stat 5021, knowledge of matrix algebra

APEC 5322. Economic Data Analysis for Managerial and Policy Decisions. (3 cr.; Student Option; Every Spring) Statistical and econometric methods for the analysis of large data sets to support managerial and policy decisions. Methods for organizing, accessing, and ensuring the quality of data. Estimation techniques include panel data methods, limited dependent variable models, and time series analysis. Clarity of reporting and design of procedures for maintaining and updating data estimates. prereq: 5031 or instr consent

APEC 5517. Applied Microeconomics: Firm and Household. (3 cr.; Student Option; Every Fall) Quantitative techniques for analysis of economic problems of firms and households. Links between quantitative tools and economic analysis Regression analysis, mathematical programming, and present value analysis. prereq: APEC 3001, Math 1272, and Math 2243 or equiv or grad student or instr consent

APEC 5518. Applied Macroeconomics: Income and Employment. (3 cr.; Student Option; Every Spring) Static general equilibrium open economy models and simple business cycle models that examine economic growth, business cycles, and fiscal and monetary policy. Input-output analysis and large scale econometric models. Sources/properties of economy and sector-wide data. Empirical applications. prereq: 3001 or Math 1271 or Math 2243 or equiv or grad student or instr consent

APEC 5521. Economic Data Analysis for Managerial and Policy Decisions. (3 cr.; Student Option; Every Fall) Statistical and econometric techniques for applied economists. Theory and application of multivariate regression model using data sets from published economic studies. Emphasis on use of statistical techniques to understand market behavior. prereq: Math 1272, Stat 5021, knowledge of matrix algebra

APEC 5522. Economic Data Analysis for Managerial and Policy Decisions. (3 cr.; Student Option; Every Spring) Statistical and econometric methods for the analysis of large data sets to support managerial and policy decisions. Methods for organizing, accessing, and ensuring the quality of data. Estimation techniques include panel data methods, limited dependent variable models, and time series analysis. Clarity of reporting and design of procedures for maintaining and updating data estimates. prereq: 5031 or instr consent
crop, and dairy products. prereq: graduate student and 1101 or Econ 1101

APEC 5451. Food Marketing Economics. ( ; 3 cr.; A-F or Audit; Every Fall)

APEC 5481. Futures and Options Markets. ( ; 3 cr.; Student Option; Every Spring)
Economic concepts related to futures/options trading. Hedging, speculation.

APEC 5511. Labor Economics. ( ; 3 cr.; Student Option; Periodic Fall)
Theoretical foundations of labor markets. Inter-temporl/household labor supply. Demand for labor, efficiency wages. Human capital theory, unemployment, migration decisions. Analysis of econometric research applied to labor policy issues such as minimum wage, tax policy, social insurance, education. prereq: [3001 or Econ 3101 or PA 5021]; [PA 5032 or equiv] or instr consent

APEC 5651. Economics of Natural Resource and Environmental Policy. ( ; 3 cr.; Student Option; Every Spring)
Economic analyses, including project evaluation of current natural resource/ environmental issues. Intertemporal use of natural resources, natural resource scarcity/ adequacy, environmental quality, and mechanisms for pollution control and their implications for public policy. prereq: [3001 or Econ 3101], [3611 or ECON 3611 or ESPM 3261] or instr consent

APEC 5711. U.S. Agricultural and Environmental Policy. ( ; 3 cr.; Student Option; Periodic Spring)
U.S. agricultural policy in an open world economy; role of private markets and government in regulating supply and demand; income vs. price support, supply controls, environmental constraints, and export protectionism; functioning of markets; roles of public interest groups and future of American agricultural policy. prereq: 3002 or [Econ 3101, Stat 3022]; Econ 4211 recommended

APEC 5751. Global Trade and Policy. ( ; 3 cr.; Student Option; Every Fall)
Trade policies of import/export nations, gains from trade, trade negotiations/agreements. Free trade and common market areas. Exchange rate impacts. Primary commodities and market instability. Current trade issues. prereq: 3001 or Econ 3101 or PA 5021

APEC 5811. Business Economics and Strategy. (3 cr.; Student Option; Every Spring)
Strategic management for production, processing, wholesaling, retailing, and service. Strategy formulation, implementation, and control. Business plans. Case study analysis. prereq: graduate student and 3002, [3501 or FINA 3001], and [ACCT 3001 or MGMT 3001 or MKTG 3001]

APEC 5821. Food and Agribusiness Marketplace. (2 cr.; A-F only; Every Spring)
This is a graduate student survey course of the industry organization and current policy issues in the food and agribusiness marketplace. It represents a collaboration between the College of Food, Agricultural, and Natural Resource Sciences and the Carlson School of Management. The course uses short readings and speakers. A comprehensive look at all of the sectors in the food and agribusiness value chain is described. Topics include food policies (Farm Bills, food stamps, food labeling, and similar topics); environmental policies (water, invasive species, agriculture production and similar topics); and industrial organization issues (marketing and production contracts, overview of firm strategic orientation, distribution and similar topics). Readings, guest speakers, and presentations are used. prereq: graduate student

APEC 5831. The Business of Food Systems. (1 cr.; Student Option; Every Fall)
This is a graduate survey course to introduce students to the Minnesota food industry through its regulatory process, research and development, and industry structure. It is an integrated week long course that includes field study tours of Minnesota agriculture and food economy coupled with classroom instruction. Each year the course will focus on two Minnesota industries such as dairy, beef, soybean, corn, potatoes, and other agricultural and food industries. The course has been developed through a collaboration with College of Veterinary Medicine, School of Public Health, and College of Food, Agricultural, and Natural Resource Sciences.

APEC 5841. Agricultural Cooperatives and Mutuals. (3 cr.; Student Option; Every Fall)
Introduction to cooperative and mutual form of business organization. Extensive applications to agricultural, food, and consumer cooperatives are used. Active-student learning process with a distance learning component.

APEC 5891. Independent Study: Advanced Topics in Farm and Agribusiness

APEC 5991. Special Topics and Independent Study in Applied Economics. ( ; 1-4 cr.; max 48 cr.; Student Option; Every Fall, Spring & Summer)
Special classes, independent study, and supervised reading/research on subjects problems not covered in regularly offered courses. prereq: instr consent

APEC 8001. Applied Microeconomic Analysis of Consumer Choice and Consumer Demand. ( ; 2 cr.; A-F or Audit; Every Fall)
Consumer behavior/demand. Introduction to welfare analysis. General equilibrium analysis in pure exchange economy. Part of four-course sequence (APEC 8001-8004). prereq: [[5151 or Econ 3101 or Econ 5151 or intermediate microeconomic theory], [MATH 2243, MATH 2263] or equiv] or instr consent

APEC 8002. Applied Microeconomic Analysis of Production and Choice Under Uncertainty. ( ; 2 cr.; A-F or Audit; Every Fall)
Production, competitive markets, and choice under uncertainty. Technology and production, cost minimization and profit maximization, production duality, efficiency and technical change, general equilibrium of production. Part of four-course sequence (APEC 8001-8004). prereq: [3001 or ECON 8001 or ECON 8101], [MATH 2243, MATH 2263] or equiv] or instr consent

APEC 8003. Applied Microeconomic Analysis of Game Theory and Information. ( ; 2 cr.; A-F or Audit; Every Spring)
Strategic competition, game theory, and information. Non-cooperative games, static games of complete and imperfect information, dynamic games of complete/incomplete information, application of incomplete information, application of incomplete information, Part of four-course sequence (APEC 8001-8004). prereq: [3001 or ECON 8002 or ECON 8102], [MATH 2243, MATH 2263] or equiv] or instr consent

APEC 8004. Applied Microeconomic Analysis of Social Choice and Welfare. ( ; 2 cr.; A-F or Audit; Every Spring)
Welfare economics/measurement, externalities and social choice. Welfare theorems in general equilibrium, externalities and public goods, social choice, social welfare, and welfare change measurement. Part of four-course sequence (APEC 8001-8004). prereq: [3001 or ECON 8003 or ECON 8103], [MATH 2243, MATH 2263] or equiv] or instr consent

APEC 8202. Mathematical Optimization in Applied Economics. ( ; 3 cr.; Student Option; Every Fall)
Economic foundations and applications of mathematical and dynamic programming and optimal control. Mathematical optimization concepts; structures and economic interpretations of various models of the firm, consumer, household, sector, and economy.
APEC 8203. Applied Welfare Economics and Public Policy. (3 cr.; Student Option; Every Spring)
Basic concepts underlying measurement of welfare change, problems of market failure and externalities, social welfare functions, and distribution within and across generations. Application of concepts, based on case studies of the environment, returns to research, technical change, and agricultural policy. prereq: calculus, intermediate econ theory

APEC 8206. Dynamic Optimization: Applications in Economics and Management. (3 cr.; Student Option; Every Spring)
Formulation and solution of dynamic optimization problems using optimal control theory and dynamic programming. Analytical and numerical solution methods to solve deterministic and stochastic problems for various economic applications. prereq: 5151 or equiv or instr consent

APEC 8211. Econometric Analysis I. (4 cr.; Student Option; Every Fall)
Classical multiple linear regression, stochastic regressors, heteroscedasticity, autocorrelated disturbances, panel data, discrete dependent variables, prereq: ApEc 5031 or equiv OR Ph.D. student OR instr consent

APEC 8212. Econometric Analysis II. (4 cr.; Student Option; Every Spring)
Second semester of econometrics for Ph.D. students. Specification tests, instrumental variables, heteroscedasticity, panel data, simultaneous equations, bootstrap methods, limited dependent variable models, semiparametric estimation, econometrics of program evaluation, general method of moments, time series, hazard models. prereq: 8211 or equiv or instr consent

APEC 8221. Programming for Econometrics. (2 cr.; Student Option; Fall Even Year)
Applications of computer programming in econometrics. Introduction to and best practices in program writing, including writing functions, organizing and commenting code, vectorization and other performance tips. Programmatic acquisition of novel econometric models through Application Programming Interfaces (APIs), web scraping, and databases. Efficient cleaning and merging of datasets. Finally, a survey of common computational challenges in econometric estimation and potential solutions. prereq: APEC 5031 or equivalent

APEC 8222. Big Data Methods in Economics. (2 cr.; Student Option; Fall Even Year)
Challenges, techniques, and opportunities presented by data that has one or more of the following characteristics: large, unstructured, high frequency, variable quality. The course will consist of three parts: 1) computational tools for applying standard econometric techniques on large datasets, 2) extracting summary information from unstructured data (e.g., images, text) for use in econometric analysis, 3) application of statistical learning techniques (e.g., classifiers, regression trees, machine learning) and the role of such techniques in causal inference, prereq: APEC 5031 or equivalent; APEC 8221 or equivalent programming experience

APEC 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

APEC 8341. Applied Public Finance. (3 cr.; A-F or Audit; Periodic Spring)
Current economic research on government tax and expenditure policy. Apply tools of applied economics to public finance issues. Tax policy, taxation and household decisions (including labor supply and saving), taxation and the firm (including the cost of capital), and fundamental tax reform. Alternative demand models for public goods, public choice theory, and fiscal federalism. prereq: 8001-8004 or ECON 8001-8004 or ECON 8101-8104

APEC 8401. Consumer Behavior and Household Economics. (2 cr.; A-F or Audit; Periodic Fall)
Seven-week course. Microeconomic analysis of individual and household behavior, both theoretical and empirical issues. Demand theory?static models to dynamic models. Equivalence scales/intrahousehold allocation. prereq: [8001 or concurrent registration in 8001], [8002 or concurrent registration in 8002], [8003 or concurrent registration in 8003], [8004 or concurrent registration in 8004] or [ECON 8001 or concurrent registration in ECON 8001], [ECON 8002 or concurrent registration in ECON 8002], [ECON 8003 or concurrent registration in ECON 8003], [ECON 8004 or concurrent registration in ECON 8004] or [ECON 8101 or concurrent registration in ECON 8101], [ECON 8102 or concurrent registration in ECON 8102] or [ECON 8103 or concurrent registration in ECON 8103], [ECON 8104 or concurrent registration in ECON 8104] or [ECON 8211 or concurrent registration 8211], [8212 or concurrent registration 8212], [MATH 1271 or equiv]

APEC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

APEC 8501. Labor Economics I. (2 cr.; A-F or Audit; Periodic Spring)
Theoretical and empirical studies of compensating differentials, discrimination, personnel economics, and gross flows. prereq: Concurrent enrollment in APEC 8502 or concurrent registration is required (or allowed) in 8003, 8211, 5032 or equiv

APEC 8502. Labor Economics II. (2 cr.; A-F or Audit; Periodic Spring)
Topics in applied microeconomics related to labor supply and human capital. Household decisions and resulting outcomes in labor market. Household labor supply. Estimation of labor supply and earnings functions. Theory of human capital, wage structure and determination, and impacts of tax and transfer policies.

APEC 8601. Natural Resource Economics. (3 cr.; Student Option; Periodic Fall & Spring)
Economic analysis of resource use and management. Capital theory, dynamic resource allocation. Applications to renewable and nonrenewable resources. Empirical studies, policy issues. prereq: [5151, 8202, 8206 [ECON 5151 or equiv]] or instr consent

APEC 8602. Economics of the Environment. (3 cr.; Student Option; Every Fall)
Economic analysis of environmental management, emphasizing environmental policy. Application of microeconomic theory to problems of market failure, market-based pollution control policies, contingent valuation, hedonic models, option value, and other topics. prereq: 8004 or ECON 8004 or ECON 8104 or equiv or instr consent

Model building and solution techniques. prereq: [5151, Econ 5151] or equiv or instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
APEC 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

APEC 8701. Trade and Development I. (2 cr.; Student Option; Fall Odd Year)
This course will analyze international trade and economic policies that affect trade. The course will consider the determinants of trade, the welfare effects of trade, and the implications of trade liberalization or protectionism. The course will use contemporary economic theory and econometric methods of analysis; and will provide an economic foundation for analyzing issues on the frontier of the academic literature and policy debate.

APEC 8702. Trade and Development II. (2 cr.; Student Option; Every Fall)
This course will focus on the applied microeconomics of international development. The course will focus on empirically testing the various theories developed to account for persistent economic underdevelopment and poverty. We will start from key ideas and methods in empirical development economics, then cover household models (both unitary and otherwise), intrahousehold models, market formation and market participation, land markets, technology adoption, risk and insurance, and other topics related to development microeconomics, all from an empirical perspective. prereq: First-year PhD level microeconomics and econometrics

APEC 8703. Trade and Development III. (2 cr. [max 3 cr.]; Student Option; Periodic Spring)
Topics in the microeconomic analysis of development covered include: education (both the determinants of educational outcomes and the impact of those outcomes on several economic outcomes), poverty, inequality, demography (population, fertility and gender issues), and the impact of international aid.

APEC 8704. Trade and Development IV. (2 cr.; Student Option; Every Spring)
This course will focus on the applied microeconomics of international development. It will empirically analyze various market failures in developing countries, their role in driving persistent poverty, and interventions to address them. The course will focus specifically on the functioning of financial, labor, and healthcare markets, as well as the influence of social networks and economic decisions and outcomes.

APEC 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

APEC 8793. Master’s Paper: Plan B Project. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer)

Students work under guidance of adviser to complete their Plan B Paper project. prereq: Agri/ApEc MS student or ApEc MS student

APEC 8801. Applied Production Theory. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Aspects of production theory. Axiomatic representations of multi-output technologies. Input, output, and directional distance functions. Cost, revenue, and profit functions and duality. Input/output separability. Jointness/non-jointness in production. Index numbers, measures of efficiency/productivity. prereq: [Econ 8001, Econ 8002, Econ 8003] or [Econ 8101, Econ 8102, Econ 8103] or equivar or instr consent

APEC 8803. Marketing Economics. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Review of market structure, conduct, and performance. Market interdependency over space/time. Product forms. Issues pertaining to market failures/interventions. prereq: [Econ 8001, Econ 8002] or [Econ 8101, Econ 8102] or instr consent

APEC 8804. Managerial Economics. (3 cr.; Student Option; Periodic Fall & Spring)
Analysis of managerial decisions by organizations/individual entrepreneurs. Application of dynamic programming to investment/resource allocation decisions. Economics of business organization, including boundaries of the firm, mechanisms for vertical coordination. Economic implications of alternative ownership structures. prereq: [8001, 8002, 8003, 8004] or [Econ 8101, Econ 8102, Econ 8103, Econ 8104] or instr consent; majors must register on A-F basis.

APEC 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Doctoral thesis credit. prereq: ApEc PhD student; max 18 cr per semester or summer; 24 cr required

APEC 8901. Graduate Seminar: MS & PhD. (1 cr.; S-N or Audit; Every Fall)
Attendance and active participation in applied economics research seminars. Effective research methods. Research topics and observe professional methods of research presentations.

APEC 8902. Graduate Research Development Seminar. (1 cr.; S-N or Audit; Every Fall & Spring)
Faculty, students, outside speakers present research ideas/results, which participants critique. Topics vary according to interests of speakers. prereq: ApEc MS student or ApEc PhD student

APEC 8903. PhD Qualifying Paper Seminar I. (1 cr.; S-N only; Every Fall)
Support for writing second year Qualifying Paper. Paper of purpose is to provide guided opportunity for doctoral students to complete substantial research paper. prereq: 8001-8004 or Econ 8001-8004 or Econ 8101-8104

APEC 8904. PhD Qualifying Paper Seminar II. (1 cr.; S-N only; Every Spring)
Provides support to doctoral students writing second year Qualifying Paper. Paper of purpose is to provide guided opportunity for students to complete substantial research paper. prereq: APEC 8903

APEC 8991. Advanced Topics in Applied Economics. (1-6 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer)
Special seminars or individual work on subjects suited to needs of students. prereq: instr consent

APSC 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; Every Spring)
Ethics training to graduate students enrolled in plant/environmental graduate research programs and fulfill requirement for training in responsible conduct of research. Course meets during first seven weeks of spring semester.

APSC 8201. Advanced Plant Breeding. (3 cr.; A-F or Audit; Spring Odd Year)
This course covers the principles underlying the application of genetics and statistics to cultivar development; evaluation of breeding methods; and methods to enhance genetic progress and efficiency through the application of statistical genetics, genomics, and molecular markers. In terms of format, this course is combination of lecture, discussion, and computer lab, varying according to the topic. An emphasis will be placed on classical and current literature to teach concepts, as well as hands-on experience with data analysis. Introductory courses in plant breeding/genetics and statistics. Knowledge of population and quantitative genetics would be useful but not required.

APSC 8270. Graduate Seminar. (2 cr.; max 4 cr.; A-F or Audit; Every Fall & Spring)
Examine qualities of effective scientific presentations. Develop skills in communicating scientific information effectively. Practice public speaking skills. Presenting scientific information to the general public. Organize a series of seminars. prereq: Grad major in Applied Plant Sciences or instructor consent

APSC 8280. Current Topics in Applied Plant Sciences. (1-3 cr. [max 4 cr.]; S-N or Audit; Periodic Fall & Spring)
This variable-credit course is a forum for learning and discussing contemporary topics in applied plant sciences. The topics covered differ according to the instructor and term that the class is taught.

APSC 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master’s student, adviser and DGS consent

APSC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

APSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq; Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

APSC 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

APSC 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Applied Professional Studies (APS)

APS 5100. Topics in Applied Professional Studies. (; 1-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Topics in Applied Professional Studies. prereq: dept consent

APS 5101. Ecological Design for Horticulture. (; 3 cr.; A-F or Audit; Periodic Summer) Design/systems thinking with plant mechanisms. prereq: SOIL 5125, HORT 1001, dept consent

APS 5102. Garden Design: Theory and Application. (; 2 cr.; A-F or Audit; Periodic Spring) This course provides an overview of the garden design process, the analysis and conceptual design of the landscape, exploration of the design characteristics of plants, sustainable design and a descriptive journey into several historical garden styles. You will be introduced to a variety of topics, including the design process, basic design principles, and the basic concepts of graphic communication in garden design. A working knowledge of design process and principles is critical to quality design. This course is intended to strengthen student awareness and knowledge of design rather than fully develop the skills necessary to draw, develop and implement garden designs. This course is different from fact-based horticulture science courses. Although you will be held responsible for learning a broad range of principles and processes in this course, there are typically no absolute right answers relative to design assessment and critique. What is more important is that you gain the ability to articulate and assess design character and quality and give evidence of your thought process.

APS 5103. Integration of Sustainable Agriculture Concepts. (3 cr.; A-F only; Every Fall) Biodiversity, ecological balance, nutrient cycling, soil quality. Organic practices of tillage, fertility management, weed control, insect control. Specific practices compared with conventional/integrated pest management. Economic analysis of both organic/conventional practices. prereq: AGRO 1101 or AGRO 1103 or BIOL 1001 or BIOL 1009 or HORT 1001 or HORT 6011 or instr consent, [sr or grad student admitted to MPS in horticulture] Because of the Sxxx level, undergraduates need permission numbers to register. Students can obtain permissions by writing to: reekx001@umn.edu

APS 5201. Career and Job Search Preparation for Graduate Students. (; 1 cr.; S-N only; Every Fall & Spring) Job search and career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan. prereq: dept consent

APS 5901. Microeconomics for High School Teaching. (3 cr.; A-F only; Every Summer) This is an online course intended for in-service and pre-service teachers who want to build or enhance their content knowledge in microeconomics and their pedagogical skills in teaching microeconomics to high school students. The course will include strategies for developing curriculum and instruction for microeconomics that engage students of diverse backgrounds. prereq: The prerequisites for this course are: licensed secondary school teachers in social studies, business, consumer science, or agricultural education; or pre-service secondary school teachers in a teaching licensure program in social studies, business, consumer science, and dept consent

APS 6001. Introduction to Applied and Professional Studies. (3 cr.; A-F only; Every Fall) This course serves as the introductory course for students in the Master of Professional Studies in Civic Engagement. Students in the course will be introduced to graduate level inquiry, and will augment critical thinking skills that frame applied business and disciplinary practice. Students will grapple with real-world problems and topical content, engaging with relevant scholarship, readings, and disciplinary methodologies. In doing so, they will gain proficiency in critical thinking, business ethics, and cultural competency in collaboration with their peers. This course offers students unique opportunities to engage in cross-disciplinary partnerships and creative problem-solving simulating real-world situations.

APS 6002. Civic Engagement Capstone. (3 cr.; S-N only; Every Spring) This course serves as the capstone course for students in the master of professional studies in civic engagement. This course will synthesize the disciplinary and applied business coursework taken by students during their graduate career and will facilitate completion of an individualized, applied capstone project based on their community engagement career focus. This culminating experience, taken in the final year of the program, will provide students with an opportunity to engage in creative problem solving to address pressing real-world needs.

APS 6011. Presentations in the Biological Sciences. (2 cr.; A-F only; Every Summer) Course introduces students to the diverse ways in which biologists communicate in their professional lives. In this course students will choose an article from the primary literature and practice presenting the information to a range of audiences through a variety of techniques including soundbites, interviews, conference talks, conference posters, TED talks, podcasts, and internet videos.

APS 6311. Cross-Functional Leadership and Communication. (; 3 cr.; A-F or Audit; Every Spring) This course provides a deep analysis of the leadership process, as influenced by social and emotional intelligence. Students will explore the interconnected roles that social intelligence and competencies play across diverse personal, cultural, and political contexts and business functions. Additionally, students will be asked to apply leadership frameworks to social and emotional intelligence competencies to enhance leadership capacity across individual, group, and organization levels.

APS 6312. Fundamentals of Organizational Finance. (; 3 cr.; A-F or Audit; Every Fall) This course explores organizational finance from the lens of a non-financial manager, helping students gain an applied understanding of financial and accounting concepts and the role finance plays in the economic viability of a business. Students will learn to construct financial statements and use these tools to strategically determine the overall business financial health. Students will forecast possibilities for future growth in relation to costs associated with operational expenses and the cost of capital. Students will review basic economic frameworks and complete case studies focusing on the connection of global economic influences to company and industry financial indicators. Specific topics include financial analysis; planning, forecasting, and budgeting; cash flow, and strategic financing.

APS 6313. Harnessing Big Data. (; 3 cr.; A-F or Audit; Every Fall) In this course, students will analyze the structure and reliability of big data sets and how big data can be applied to decision making in organizations. Students will learn to use numerical, statistical and geometric models to organize data, make predictions, form valid arguments, and support conclusions. Students will also be introduced to the growing field of Business Intelligence and Data Analytics. Topics include data mining, text mining, business intelligence architecture, data reporting systems, dashboards, and data visualization tools such as Tableau and Power BI.

APS 6314. Leading Projects and Teams. (; 3 cr.; A-F or Audit; Every Spring) This course provides students the background and skills needed to enhance teamwork, make informed business decisions, or resolve productivity issues effectively. This course will focus on the principles techniques, and tools used to plan, control, monitor, and review projects to meet organizational monetary and time constraints. Through case studies and practical application, students will practice
ARCH 5001. Architectural Design Studies: Representation & Design. (1 cr.; A-F only; Every Summer)
During this six week, summer intensive course, students will focus on basic issues of visual thinking and conceptual representation in architecture. This sequence of complementary exercises introduces issues and ways of working intended to complement educational backgrounds from other, non-architectural, disciplines. To do that we have designed the exercises to juxtapose different ways of perceiving and understanding constructed environments. While exploring these architectural ways of thinking, the exercises will also help to acknowledge preconceptions that may hinder one's ability to explore conceptual decisions.

ARCH 5101. Architectural Design Studies. (7 cr.; S-N only; Every Summer)
Principles/methods architecture design. Theories, history, technologies, media, and processes as foundation for critical thinking. Analytic modeling, visual thinking. prereq: 3+ track for MArch

ARCH 5110. Architecture as Catalyst. (1 cr. ; 3 cr.; A-F or Audit; Every Spring)
Topical workshops on design methods, theories, or emerging practices. prereq: MArch

ARCH 5207. Venice Design Workshop. (4 cr.; A-F only; Every Spring)
Design interventions with special concerns for urban landscapes, heritage conservation, and sustainable development. Jointly conducted with a graduate landscape architecture design studio. Design techniques for site plans/masterplans. Final project. prereq: MArch or instr consent

ARCH 5212. Undergraduate Architecture Studio 05: Advanced Design. (6 cr.; A-F only; Every Fall)
Advanced design studio to engage students in range of critical subjects to be determined by respective instructors. Intended to challenge students with independent/experimental approach to design that builds on prior knowledge, develop working methodologies/design ethics. prereq: C- or better in 3281, 3282, 4283, 4284

ARCH 5241. Principles of Design Programming. (3-4 cr.; A-F or Audit; Periodic Spring)

ARCH 5250. Advanced Topics in Design. (1-6 cr. ; max 24 cr.; A-F only; Every Fall, Spring & Summer)
Advanced topics in architectural design.

ARCH 5301. Conceptual Drawing. (3 cr.; A-F only; Every Spring)
Drawing as way of analyzing, exploring, and generating design ideas. Projection systems, diagramming, mapping. Different modes of visual perception. Nonverbal structures. prereq: MArch major or instr consent

ARCH 5313. Visual Communication Techniques in Architecture. (3 cr.; A-F or Audit; Every Fall & Spring)
Delineation, presentation, and design techniques. Various visual media and methods of investigation. prereq: M Arch major or instr consent

ARCH 5321. Architecture in Watercolor. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design. prereq: M Arch grad student or instr consent

ARCH 5350. Topics in Architectural Representation. (1-4 cr. ; max 16 cr. ; A-F or Audit; Every Fall, Spring & Summer)
Selected topics in architectural representation.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Use of 3D computer modeling for representation in abstract/realistic ways. Computer modeling software. Creation/arrangement of objects, setting up lighting, developing surface materials, creating still renderings/animations. Ways in which computer visualization can be used for design exploration, for feedback during development of ideas, and for realistic representation of fully formed designs. prereq: M Arch major

ARCH 5372. Computer Methods II. (1 cr.; S-N or Audit; Every Spring)
Current techniques, computer programs, and their application to architectural computing and design. prereq: 5371, concurrent registration is required (or allowed) in 8252 and M Arch major or instr consent

ARCH 5381. Introduction to Computer Aided Architectural Design. (3 cr.; A-F or Audit; Every Fall)
2-D drawing, 3-D modeling/animation, printing, plotting. Electronic networking/communications, database management, spreadsheet analysis, land-use analysis, project management. prereq: Arch or BED or M Arch or grad student in LA or instr consent

ARCH 5382. Computer Aided Architectural Design. (3 cr.; A-F or Audit; Every Spring)
2-D/3-D CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recording.

ARCH 5391. Design and Representation with BIM. (3 cr.; A-F or Audit; Every Fall)
In this course, students will be introduced to the concept of Building Information Modeling (BIM) through the use of Autodesk Revit, one of the BIM software tools most commonly used in architectural practice today. Students will engage in a series of design exercises that will require both learning and applying Revit in the context of real world architectural scenarios. In addition to learning Autodesk Revit as a design tool, we will examine the use of BIM...
technology within the architectural industry through a series of case study examples. Also, presenters will share firsthand accounts of CAD and BIM software being implemented in architectural practice.

ARCH 5392. Digital Documentation: Facades. (3 cr.; A-F or Audit; Every Spring)

This course explores two aspects of contemporary architectural practice that are bound up in a constantly evolving relationship: Facades and BIM. Over the course of the semester, students will study the anatomy of contemporary enclosure systems and understand the requirements that shape them. We will look at systems that are complex, layered and multi-functional, and develop an understanding of contemporary enclosure design relative to historical precedents.

ARCH 5410. Topics in Architectural History. (3 cr.; max 12 cr.); A-F or Audit; Every Fall & Spring

Advanced study in architectural history. Readings, research, seminar reports.

ARCH 5411. Principles of Design Theory. (3 cr.; A-F or Audit; Every Spring)

Principles of design and their instrumentation. How and why architecture theory is generated. Types and significance of formal analysis. Theoretical positions. Student model of criticism. Prereq: M Arch major or instr consent

ARCH 5412. Architecture: A Global and Cultural History. (3 cr.; A-F or Audit; Every Fall)

This course examines the history of architecture from a global perspective, addressing a variety of traditions and geographical locations, and following their interconnections and exchanges.

ARCH 5413. Modern and Contemporary Global Architecture. (3 cr.; A-F only; Every Spring)

This course is a global history of modern and contemporary architecture, tailored to graduate students in the M.Arch. program. The course examines the architectural production of the 20th and 21st centuries through the focused study of buildings, urban plans, unbuilt designs, manifestos, and other visual and textual documents. Students will be called upon to reflect on issues of design, planning, programming, technology, and representation, connecting this course to their architectural training and future professional practice.

At the same time, the course will offer a critical and multidisciplinary perspective, presenting architecture in the context of culture, politics, economics, ideology, and other historical developments. The premise of this course is the fundamental role of history for contemporary and future architectural practice. The course assignments, readings, and activities aim to spur a productive dialogue between critical reflection and historical knowledge with an eye towards creative action.

ARCH 5421. Architecture and Interpretation: The Cave and the Light. (3 cr.; A-F only; Periodic Spring)

Historical/hermeneutical investigation of iconography of grotto. Intertwined themes of descent into earth and ascent to light, from earliest strata of human culture to present day. Prereq: [3411, 3412] or instr consent

ARCH 5423. Gothic Architecture. (3 cr.; A-F or Audit; Spring Odd Year)

History of architecture and urban design in Western Europe, from 1150 to 1400. Emphasizes major figures (Brunelleschi, Alberti, Bramante, Palladio) and evolution of major cities (Rome, Florence, Venice). Prereq: MS Arch or M Arch major or instr consent

ARCH 5424. Renaissance Architecture. (3 cr.; A-F or Audit; Periodic Fall & Spring)

History of architecture and urban design in Italy, from 1400 to 1600. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin). Prereq: MS Arch or M Arch major or instr consent

ARCH 5425. Baroque Architecture. (3 cr.; A-F or Audit; Fall Odd Year)

Architecture and urban design in Italy, from 1600 to 1750. Emphasizes major figures (Bernini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin). Prereq: MS Arch or M Arch major or instr consent

ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3 cr.; A-F or Audit; Periodic Fall & Spring)

Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3 cr.; A-F or Audit; Periodic Fall)

Architecture and urban design in Europe and the United States, from early 19th century to World War II. Prereq: MS Arch or M Arch major or instr consent

ARCH 5434. Contemporary Architecture. (3 cr.; A-F or Audit; Every Fall)

Developments, theories, movements, and trends in architecture and urban design, from World War II to present. Prereq: MS Arch or M Arch major or instr consent

ARCH 5435. History of American Architecture. (3 cr.; A-F or Audit; Periodic Fall)

Through lectures, readings, discussion, and research, we will analyze buildings and spaces/architect designed and ?vernacular?? in the context of social, political, economic, technological, and ecological change. As we address these issues, we will examine the ways design and daily life, performed locally, interacted with national and global systems and flows; and the role the built environment has played in advancing structures and concepts of class, gender, race, ethnicity, and power. Students will gain a broad familiarity with the history of American buildings and landscapes, develop critical frameworks for analysis, and enhance their understanding of the environments they interact with every day?as designers, citizens, consumers, and professionals.

ARCH 5441. Minnesota: Architecture and Landscapes. (3 cr.; A-F only; Every Spring)

History of major architectural monuments, urban phenomena, and landscape forms of Minnesota. Interrelationships between architecture, geography, and people. Prereq: [3411, 3412] recommended

ARCH 5446. Architecture Since World War II: Postwar Experimentation: Aesthetics and Politics of Architecture. (3 cr.; A-F only; Every Fall)

Eight-week seminar. Avant-garde architectural responses to postwar consciousness of social issues/meaning. How tenets of western avant-gardism were transformed by regional constraints when introduced to post-independent agendas of non-western world. Prereq: M Arch major

ARCH 5450. Topics in Architectural Theory. (1-3 cr.; max 9 cr.); A-F or Audit; Every Fall, Spring & Summer

Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (4 cr.; A-F only; Periodic Fall & Spring)

Paradigms through which architecture has defined itself. Implications for its practice, product, and architecture in general. Lecture, discussion, design exercises. Prereq: M Arch major

ARCH 5452. Architecture: Design, Form, Order, and Meaning. (4 cr.; A-F or Audit; Every Fall & Spring)

Architecture and the issue of meaning. Explores fundamental and constituent elements of architectural form and order; their inherent tectonic, phenomenal, experiential, and symbolic characteristics; their potential and implications for the creation and structure of meaningful human places. Prereq: M Arch major or instr consent

ARCH 5461. North American Indian Architecture. (3 cr.; Student Option; Every Spring)

Historic/contemporary principles/theories of North American Indian architecture. Culture, technology, environment, art, and craft of North American Indians in their settlements/architecture. Prereq: M Arch major or instr consent

ARCH 5462. Venice: A Port City. (3 cr.; A-F only; Every Spring)

Historical understanding of Venice and its lagoon, the rise and decline of Venice as a maritime empire as well as a port city of global trades, and environmental issues of heritage conservation. Seminars/field trips highlighting architectural and artistic achievements of Venice. Prereq: M Arch or MLA or instr consent

ARCH 5515. Technology One: Building Materials and Construction Systems. (3 cr.; A-F only; Every Fall)


ARCH 5516. Technology Two: Luminous and Thermal Design. (6 cr.; A-F only; Every Spring)

Concepts/principles of daylighting, thermal, energy, and systems integration. Architectural/technological implications of lighting and thermal design. Ecological thinking in support
of sustainable design decision making. prereq: M Arch

ARCH 5517. Technology Three: Structural Systems. (; 3 cr. ; A-F only; Every Fall) Structural behavior in withstanding gravity and lateral forces. Evolution, range, and applications of structural systems. Structural analysis. Graphical methods, site visits, analog/digital modeling. Case studies, problems. prereq: M Arch student

ARCH 5518. Environmental Technology: Integrative Ecological Design for Responsive Architecture. (3 cr.; A-F only; Every Fall) This course introduces the ecological design concepts and principles of daylighting, thermal, energy, and building systems integration. The course will provide students with an understanding of the primary architectural and technological implications of lighting and thermal to inform design and ecological thinking and to support sustainable design decision-making.

ARCH 5521. Material Investigation: Concrete. (4 cr.; A-F only; Every Spring) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where concrete is primary building material. prereq: MArch or MS

ARCH 5523. Material Investigation: Steel and Glass. (4 cr.; A-F only; Every Spring) Design projects identify common problems and improvements, investigate alternatives and develop solutions where steel and glass are the primary building materials. prereq: Grad student

ARCH 5527. Material Investigations: Stone and Water. (4 cr.; A-F only; Every Spring) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where wood is primary building material. prereq: MArch or M.S.

ARCH 5539. Daylighting and Architecture Design. (4 cr.; A-F only; Every Spring) Ecological design approaches that combine ecological, physiological, and experiential aspects to enhance relationship to place. How formal, aesthetic, and experiential aspects of daylighting support/foster sustainable architectural design. prereq: M Arch major

ARCH 5541. Material Strategies. (3 cr.; A-F only; Every Fall) Emergent materials in advanced building design; strategies for material approaches relevant to global resource flows, technological trajectories, and sociocultural effects. Research projects based on evaluative tools and case studies. prereq: M Arch or Arch MS major

ARCH 5550. Topics in Technology. (1-4 cr. ; max 12 cr.; A-F only; Every Fall, Spring & Summer) Selected topics in architecture technology, e.g., construction, environmental management, energy performance, lighting, materials.

ARCH 5561. Tech 1, Structures for Building. (3 cr.; A-F only; Every Fall) Role of structure in architectural design. Common systems found throughout history. Review systems to identify parameters that influence structural decisions. prereq: M Arch major or instr consent

ARCH 5562. Tech 2, Intro to Building Technology. (3 cr.; A-F only; Every Fall) Origin/development of architectural idea. Designs as direct means of representing our underlying intentions. prereq: MArch or instr consent

ARCH 5563. Tech 3: Advanced Building Technology Integrated Building Systems. (3 cr.; A-F only; Every Fall) Logic of integrating building systems. Improving understanding of/thinking critically about integration principles, theories, practice, application. Identifying/working through problems the project architect must address. prereq: MArch or instr consent

ARCH 5564. Tech 4: Building Structural Systems. (3 cr.; A-F only; Every Fall) Main concepts related to building structures. Basic knowledge of flow of forces. Review of rules for sizing structures. Calculations to understand systems behavior. Knowledge/tools to design buildings considering structure within design process. prereq: MArch or instr consent

ARCH 5569. Development and Implementation of Research. (3 cr.; A-F only; Every Fall) Bridge gaps among architectural research, design, practice. Forum for students to independently develop research topics/implement research methods related to architectural scholarship/practice, aided by classmates, instructor, guest lecturers. prereq: instr consent

ARCH 55611. Design in the Digital Age. (3 cr.; A-F or Audit; Every Spring) Introduction to design, design process. Developing/understanding ways of seeing, thinking, and acting as a designer. Changes in design being wrought by digital technology. Team design project. prereq: Grad student or upper level undergrad student

ARCH 55621. Professional Practice in Architecture. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Legal, ethical, business, and practical requirements of architectural practice. Contemporary and historical models of contract formation, business principles, accounting, project management, design services, and marketing. prereq: M Arch major or instr consent

ARCH 55630. Practicum: Advanced Issues in Practice. (3 cr. ; max 6 cr.) S-N only; Every Fall & Spring) Advanced architectural practice topics not normally covered in curricula are examined/evaluated as foundation for licensure/ARE 4.0 testing processes. prereq: M.S. Architecture or MArch

ARCH 55650. Topics in Architectural Practice. (1-4 cr. ; max 16 cr.; Student Option; Every Fall, Spring & Summer) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architecture, and society. prereq: 5621, Arch major or 5621, M Arch major or instr consent

ARCH 55651. Building Stories. (3 cr. ; max 12 cr.; A-F only; Every Spring) Professional practice education by means of case study analysis.

ARCH 55670. Topics in Historic Preservation. (1-3 cr.; max 12 cr.; Student Option; Periodic Fall) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 55671. Historic Preservation. (3 cr.; Student Option; Every Fall) Philosophy, theory, origins of historic preservation. Historic archaeology/research, descriptive analysis, documentation of historic buildings. Government’s role in historic preservation, preservation standards/guidelines, preservation/building codes, preservation advocacy.

ARCH 55672. Historic Building Conservation. (3 cr.; Student Option; Every Spring) Historic building materials, systems, and methods of conservation. Discussion of structural systems, building repair and pathology, introduction of new environmental systems in historic buildings, and conservation of historic interiors. Research on historic building materials and techniques using primary and secondary resources and on documentation of a specific historic site through large-format photography and measured drawings. prereq: 3412, 5671 or instr consent

ARCH 55673. Historic Property Research and Documentation. (3 cr.; Student Option; Every Spring) Philosophy, theory, methods of historic building research. Descriptive analysis of buildings, building documentation, historical archaeology, architectural taxonomy. prereq: 3412, 3641, 4671, 5671, 4672 or 5672 or instr consent

ARCH 55674. World Heritage Conservation. (3 cr.; A-F only; Periodic Fall) Investigations of World Heritage conservation and nomination for the preservation of historic buildings and sites and their management for public use. Case studies link current practices, methods, and solutions with expert preservationists, site conservationists and local communities in the development and design of preservation strategies. prereq: MS in Arch-HP concentration or MARCH or MLA or instr consent

ARCH 5677. Preservation of the Vernacular Built Environment and Cultural Landscape. (3 cr.; A-F only; Periodic Spring)
Theoretical, methodological, practical implications of preserving vernacular environment such as commercial blocks, strips/buildings, warehouses/sheds, wharves/piers, abandoned streetcar tracks/railroad spurs. prereq: Grad student, open to upper level (junior/senior) undergraduates with instr consent. Honors student encouraged.

ARCH 5678. Preservation & Sustainability. (3 cr.; A-F or Audit; Every Spring)
Topics covered include identification of historic properties, consideration of constraints on modification, examination of potential energy-saving treatments, consideration of the full range of options for 7green? buildings and neighborhood, and discussion of resolution of conflicts between the two.

ARCH 5686. Research Practices Final Project: Research into Practice. (4 cr.; A-F only; Every Fall)
The course is the first of a three-??course final project sequence required as the capstone experience for MS-??RP students. The course provides a forum for understanding the current state of research in the design and building industry and its trajectories and trends. Student projects will apply this knowledge to a regionally based commercial or non-????profit practices in the building industry, assessing the firm??s research capacity, mapping its potential in context of innovative precedents and suggesting future growth. prereq: MS-RP student

ARCH 5687. Research Practices Final Project: Practice into Research. (4 cr.; S-N only; Every Fall)
Course is the second of a three-??course final project sequence required as the capstone experience for MS-??RP students. Building upon the previous semester understanding the state of research in the building industry, this course develops a single case study project in comparative context of contemporary practice. The work of individual students adds to a collective knowledge base on project best practices and development of industry-????wide metrics and standards. Course meets concurrently with ARCH 5688 Representation of Case Studies. prereq: Arch 5686

ARCH 5688. Research Practices Final Project: Representation of Case Studies. (1 cr.; A-F only; Every Fall)
The course is the third of a three-??course final project sequence required as the capstone experience for MS-??RP students. This course meets concurrently with ARCH 5687 Practice into Research. Information graphics are essential to understanding and explaining critical issues in a case study. The format of information can be designed to emphasize comparisons between projects or to highlight unique characteristics of individual projects. This course will explore a variety of strategies commonly used in case study documentation and ask the student to apply one method to present the case developed in ARCH 5687. prereq: Arch 5686

ARCH 5711. Theory and Principles of Urban Design. (3 cr.; A-F or Audit; Every Spring)
Seminar. Debate on dominant theories/paradigms informing city design from renaissance to 21th century. Critical issues central to current debates. prereq: M Arch major or LA grad major or grad student or instr consent

ARCH 5721. Case Studies in Urban Design. (3 cr.; A-F or Audit; Every Spring)
Reading seminar. Evolution of contemporary city. Dynamics that created contemporary urban spatial patterns. Planning/design theories that have guided public interventions in built environment. Thematic texts, classroom discussions. prereq: Grad student or instr consent

ARCH 5731. Territorial City. (3 cr.; A-F only; Every Fall)
Seminars. Students research, define, and test conditions within which the territory and contemporary city coexist. Site for research is Twin Cities metropolitan area. Readings, discussions, field trips, collaborative development of urban proposals.

ARCH 5750. Topics in Urban Design. (1-4 cr. [max 16 cr.]; A-F or Audit; Every Fall, Spring & Summer)
Special topics in theory/practice of urban design.

ARCH 5756. Public Interest Design: Principles and Practices. (3 cr.; A-F or Audit; Every Spring)
As the allied fields of design evolve in response to an increasing number of global challenges?inequity, social and political turmoil, disruptive climate-change, accelerating population growth?the question of how designers will address the needs of the most vulnerable among us is fundamental. Public Interest Design (PID), an emerging area of specialization within the design professions, specifically considers the concerns of the vast majority of the world's inhabitants who are historically under-resourced and ill-equipped to respond to the "Grand Challenges" facing humankind. This course offers an introduction to PID and its application.

ARCH 5793. Directed Study. (1-4 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring)
Guided individual reading or study. prereq: instr consent

ARCH 8101. Subjects and Methods in Architecture. (2 cr.; S-N or Audit; Periodic Fall & Spring)
The discipline of architecture. prereq: Grad Arch major or instr consent

ARCH 8250. Advanced Topics in Design. (1-6 cr.; S-N or Audit; Periodic Spring & Summer)
Design studio. prereq: Admitted to 3+ track for MArch prog or instr consent

ARCH 8251. Graduate Architectural Design I. (6 cr.; A-F or Audit; Every Fall)
Design projects focused on fundamental issues of space/form/light/materiality in relation to human habitation. Design as a process of exploration/inquiry. Modes/media of representation, their critical impact. prereq: M Arch major or instr consent

ARCH 8252. Graduate Architectural Design II. (6 cr.; A-F or Audit; Every Spring)
Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort. prereq: 8251, grad Arch major or instr consent

ARCH 8253. Graduate Architectural Design III. (6 cr.; A-F or Audit; Every Fall)
Issues of design process, representation, programming, technology, and urban relations. prereq: [8251, MArch] or instr consent

ARCH 8254. Technical Applications in Design. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall)
Design potential inherent in technical development process of design project. Testing concepts, developing details, integrating building systems. Structural bay enclosure, cost considerations, regulatory compliance, Building information modeling, analog/digital representations in architecture document production, prereq: [8253, MArch major] or dept consent

ARCH 8255. Graduate Architectural Design V. (6 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring)
Fundamental architectural problems involving design as a creative inquiry. Individual/ collaborative effort. prereq: [8254, grad Arch major] or instr consent

ARCH 8295. Directed Graduate Architectural Design. (6 cr.; A-F or Audit; Every Spring)
N/A prereq: 8251, grad Arch major or instr consent

ARCH 8299. Master's Final Project. (10 cr.; S-N only; Every Spring)
Final studio project for Plan C master's. Measures knowledge of architecture and ability to conduct research for design proposal, communicate in visual/written representations. Proposal, graphic presentation of project. prereq: Plan C, MArch

ARCH 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
No description. prereq: Master's student, adviser and DGS consent

ARCH 8350. Advanced Topics in Representation. (1-3 cr.; A-F or Audit; Periodic Fall & Spring)
Theory and practice of visual representation in architecture. prereq: Grad Arch major or instr consent

ARCH 8450. Topics in Theory. (1-3 cr.; A-F or Audit; Every Fall & Spring)
ARCH 8494. Directed Research in Architectural History. (1-3 cr.; A-F or Audit; Every Spring) N/A prereq: Grad Arch major or instr consent

ARCH 8550. Topics in Technology. (1-3 cr.; A-F or Audit; Every Fall & Spring) Special topics in theory/practice of architecture technologies. prereq: Grad arch major or instr consent

ARCH 8561. Sustainable Design Theory and Practice. (3 cr.; A-F only; Every Fall) History, theory, and ethics of sustainable design processes/practices. Emphasizes approaches to sustainable architecture. Regional/global ecological issues, design strategies, methods of assessment. Primary architectural/technological implications of sustainable design theory/practice that inform design thinking/research. Sustainable design issues. Research projects, case studies, fieldwork. prereq: [5512, grad MS or MArch] or instr consent

ARCH 8563. Energy and Indoor Environmental Quality Issues in Sustainable Design. (3 cr.; A-F or Audit; Every Spring) Energy/IEQ aspects of sustainable design related to global environmental issues. Energy/IEQ strategies, methods, and tools as applied to sustainable building design. Research projects, case studies. prereq: [5513, grad MS or MArch] or instr consent

ARCH 8565. Materials Performance in Sustainable Building. (3 cr.; A-F only; Every Fall) Building-material properties, resource conservation, fabrication/construction processes in production of high performance sustainable building designs. Application of assessment/evaluation tools (LCA, BEES, Athena or LEED) for IEQ, waste reduction and management with an emphasis on experimental/analytic methods. Aesthetic/technical solutions that integrate design selection processes, construction methods, commissioning processes, and facility management, maintenance, and decommissioning. prereq: [5512, grad MS or March] or instr consent

ARCH 8567. Site and Water Issues in Sustainable Design. (3 cr.; A-F only; Every Fall) Site, water and site/building integration aspects of sustainable design. Ecological principles, site analysis. Water/site/building integration strategies, methods, and tools integrated with sustainable design issues such as energy, indoor environmental quality, and materials. Research projects, case studies, measurement methods. prereq: [5512, grad MS or MArch student] or instr consent

ARCH 8650. Topics in Architectural Practice. (1-3 cr.; A-F or Audit; Periodic Fall) N/A prereq: Grad Arch major or instr consent

ARCH 8750. Topics in Urban Design. (1-3 cr.; A-F or Audit; Periodic Fall) Special topics in theory/practice of architecture technologies. prereq: Grad arch major or instr consent

ARCH 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only

ARTS 5015. Advanced Dimensional Painting. (4 cr.; Student Option; Every Spring) Illusionary space applied to sculptural forms. Practical applications of spatial/painterly concepts. Emphasizes critical/visual judgment. Development of cohesive body of work reflecting interaction of two/three dimensions. prereq: 3105 or inst consent

ARTS 5110. Advanced Drawing. (4 cr.; max 16 cr.; Student Option; Every Fall & Spring) This studio course provides students the opportunity to investigate individual ideas and work on self-guided projects within a communal learning environment. Students will be encouraged to develop and execute their ideas with skillfulness and clarity. Through a consideration of diverse materials and practices, students will develop a proficiency in the language of contemporary drawing or painting. This course is designed to assist students in making connections between their own work and larger global themes and issues. Group and individual critiques, field trips, reviewing the work of other artists and readings will supplement studio work. Students are expected to spend time working on their projects outside of scheduled class time. prereq: previously completed a 3XXX course in Drawing or Painting

ARTS 5120. Advanced Painting. (4 cr.; max 16 cr.; Student Option; Every Fall & Spring) This studio course provides students the opportunity to investigate individual ideas and work on self-guided projects within a communal learning environment. Students will be encouraged to develop and execute their ideas with skillfulness and clarity. Through a consideration of diverse materials and practices, students will develop a proficiency in the language of contemporary painting. This course is designed to assist students make connections between their own work and larger global themes and issues. Group and individual critiques, field trips, reviewing the work of other artists and readings will supplement studio work. Students are expected to spend time working on their paintings outside of scheduled class time. prereq: 3120 or inst consent

ARTS 5140. Advanced Printmaking. (4 cr. [max 16 cr.]; Student Option; Every Fall & Spring) In-depth research of personal imagery using a broad range of historical and contemporary applications. Development of imagery using color, photo-mechanical, digital processes. Cross-media approaches. Prereq: previously completed a 3xxx-level course in Drawing or Painting

ARTS 5340. Advanced Sculpture: Carving and Construction. (4 cr. [max 8 cr.]; Student Option; Every Fall & Spring) Carving/construction using wood, other materials. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculptural imagery. prereq: 3304

ARTS 5390. Advanced Sculpture Methods and Practice. (4 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Work in selected sculptural processes with intense studio activity. Development of innovative methods/techniques. prereq: 5300


ARTS 5404. BA Capstone and Exhibition. (3 cr.; S-N only; Every Fall & Spring) The BA Capstone and Exhibition will focus on building professional skills, developing a strong studio practice, and preparing for an exhibition in Regis Center Public Spaces.

ARTS 5407. BFA Capstone 2: Critique and Exhibition. (4 cr.; A-F only; Every Spring) This critique-based seminar will provide a structured critical forum for the discussion of your work, help you to verbally articulate and defend your work and prepare you in the presentation of your work. This is a self-motivated and self-directed class. It is expected that you will produce a substantial amount of work to show in this course. Your work is self-directed Artwork created from assignments (in other classes) will not be critiqued. Each artist will have two one-hour critiques of their work over the course of the semester. Critiques may include members from the arts community such as local artists, MIA, Midway Contemporary Art, Walker Art Center, The Soap Factory and Franklin Artworks. Grades are based on critique participation, attendance and your artist presentation. This class culminates in the BFA Exhibition in the Nash Gallery. Throughout the semester, we will meet with Nash Gallery staff to develop this final show.

ARTS 5490. Workshop in Art. (1-4 cr. [max 48 cr.]; Student Option; Every Fall, Spring & Summer) Selected topics and intensive studio activity. Topics vary yearly.

ARTS 5610. New Media: Making Art Interactive. (4 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Conceptual/aesthetic development with digital, interactive art. Experimental approaches to interactive technologies. Projects with responsive/tangible media. Theory/history of new media. prereq: 3601 or inst consent

ARTS 5650. Advanced Sound Art. (4 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Sound art practice/theory. Emphasizes individual creative projects using sound as
Theory, critical readings about historical and contemporary works in video. prereq: 3750
ARTS 5760. Experimental Film and Video. (; 4 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Experimental approaches in producing digital video within a contemporary art context. Using digital media technologies in installation, performance, and interactive video art. Emphasizes expanding personal artistic development. Theoretical issues, critical/historical readings/writings in media arts. prereq: 3760
ARTS 5770. Animation. (; 4 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Creating ideas visually with 2- and 3-dimensional animation technologies. Vector-and layer-based raster animation. Modeling objects and spaces, creating textures, lighting, movement, sound track. prereq: 3770
ARTS 5780. Advanced Super 8 and 16 MM Filmmaking. (4 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring)
This course will explore the medium of Super 8 filmmaking in the tradition of the experimental and avant-garde. We will focus on the physicality of the film stock, the basic mechanics of the camera and projector, and how these elements translate into a visual language and aesthetic. Students will learn how to shoot, process, edit, splice, project, and transfer their own Super 8 films. This course will balance the technical, conceptual, and historical aspects of small gauge or amateur analog filmmaking, and address what it means to work in this medium at the beginning of the 21st century. The course will include presentations, readings, and discussions on contemporary and historical artists in the medium, as well as outside film screenings and lectures. Classroom visits by artists will also provide an informed context for the primary course objective.
ARTS 5810. Advanced Ceramics. (; 4 cr. [max 16 cr.]; Student Option; Every Fall & Spring)
Critical discourse of aesthetics. History of, contemporary issues in clay and criticism. Independent, advanced projects. prereq: 3820 and 3830
ARTS 5850. Advanced Foundry and Metal Sculpture. (4 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Metal casting of sculpture in bronze, iron, aluminum, other metals. Studio practice, investigation of historical/contemporary methods and concepts. Development of personal sculptural imagery. prereq: 3850 or instr consent
ARTS 5860. Advanced Sculpture. (; 4 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
This advanced Sculpture course is a self-motivated and self-directed studio class to help you develop and maintain a personal studio practice. The structure of this studio course provides space for in-depth research, idea development, individual exploration, experimentation, play and critical feedback.
ARTS 5890. 3D Modeling and Digital Fabrication. (4 cr. [max 12 cr.]; Student Option; Every Spring)
In this class, students will learn the basic skills of 3D computer modeling and digital fabrication to generate objects using the Department of Art's 3D Printers, 3-axis CNC Router and Laser Cutter. Instruction includes computer modeling in Adobe Illustrator and Rhino, transfer of files and object fabrication.
ARTS 5990. Independent Study in Art. (1-4 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Independent study project designed by student in consultation with instructor. prereq: Major, completed regular course with instructor, instr consent
ARTS 8100. Practice and Critique: Drawing and Painting. (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism. prereq: Art MFA student
ARTS 8300. Practice and Critique: Sculpture. (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.
ARTS 8333. FTE: Master’s. (; 1 cr. ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master’s student, adviser and DGS consent
ARTS 8401. Studio and Pedagogy: Philosophy and Practice. (; 3 cr. [max 6 cr.]; Student Option; Every Spring)
Orientation to establishing studio practice, introduction of department and community resources, and preparation for teaching. Studio visits and critiques; development of teaching strategies. Required of drawing and painting students.
ARTS 8402. Theoretical Constructions in Contemporary Art. (; 3 cr.; Student Option; Every Fall & Spring)
ARTS 8403. MFA Professional Practices and Teaching Pedagogy. (3 cr.; A-F only; Every Spring)
This course is intended to provide a context for developing a career as an artist and explore how to create a sustainable artistic practice. This course will also explore issues in contemporary arts education through multiple approaches and best practices in teaching pedagogy. A primary goal of the course is to provide the Department of Art graduate instructors with an opportunity develop teaching skills before entering the classroom, access to UMN teaching resources and important information regarding expectations.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
of University of Minnesota instructors and courses. Through visiting artist presentations, as well as those by professionals in arts administration, non-profits, established and non-traditional galleries, curators, critics, and recent art graduates, we will also examine the rich ecology of the arts in the Twin Cities community. We will also explore how to navigate the arts terrain successfully as an artist.

ARTS 8404. MFA Thesis Research + Writing. (3 cr.; A-F only; Every Fall) This workshop aims to facilitate the writing process of the MFA Thesis Supporting Paper for third-year graduate students. In accordance with the MFA advisory manual, students are challenged to articulate their creative investigations and processes as well as philosophical and critical perspectives developed throughout their course of study. By the time third-year reviews take place in December, students are expected to have a full-length draft of their text (15 pages, double-spaced, 12-point type) that names relevant reference points of the work, historical and contemporary art influences, a bibliography, and completes the requirements laid out in the MFA Advising Manual.

ARTS 8410. MFA Critique Seminar. (3 cr. [max 12 cr.]; A-F only; Every Fall & Spring) Taken for three semesters during the first and second year of the program, the MFA Critique Seminar provides candidates with an intellectual community and critical forum in which they may test, temper, and enlarge the ideas that underlie their artistic goals. The seminar will meet weekly to critique, in rotation, the work-in-progress of all candidates. The cross-disciplinary nature of the conversation is meant to foster the widest possible dialogue among artists, encourage divergent thinking and discourse the easy acceptance of received notions. The seminar will also include, critiques, and discussions with visiting artists, curators, etc.

ARTS 8420. MFA Studio. (3 cr. [max 12 cr.]; A-F only; Every Fall & Spring) This graduate level directed studio offers students the opportunity to work with individual faculty. Students arrange regular meetings and develop a proposal for the semester, which is approved by the instructor. Prior to registration, the student must contact the faculty member with whom they hope to work.

ARTS 8450. MFA Creative Thesis. (1-9 cr.; A-F only; Every Fall & Spring) Research/studio work in preparation for thesis exhibition. Third year students are required to complete 18 cr. of this course in their final year.

ARTS 8490. Workshop in Art. (1-4 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Selected topics/intensive studio activity. Topics vary yearly.

ARTS 8500. Practice and Critique: Printmaking. (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Creative practice/critique. Colloquium emphasizing individual goals/directions.

Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8600. Practice and Critique: Experimental and Media Arts. (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Creative practice/critique. Colloquium emphasizing individual goals/directions.

Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8700. Practice and Critique:Photography. (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Creative practice/critique. Colloquium emphasizing individual goals/directions.

Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8800. Practice and Critique: Ceramics. (3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring) Creative practice/critique. Colloquium emphasizing individual goals/directions.

Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8990. MFA Creative Thesis. (1-9 cr. [max 18 cr.]; A-F only; Every Fall & Spring) Research/studio work in preparation for thesis exhibition.

Art History (ARTH)

ARTH 5115. Hellenistic and Iranian Asia: Art and Archaeology of Hellenistic, Scythian, Kushan, and Sogdian Asia. (3 cr.; Student Option: Every Fall & Spring) Transformations of Greek architecture, sculpture, painting, mosaic, and decorative arts beginning of the eastern Mediterranean and Hellenistic Asia. Art and archaeology of the post-Hellenistic Iranian world. Religious, political and historical contexts of archaeological sites, monuments, and art objects.

ARTH 5192. Persia and the Ancient Iranian World: Art and Archaeology of Achaemenid to Sasanian Persia. (3 cr.; Student Option; Every Fall & Spring) Art, archaeology of ancient Persia and the wider ancient Iranian world from the rise of the Achaemenid empire in 650 BCE to the advent of Islam in the seventh century CE.

ARTH 5301. Visual Culture of the Atlantic World. (3 cr.; A-F or Audit; Periodic Spring) Visual culture of Atlantic world, from Columbus to American Revolution. Visual objects, practices considered in context of Europe’s colonization of Americas. Slavery, religious conflict, international commerce, production of scientific knowledge addressed in terms of their impact upon visual imagery.

ARTH 5302. The Image Multiplied: Prints in Early Modern Europe. (3 cr.; A-F or Audit; Periodic Fall & Spring) The technology of mechanically reproducing complex visual images on paper, a development of fifteenth-century Europe, transformed the early modern world no less than the emergence of digital media has transformed our own. Techniques of woodcut, engraving and etching quickly became important media for innovation within the fine arts. At the same time, they became equally important as sources for devotional imagery, for disseminating copies of other artworks, for the expansion of knowledge through scientific illustration, and for the effective broadcasting of political and religious messages during centuries of extraordinary political and religious upheaval. In this course we will investigate the cultural history of printed images in Europe from the time of their emergence in the fifteenth century through the mid-eighteenth century. Through lectures and class discussion, you will develop a familiarity with the technical aspects of printmaking and apply that understanding to the historical interpretation of specific works. The course will not be an exhaustive survey of printmakers and printmaking styles during the early modern era but will instead approach the early modern print through the changing cultural circumstances of its production and reception. While we will consider the work of many lesser-known (and anonymous) artists, we will concentrate on the work of major printmakers such as Mantegna, D?rer, Goltzius, Rembrandt, Callot, Hogarth, and Piranesi. The course will include visits to local collections.

ARTH 5324. 15th-Century Painting. (3 cr.; Student Option; Periodic Fall & Spring) The origin, character, and development of painting in Northern and Southern Europe. prereq: Jr or sr or grad or instr consent

ARTH 5335. Baroque Rome: Art and Politics in the Papal Capital. (3 cr.; Student Option; Fall Even Year) Center of baroque culture--Rome--as city of spectacle and pageantry. Urban development. Major works in painting, sculpture, and architecture. Ecclesiastical/private patrons who transformed Rome into one of the world’s great capitals.

ARTH 5336. Transformations in 17th Century Art: Caravaggio, Velazquez, and Bernini. (3 cr.; Student Option; Periodic Fall & Spring) This course offers an in-depth examination of three of the most innovative masters of early modern European art, the painters Michelangelo Merisi da Caravaggio and Diego Velázquez, and the sculptor and architect Gianlorenzo Bernini. Through selected readings, slide presentations and discussions, we will explore the lives and works of these artists, paying particular attention to the ways they created an entirely new relationship between the work of art and the viewer and ushered in a radically new way of conceiving visual imagery.

ARTH 5411. Gender and Sexuality in Art Since 1863. (3 cr.; Student Option; Periodic Fall & Spring) History of art from late 19th to early 21st century. How gender/sexuality have been central to that period’s artistic production, art criticism, and aesthetic theorization. How gender/sexuality are important themes for artists. How the writing of history reveals
In-depth examination of development of objects/motifs. Topics specified in Class Schedule. prereq: instr consent

ARTH 5950. Topics: Art History. (3 cr. ; A-F or Audit; Periodic Fall & Spring) Selected topics, with special attention to current scholarly disputes. Topics specified in Class Schedule. prereq: instr consent

ARTH 8190. Seminar: Issues in Ancient Art and Archaeology. (; 3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Focus on a major art historical theme, artist, period, or genre.

ARTH 8333. FTE: Master’s. (; 1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

ARTH 8340. Seminar: Baroque Art. (; 3 cr. [max 12 cr.]; Student Option; Every Spring) Topics vary. prereq: instr consent

ARTH 8400. Seminar: Issues in 19th-Century Art. (; 2 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Typical seminars have included symbolism, role of the academy and the avant-garde, surrealism in art and theory, and Franco-American relationships at the turn of the 20th century. prereq: instr consent


ARTH 8444. FTE: Doctoral. (; 1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

ARTH 8500. Issues in Latin American Art. (; 3 cr. [max 12 cr.]; Student Option; Every Spring)
ARTH 8520. Seminar: American Art and Material Culture. (3 cr.; max 12 cr.) ; Student Option; Periodic Fall & Spring)
Topics in American art, popular art, and material culture, emphasizing methods and techniques of inquiry: creation and use of archives, oral history, sources for pictorial evidence, and current approaches to interpreting traditional and non-traditional data.
prereq: instr consent

ARTH 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr.; max 12 cr.) ; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ARTH 8710. Seminar: Islamic Art. (3 cr.; max 12 cr.) ; Student Option; Periodic Fall & Spring)
Focus depends on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history. prerreq: instr consent

ARTH 8720. Seminar:East Asian Art. (3 cr.; max 12 cr.) ; Student Option; Periodic Fall & Spring)
Research focuses on closely defined topic, such as a short period of Chinese art, a restricted subject, or role of a single artist. A substantive research paper is required and participation in the seminar dialogue is expected. prerreq: instr consent

ARTH 8770. Seminar: Art of India. (3 cr.; max 12 cr.) ; Student Option; Periodic Fall & Spring)
Selected problems and issues in history of South Asian art. Topic varies by offering. prerreq: 3 cr art history, instr consent

ARTH 8783. Art, Diplomacy, and Empire. (3 cr. ; A-F only; Periodic Fall & Spring)
This course examines the mobility and agency of objects and people in diplomatic practice. An emerging body of scholarship within Renaissance and early modern studies explores the exchange and global circulation of objects and their role in cultural encounters. The possibilities offered by this 'material turn' highlight the potential of objects to enable cultural contact, conversion, and exchange across traditional political and cultural boundaries. At the same time, recent innovative and interdisciplinary approaches to exchange highlight cultural aspects of the diplomatic encounter. As a result, the roles of diplomats, interpreters, merchants as well as various types of objects and services continue to be interpreted in new ways. This course will introduce students to canonical texts associated with gift-exchange and reciprocity, and will explore their relevance to the disciplines of history and art history particularly with regard to imperial encounters and exchanges.

ARTH 8783. Art, Diplomacy, and Empire. (3 cr.; A-F only; Periodic Fall & Spring)
This course examines the mobility and agency of objects and people in diplomatic practice. An emerging body of scholarship within Renaissance and early modern studies explores the exchange and global circulation of objects and their role in cultural encounters. The possibilities offered by this 'material turn' highlight the potential of objects to enable cultural contact, conversion, and exchange across traditional political and cultural boundaries. At the same time, recent innovative and interdisciplinary approaches to exchange highlight cultural aspects of the diplomatic encounter. As a result, the roles of diplomats, interpreters, merchants as well as various types of objects and services continue to be interpreted in new ways. This course will introduce students to canonical texts associated with gift-exchange and reciprocity, and will explore their relevance to the disciplines of history and art history particularly with regard to imperial encounters and exchanges.

ARTH 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.) ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

ARTH 8890. Seminar: Issues in the History of Art. (3 cr.; max 12 cr.) ; Student Option; Every Fall & Spring)
Theoretical or topical issues. Topics vary. prerreq: 3 cr art history, instr consent

ARTH 8970. Directed Studies. (1-3 cr.; max 12 cr.) ; Student Option; Every Fall, Spring & Summer)
tbd prereq: instr consent

ARTH 8770. Seminar: Islamic Art. (3 cr.; max 12 cr.) ; Student Option; Periodic Fall & Spring)
Focus depends on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history. prerreq: instr consent

ACL 5212. Creative Entrepreneurship and Resource Development. (3 cr.; A-F or Audit; Every Spring)
An entrepreneurial approach to developing resources (including financial, human, and partnership) for arts and culture based enterprises whether using a nonprofit, for-profit or social enterprise business model. The course will investigate and discuss the complexities and nuances of how to determine the appropriate business model and develop both earned and philanthropic income. Students focus on framing and articulating the relevance of the enterprise as well as understanding the perspectives of audiences, customers, funders and donors. The course also explores the role of communications strategies in support of fundraising, and the importance of leadership in acquiring resources to sustain and grow successful organizations. Students develop both a broad understanding of resources as well as detailed strategies for supporting work in arts and culture based enterprises.

ACL 5221. Ethical Dilemmas and Legal Issues for Cultural Leaders. (3 cr.; A-F or Audit; Every Spring)
This course explores topics in ethics, law and leadership. Through interactive sessions, readings, presentations, discussions, papers and guest speakers, student-leaders will develop knowledge, tools and resources for assessment of ethical and legal issues within arts and cultural contexts. The course will engage student-leaders with an overview of relevant topics and a foundation for further exploration of self selected topics. Student-leaders will learn to spot issues and identify when to seek legal guidance, and assess considerations relevant to critical problem solving and informed decision-making.

ACL 5241. Financial Management for Arts Nonprofits. (2 cr.; A-F or Audit; Every Fall)
This course introduces students to concepts and applications of financial management and leadership practices for nonprofits with a specific focus on arts and cultural organizations. The goal of the course is to develop both theoretical and practical understanding of the central responsibilities of financial management and leadership in order to equip students to use financial information, identify business models, and employ a financial lens for planning and decisions. Focus will be on the fundamentals of budgeting and accounting, interpretation of financial statements, data, and procedures for operational forecasts, as well as the fiduciary responsibilities of nonprofit boards.

ACL 5251. Arts Advocacy in the Political Landscape. (2 cr.; A-F or Audit; Every Fall)
No artist or arts organization functions in a vacuum. They are surrounded by communities dealing with many social issues, and by
Asian American Studies (AAS)

AAS 5920. Topics in Asian American Studies. (1-4 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Topics specified in Class Schedule.

AAS 5993. Directed Readings. (1-4 cr. [max 8 cr.]; Student Option; Periodic Fall) Directed reading--must be set up with individual instructor.

AAS 5996. Graduate Proseminar. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring) Discussions/presentations from various disciplinary perspectives, research, activism, and performance in Asian American/Diasporic Studies. Students engage in dialogue, observe models of scholarly engagement, and reflect on issues within Asian American/diasporic studies.

Asian Languages and Literature (ALL)

ALL 5250. Advanced Topics in Asian Film and Media. (3 cr. [max 6 cr.]; A-F only; Periodic Fall & Spring) Examines theme, problem, region, style or filmmaker in Asian cinema. Focuses on (geo)political and socioeconomic contexts in relation to artistic and interpretive frameworks.


ALL 5276. Liberalism and Its Critics: Global Perspectives. (3 cr.; A-F only; Fall Odd Year) Survey of liberal political thought and various critics of it that arose in extreme left/right political perspectives, including those in colonial contexts and within non-Western religious formations, especially Hindu and Muslim.

ALL 5277. Space and Modernity in Asia. (3 cr.; Student Option; Periodic Fall & Spring) Examines methods, vocabularies, and theories necessary to articulate new spatial approaches to modern Asian cultural texts, including literature, films, and urban spaces. Special focus on Soja, Lefebvre, Winichakul, Henry, Ai, Zhang, and Furuhata.

ALL 5351. Chinese New Media. (3 cr.; A-F only; Every Fall) This course explores new media and intermediality from specific moments in the history of modern China. The new visuality of the late Qing Dynasty offers examples of how new forms of visual culture became both reflexive and constitutive of modernity. Later, silent cinema of the Republican era both drew upon and defined itself against existing Chinese dramatic forms, particularly opera.
In the 1930s, the arrival of sound in cinema provided a space for phonographic modernity to be expressed through film. In the People’s Republic, the productive interplay between traditional art forms and cinema entered a new era, culminating in the cinematic adaptations of the ?model plays? of the Cultural Revolution. Finally, recent years have seen the explosive growth of digital cinema, computer animation, internet culture, and gaming communities.

ALL 5359. Early Shanghai Film Culture. (3 cr.; Student Option; Spring Even Year) Shanghai film culture, from earliest extant films of 1920s to end of Republican Era in 1949. Influences on early Chinese film, from traditional Chinese drama to contemporary Hollywood productions. Effects of leftist politics on commercial cinema. Chinese star system, material film culture.

ALL 5374. The Monkey King and Transcultural China: Chinese Myth, Legend, and Ideology. (?; 3 cr.; Student Option No Audit; Periodic Fall & Spring) Early Chinese myths/legends/historical narratives about the Monkey King. Cultural formations from later periods, including contemporary popular culture and Asian American literature. Construction of China/Chinese in 20th Century seen through the Monkey as a figure of otherness and in-betweeness in relation to globalization and cross-cultural identity.

ALL 5436. Literature by 20th-Century Japanese Women in Translation. (3 cr.; Student Option; Periodic Fall) Literary/historical exploration of selected works by Japanese women writers in variety of genres. All literary texts read in English.

ALL 5446. Kabuki: A Pop, Queer, and Classical Theater in Japan. (3 cr.; A-F only; Spring Odd Year) Kabuki, an all-male theater of "song (ka)/dance (bu)/acting (ki)" that came into being in the 17th century, still boasts popularity in Japan. This course explores kabuki in several contexts: historical, theatrical, literary, and theoretical. It aims to historicize this performing art in its four-hundred-year dynamic trajectory against the static understanding that it is a national, high culture. No less importantly, we inquire into theoretical implications of subject matter, such as citationality, gender construction, and the like. Furthermore, this course attends to what is usually marginalized in kabuki historiography: koshibai (unlicensed small troupes of kabuki); onna yakuisha (women kabuki actors who mastered the acting techniques established by male kabuki actors--including the technique of female impersonation). Open to anyone with an interest, no previous knowledge of Japanese studies, theater studies, or Japanese literature/cultures. Problems in contemporary academic theory in humanities. Application of theory to Asian issues raised. Interventions of critical theory. Ethics of professional peer review. Crisis in higher education.

ALL 8333. FTE: Master’s. (?; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) x prereq: Doctoral student, [adviser, DGS] consent

ALL 8444. FTE: Doctoral. (?; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) x prereq: Doctoral student, [adviser, DGS] consent

ALL 8666. Doctoral Pre-Thesis Credits. (?; 1-6 cr.; [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) x prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ALL 8888. Thesis Credit: Doctoral. (?; 1-24 cr.; [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) x

ALL 8920. Topics in Asian culture. (?; 1-3 cr.; [max 9 cr.]; S-N only; Every Fall & Spring) Topics specified in Class Schedule.

ALL 8990. Directed Readings. (?; 1-4 cr.; [max 16 cr.]; Student Option; Every Fall & Spring) Directed readings in foreign language(s) of specialty, where appropriate. prereq: PhD student

Astronomy (AST)

AST 5012. The Interstellar Medium. (?; 4 cr.; Student Option; Periodic Fall) Survey of physical processes in the interstellar medium. Dynamic processes, excitation processes, emission and absorption by gas and dust. Hot bubbles, Hill regions, molecular clouds. prereq: 2001, Phys 2601 or instr consent

AST 5022. Relativity, Cosmology, and the Universe. (?; 4 cr.; Student Option; Periodic Fall & Spring) Large-scale structure/history of universe. Introduction to Newtonian/relativistic world models. Physics of early universe, cosmological tests, formation of galaxies. prereq: [2001, Phys 2601] or instr consent

AST 5201. Methods of Experimental Astrophysics. (?; 4 cr.; Student Option; Spring Even Year) Contemporary astronomical techniques and instrumentation. Emphasizes data reduction and analysis, including image processing. Students make astronomical observations at O’Brien Observatory and use department’s computing facilities for data analysis. Image processing packages include IRAF, AIPS, IDL, MIRA. prereq: Upper div CSE or grad or instr consent

AST 8001. Radiative Processes in Astrophysics. (?; 4 cr.; Student Option; Periodic Fall) Introduction to classical/quantum physics of electromagnetic radiation as it applies to astrophysics. Emphasizes radiative processes (e.g., emission, absorption, scattering) in astrophysical contexts (e.g., ordinary stars, ISM, neutron stars, active galaxies). prereq: instr consent
AST 8011. High Energy Astrophysics. (4 cr.; Student Option; Periodic Fall)
Energetic phenomena in the universe. Radiative processes in high energy regimes; supernovae, pulsars, and X-ray binaries; radio galaxies, quasars, and active galactic nuclei. prereq: instr consent

AST 8021. Stellar Astrophysics. (4 cr.; Student Option; Periodic Fall)
Stellar structure, evolution, and star formation. Emphasizes contemporary research. prereq: instr consent

AST 8031. Astrophysical Fluid Dynamics. (4 cr.; Student Option; Periodic Fall)
Introduction to physics of ideal/non-ideal fluids with application to problems of astrophysical interest. Steady/unsteady flows, instabilities, turbulence. Conducting fluid flows. Magnetohydrodynamics. prereq: instr consent

AST 8041. Comparative Planetology. (4 cr.; Student Option; Periodic Fall)
Overview of different knowledge of the solar system. Formation history of protostellar nebula, physical properties of major planetary bodies/moons. Sun and fossils of epoch of planetary system formation: comets, asteroids, minor bodies. prereq: instr consent

AST 8051. Galactic Astronomy. (4 cr.; Student Option; Periodic Fall)
Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-/ground-based telescopes. prereq: instr consent

AST 8061. Radio Astronomy. (4 cr.; Student Option; Periodic Fall)

AST 8071. Infrared Astronomy. (4 cr.; Student Option; Periodic Fall)

AST 8081. Cosmology. (4 cr.; Student Option; Periodic Fall)
Role of gravity in cosmology. Background, recent research advances. prereq: instr consent

AST 8110. Topics in Astrophysics. (4 cr.; A-F or Audit; Periodic Fall & Spring)
The course will concentrate on two topics in cosmology: formation of the large scale structure in the Universe, and gravitational lensing and its applications. The course will cover the evolution of structure in the early Universe, growth of super- and sub-horizon sized perturbations, transfer function, linear theory of gravitational instability, evolution of mass clustering, statistics of discrete objects, Cold, hot and warm dark matter, and means of measuring mass inhomogeneities. Gravitational lensing is a rapidly growing and wide-reaching field within modern astrophysics and cosmology. In the last 2 decades it has grown from a niche topic to a versatile and indispensable tool. It is now utilized in the studies of planetsfinding exoplanets using microlensing), stars (measuring limb darkening, masses, radii, motions of stars), galaxies and clusters of galaxies (mapping out detailed distribution and clumpiness of dark matter, and constraining properties of dark matter particles), and the distribution of mass on the largest cosmological scales (using distant galaxies, and Cosmic Microwave Background as sources). Lensing is often used for its magnifying power to examine highest redshift galaxies (using clusters of galaxies as telescopes), as well as accretion disks around supermassive black holes (using microlensing by stars in external galaxies). About half of the course will be lectures (interspersed throughout the semester), the rest will be seminar-style discussions of current literature, lead by students.

AST 8120. Topics in Astrophysics. (2-4 cr.; Student Option; Periodic Fall)
NA prereq: instr consent

AST 8200. Astrophysics Seminar. (1-3 cr.; Student Option; Every Fall & Spring)
TBD prereq: instr consent

AST 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall & Spring)
(No description) prereq: Master's student, adviser and DGS consent

AST 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

AST 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

AST 8777. Thesis Credits: Master's. (1-18 cr.; [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

AST 8888. Thesis Credit: Doctoral. (1-24 cr.; [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

AST 8990. Research in Astronomy and Astrophysics. (1-4 cr.; Student Option; Every Fall & Spring)
Research under supervision of a graduate faculty member. prereq: instr consent

Biochemistry (BIOC)

BIOC 5002. Critical Evaluation of Biochemistry Research. (1 cr.; S-N only; Every Fall & Spring)
Bio 5002 guides advanced undergraduates and new graduate students as they learn how to design experiments and to critically evaluate a wide variety of cutting-edge research projects, both as readers and as researchers. Introductory lectures include peer review, experimental design, critical thinking and the psychology of judgment and decision-making. This is followed by a series of guest speakers who will guide students as they develop their skills in evaluation of current research papers.

BIOC 5213. Selected Topics in Molecular Biology. (3 cr.; A-F only; Every Fall)
Cutting edge areas in molecular biology. Topics focus on the "3 Rs" of DNA: repair, replication, and recombination. Faculty who are experts in these areas teach modules on specific topics, including discussion of their research interests. prereq: 4332 or 8002 or [3021, BIOL 4003] or instr consent

BIOC 5216. Current Topics in Signal Transduction. (3 cr.; A-F only; Every Spring)
Principles of cell signaling. Important signaling pathways/experimental approaches to study signal transduction. Discussion of current issues/unanswered problems in field. prereq: Bio 4332 or Biol 4004 or instr consent

BIOC 5225. Graduate Laboratory in NMR Techniques. (1 cr.; S-N only; Every Spring)
Practical aspects of nuclear magnetic resonance (NMR) spectrometry. Hands-on experience with 500/600 MHz instruments. Sample preparation/handling, contamination sources, tube/probe options, experiment selection, experimental procedures, software, data processing. prereq: 8001 or instr consent

BIOC 5309. Biocatalysis and Biodegradation. (3 cr.; Student Option; Every Spring)
Fundamentals of microbial enzymes/metabolism as pertaining to biodegradation of environmental pollutants/biosynthesis for making commodity chemicals. Practical examples. Guest speakers from industry.

BIOC 5351. Protein Engineering. (3 cr.; A-F only; Every Fall)
Key properties of enzymes/molecular basis, computer modeling strategies, mutagenesis strategies to create protein variants, expression/screening of protein variants. Evaluate research papers, identify unsolved practical/theoretical problems, plan protein engineering experiment.

BIOC 5352. Biotechnology and Bioengineering for Biochemists. (3 cr.; A-F or Audit; Periodic Spring)
Protein biotechnology. Microorganisms used as hosts for protein expression, protein expression, and engineering methods. Production of enzymes of industrial interest. Applications of protein biotechnology in bioelectronics. Formulation of therapeutic

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
biopharmaceuticals. prereq: [[3021 or 4331 or BIOL 3021 or or MICB 4111]. [BIOL 3301 or MICB 3301]] or instr consent

**BIOC 5361. Microbial Genomics and Bioinformatics.** (3 cr.; Student Option; Every Fall & Spring)
Introduction to genomics. Emphasizes microbial genomics. Sequencing methods, sequence analysis, genomics databases, genome mapping, prokaryotic horizontal gene transfer, genomics in biotechnology, intellectual property issues. Hands-on introduction to UNIX shell scripting, genomic data analysis using R and Excel in a computer lab setting. prereq: College-level courses in [organic chemistry, biochemistry, microbiology]

**BIOC 5444. Muscle.** (3 cr.; Student Option; Every Spring)
Muscle molecular structure/function and disease. Muscle regulation, ion transport, and force generation. Muscular dystrophy and heart disease. prereq: 3021 or BIOL 3021 or 4331 or BIOL 3431 or PHSL 3061 or instr consent

**BIOC 5527. Introduction to Modern Structural Biology.** (4 cr.; Student Option; Every Fall)
Methods employed in modern structural biology to elucidate macromolecular structures. Primary focus on X-ray diffraction, nuclear magnetic resonance (NMR) spectroscopy and mass spectrometry. Principles underlying structural biology and structure/function relationships. prereq: [intro biochemistry, intro physics] or physical chemistry or instr consent

**BIOC 5528. Spectroscopy and Kinetics.** (4 cr.; Student Option; Every Spring)
Biochemical dynamics from perspectives of kinetics and spectroscopy. Influence of structure, molecular interactions, and chemical transformations on biochemical reactions. Focuses on computational, spectroscopic, and physical methods. Steady-state and transient kinetics. Optical and magnetic resonance spectroscopies. prereq: Intro physical chemistry or equiv; intro biochemistry recommended

**BIOC 5535. Introduction to Modern Structural Biology - Diffraction.** (2 cr.; A-F or Audit; Every Fall)
Theory and practice in the determination of three-dimensional structures of macromolecules using X-ray and neutron diffraction and electron microscopy. prereq: [introductory biochemistry, introductory physics, college calculus] or physical chemistry or instr consent

**BIOC 5536. Introduction to Modern Structural Biology - Nuclear Magnetic Resonance.** (2 cr.; Student Option; Every Fall)
Theory and practice in the determination of three-dimensional structures of macromolecules using NMR. prereq: [introductory biochemistry, introductory physics, college calculus] or physical chemistry or instr consent

**BIOC 5960. Special Topics in Biochemistry.** (3 cr.; A-F only; Every Spring)
In-depth study of topics in biochemistry. prereq: [[3021 or equiv], CHEM 2301] or instr consent

**BIOC 6011. Biochemistry for Dental Students.** (4 cr.; A-F or Audit; Every Fall)
Survey of chemical properties, biosynthesis, catabolism, structure/function of biomolecules. Fundamentals of molecular biology/metabolic regulation. prereq: Dental student

**BIOC 6021. Biochemistry.** (3 cr.; Student Option; Every Fall, Spring & Summer)

**BIOC 8001. Biochemistry: Structure, Catalysis, and Metabolism.** (3 cr.; Student Option; Every Fall)
Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering, design. Dynamic properties of proteins/enzymes, enzyme substrate complexes, mechanism of enzyme catalysis. Enzymology of metabolic regulation and cell signaling. prereq: BMXB or MCB or concurrent registration with required (or allowed) in G grad student or instr consent

**BIOC 8002. Molecular Biology and Regulation of Biological Processes.** (3 cr.; A-F only; Every Fall)
Classical to current topics in molecular biology. Aspects of DNA, RNA, and protein biology. DNA replication, repair, and recombination. RNA transcription, editing, and regulation. Protein translation/modification. Technologies such as deep-sequencing micro-RNA and prions. prereq: [BMXB or MCB] grad student or instr consent

**BIOC 8005. Biochemistry: Structure and Catalysis.** (2 cr.; A-F or Audit; Every Fall)
Protein structure, methods to determine structure, protein folding, forces stabilizing macromolecular structure, protein engineering, design. Dynamic properties of proteins/enzymes, enzyme substrate complexes, mechanism of enzyme catalysis.

**BIOC 8006. Biochemistry: Metabolism and Control.** (2 cr.; A-F or Audit; Every Fall)
Enzymology of metabolism, metabolic regulation, metabolic control and cell signaling.

**BIOC 8007. Molecular Biology of DNA.** (2 cr.; A-F or Audit; Every Fall)
Structure and organization of genes. Replication, transcription, epigenetic modification of chromatin. Genome editing. Deep sequencing. Cellular adhesion mechanisms. prereq: BMXB or MCB concurrent registration is required (or allowed) in G grad student or instr consent

**BIOC 8008. Molecular Biology of RNA.** (2 cr.; A-F or Audit; Every Fall)
Translation. RNA editing. Epigenetics and long non-coding RNA. MicroRNAs and RNA interference. Pre-mRNA processing.

**BIOC 8084. Research and Literature Reports.** (1 cr. [max 5 cr.]; S-N or Audit; Every Fall & Spring)
Current developments. prereq: Grad BMXB major or instr consent

**BIOC 8184. Graduate Seminar.** (1 cr. [max 5 cr.]; S-N or Audit; Every Fall & Spring)
Reports on recent developments in the field and on research projects in the department. prereq: grad BMXB major or DGS consent

**BIOC 8215. Signal Transduction and Gene Expression.** (3 cr.; Student Option; Every Fall & Spring)
Cell signaling, metabolic regulation in development. Procarotid/eucaryotic systems used as models for discussion. Literature-based course. prereq: 8002 or instr consent

**BIOC 8290. Current Research Techniques.** (1-3 cr. [max 9 cr.]; S-N or Audit; Every Fall & Spring)
Research project carried out in laboratory of a staff member. prereq: Grad BMXB major

**BIOC 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

**BIOC 8401. Ethics, Public Policy, and Careers in Molecular and Cellular Biology.** (1 cr. [max 2 cr.]; S-N or Audit; Every Fall & Spring)
Ethics of scientific investigation from viewpoint of western scientific enterprise. Relationship between science, culture, and public policies. Careers in molecular/cellular biology. Nontraditional career tracks. Invited speakers, case studies, small-group discussions, lectures. prereq: Grad student in [BMXB or MCB] concurrent registration is required (or allowed) in G

**BIOC 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

**BIOC 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**BIOC 8777. Thesis Credits: Master’s.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**BIOC 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

**Bioethics, Center for (BTHX)**
BTHX 5000. Topics in Bioethics. (1-4 cr. [max 8 cr.]; Student Option; Every Fall & Spring)
Bioethics topics of contemporary interest. Topics specified in Class Schedule.
BTHX 5010. Bioethics Proseminar. (2 cr.; A-F only; Every Fall)
Introduction to topics in bioethics. prereq: Bioethics grad student or grad minor

BTHX 5100. Introduction to Clinical Ethics. (3 cr.; Student Option; Every Fall & Spring)
Most frequent ethical problems faced by clinicians, patients/families, and ethics consultants. Forcging life sustaining treatment, decisional capacity, informed consent, treatment refusals, death/dying, pediatric ethics, reproductive issues, research ethics, psychiatric illness. Real cases.

BTHX 5110. Ethical Issues in Pediatrics. (2 cr.; Student Option; Every Spring)
Bioethics concerns the identification, analysis, and resolution of ethical problems that arise in planning for the care of patients in biomedical research, and in relation to the natural world. This course deals with ethical problems that occur frequently in pediatrics settings, in clinical and public health venues, in research and in the environment. The course emphasizes the ethical responsibilities of laypersons, health professionals, researchers and policy makers in planning for and resolving bioethics issues in pediatrics, including the prenatal and perinatal period. Issues addressed include reproductive issues, death and dying, forgoing life sustaining treatment, conflicts and war, research with children and pregnant women, genetics, public and global health, social justice and other topics.

BTHX 5120. Dying in Contemporary Medical Culture. (2 cr.; Student Option; Every Fall)
Examines practices of dying and death in contemporary U.S. culture, moral problems associated with these practices, possible solutions, and practical applications. Readings will consist of cultural critiques, bioethics literature, and empirical research.

BTHX 5210. Ethics of Human Subjects Research. (3 cr.; Student Option; Fall Even Year)
Issues in ethics of human subjects research. prereq: Grad student or instr consent

BTHX 5220. Standards for Research with Human Participants: A Lecture Series for Researchers. (1 cr.; Student Option; Fall Even Year)
This series of lectures presents various legal and regulatory standards that apply to research using human participants. Some are of general interest (e.g., Informed Consent); others will interest more specialized researchers (e.g., International Research).

BTHX 5300. Foundations of Bioethics. (3 cr.; Student Option; Every Spring)
Overview of major contemporary frameworks used to approach ethical issues in bioethics. prereq: Grad student or instr consent

BTHX 5325. Biomedical Ethics. (3 cr.; Student Option; Every Fall & Spring)
Major topics/issues in biomedical ethics. Patients' rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, allocation of medical resources, prereq: Jr or sr or grad student or instr consent

BTHX 5400. Intro Ethics in Hlth Policy. (3 cr.; Student Option; Spring Even Year)
Topics vary to reflect issues of current significance. Relates to law/policies as appropriate but focuses on moral analyses of policy issues. prereq: Grad student or professional student or instr consent

BTHX 5411. Health Law and Policy. (3 cr.; A-F or Audit; Spring Even Year)

BTHX 5453. Law, Biomedicine, and Bioethics. (1-4 cr.; A-F only; Spring Even Year)
Law/bioethics as means of controlling important biomedical developments. Relationship of law and bioethics. Role of law/bioethics in governing biomedical research, reproductive decisionmaking, assisted reproduction, genetic testing/screening, genetic manipulation, and cloning. Definition of death. Use of life-sustaining treatment. Organ transplantation. prereq: Grad student or instr consent

BTHX 5510. Gender and the Politics of Health. (3 cr.; Student Option; Periodic Fall & Spring)
Significance of gender to health and health care. Feminist analysis regarding moral/political importance of gender, possibly including contemporary western medicine? s understanding of the body, childbirth, and reproductive technologies; cosmetic surgery; chronic illness; disability; participation in research; gender and classification of disease. Care work, paid/non-paid. Readings from feminist theory, history, social science, bioethics, and moral philosophy.

BTHX 5520. Social Justice and Bioethics. (3 cr.; Student Option; Fall Even Year)
This course explores matters of social justice related to health. Readings from multiple disciplinary perspectives ground examination of how to understand social justice in this context. Class sessions will primarily focus on specific practical issues such as health disparities, the politics of inclusion and exclusion in clinical research, resource allocation in resource poor settings, and health professional roles during war. Discussions incorporate consideration of these issues institutional and broader social contexts. This course is appropriate for a wide audience including students from the health professions, philosophy, social science, and law.

BTHX 5530. Investigative Journalism and Bioethics. (3 cr.; Student Option; Periodic Fall & Spring)
This seminar will explore the links between bioethics and journalism, examining classic and contemporary works of investigative health journalism, works of literary non-fiction related to medicine and health, and investigative work by bioethicists. It will also examine the art of muckraking, non-profit investigative journalism, the public relations industry, the decline of print journalism and the rise of digital media, and how these developments are shaping the relationship between bioethicists and the press.

BTHX 5540. Bioethics, Psychiatry & Psychology. (3 cr.; A-F only; Periodic Fall & Spring)
Explore philosophical and ethical issues in psychiatry and psychology. Potential topics include the moral responsibility of psychophaths for their actions, false memories of Satanic ritual abuse, insanity pleas, the sociology of institutionalization, clinical trials of psychiatric drugs, cosmetic psychopharmacology, recent work in experimental philosophy, and classic experiments in social psychology.

BTHX 5560. Research & Publication Seminar. (1 cr.; A-F only; Every Fall)
Publication strategy/venues. Authorship issues/ ethics in publication. Manuscript formatting/ letters of submission. Peer review. prereq: [Junior or senior or grad student], bioethics grad majors must register A-F

BTHX 5620. Social Context of Health and Illness. (3 cr.; Student Option; Spring Even Year)
Social context in which contemporary meanings of health and illness are understood by providers/patients. Ethical implications. Readings from history, social science, literature, and first-person accounts. prereq: Grad student or instr consent

BTHX 5630. Bioethics Colloquium. (1 cr.; max 2 cr.; S-N only; Every Fall & Spring)
This course features presentations from a variety of departments and programs across campus that deal in some way with ethics as a theoretical and/or applied concept. Students will attend these presentations; engage with scholars thinking about ethics from multiple perspectives; and be able to bring these perspectives to bear upon their own research. The course is thus an opportunity to explore ethics as it might be conceptualized or practiced in the social sciences, law, public policy, global health, and many other arenas, and in turn to think about how these disparate frameworks and practices can be usefully put into conversation with bioethics, and with their own projects.

BTHX 5650. Disability Ethics. (3 cr.; A-F only; Spring Odd Year)
This course is an examination of ethical issues pertaining to disability, with an emphasis on discussion and consideration of widely contrasting perspectives. Issues discussed include physician-assisted suicide, euthanasia, selective abortion, cochlear implant technology, sterilization, special versus inclusive education, Universal Design/Universal Instructional Design, disability accommodations, and built and social environments, examined within
social, legal, policy, and cultural environments. Assignments include, readings, viewings, journaling, field projects, and research papers.

BTHX 5710. Ethical Issues in Global Health. (3 cr.; Student Option; Fall Even Year) This course examines ethical issues related to global health. Topics may include religion, morality, public policy, and the connection between health and human rights. Open to juniors, seniors, graduate and professional students.

BTHX 5800. Animal Ethics. (3 cr.; Student Option; Periodic Fall & Spring) Human relationships with animals are changing and this course offers a venue for exploring some of the ethical issues in these evolving relationships. The course will discuss the differences between animal ethics and animal welfare and examine the morality and ethics of human-animal interactions in various contexts. These include cultural and historical views of animals; animals as companions; the use of animals in scientific research, entertainment, and service work; euthanasia; animal production and sustainability; and conservation issues.

BTHX 5900. Independent Study in Bioethics. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Students propose area for study with faculty guidance, write proposal which includes outcome objectives and work plan. Faculty member directs student's work and evaluates project. prereq: instr consent

BTHX 8000. Advanced Topics in Bioethics. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Advanced study of bioethics topics of contemporary interest. prereq: Grad or professional student

BTHX 8100. Advanced Theory & Practice of Clinical Ethics. (2 cr.; Student Option; Every Spring) This graduate seminar examines the principles and practices of health care ethics consultation. Focuses on the Core Competencies for Health Care Ethics Consultation promulgated by the American Society for Bioethics and Humanities. Topics include the nature and goals of health care ethics consultation, methods and processes of health care ethics consultation, evolving standards of clinical practice, core skills and core knowledge for ethics consultation, consultation evaluation, accountability, and institutional relationships, and special obligations of ethics consultants and institutions. The course serves graduate students in bioethics, ethics committee members (including community/lay members) and ethics consultants, clinical staff and faculty, law students, student clinicians, and students of the social and behavioral sciences and other disciplines. prereq: BTHX 5100 or instr consent

BTHX 8110. Ethical Issues in Pediatrics. (2 cr.; Student Option; Every Spring) Bioethics concerns the identification, analysis, and resolution of ethical problems that arise in planning for the care of patients in biomedical research, and in relation to the natural world. This course deals with ethical problems that occur frequently in pediatrics settings, in clinical and public health venues, in research and in the environment. The course emphasizes the ethical responsibilities of laypersons, health professionals, researchers and policy makers in planning for and resolving bioethics issues in pediatrics, including the prenatal and perinatal period. Issues addressed include reproductive issues, death and dying, forgoing life-sustaining treatment, conflicts and war, research with children and pregnant women, genetics, public and global health, social justice and other topics.

BTHX 8114. Ethical and legal issues in Genetic Counseling. (3 cr.; A-F or Audit; Every Spring) Professional ethics. Ethical/legal concerns with new genetic technologies. prereq: [MCDG MS, genetic counseling specialization] or instr consent

BTHX 8120. Dying in Contemporary Medical Culture. (2 cr.; Student Option; Every Fall) Examines practicalities of dying and death in contemporary U.S. culture, moral problems associated with these practices, possible solutions, and practical applications. Readings will consist of cultural critiques, bioethics literature, and empirical research.

BTHX 8331. The Psychology of Morality. (3 cr.; A-F or Audit; Fall Even Year) Current research topics in socio-political moral judgment and moral development. prereq: Grad

BTHX 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) tbld prereq: Master's student, adviser consent, DGS consent

BTHX 8500. Practicum in Bioethics. (1-4 cr. [max 16 cr.]; Student Option No Audit; Every Fall & Spring) Supervised placement to apply knowledge/skills from core courses. Individualized plan is developed between student, bioethics adviser or DGS, and mentor at practicum site. prereq: Bioethics grad [major or minor] or instr consent

BTHX 8510. Gender and the Politics of Health. (3 cr.; Student Option; Spring Even Year) Significance of gender to health and health care. Feminist analysis regarding moral/political importance of gender, possibly including contemporary western medicine? s understanding of the body, childbirth, and reproductive technologies; cosmetic surgery; chronic illness; disability; participation in research; gender and classification of disease. Care work, paid/non-paid. Readings from feminist theory, history, social science, bioethics, and moral philosophy. prereq: instr consent

BTHX 8520. Social Justice and Bioethics. (3 cr.; Student Option; Fall Even Year) This course explores matters of social justice related to health. Readings from multiple disciplinary perspectives ground examination of how to understand social justice in this context. Class sessions will predominantly focus on specific practical issues such as health disparities, the politics of inclusion and exclusion in clinical research, resource allocation in resource poor settings, and health professional roles during war. Discussions incorporate consideration of these issues? institutional and broader social contexts. This course is appropriate for a wide audience including students from the health professions, philosophy, social science, and law.

BTHX 8540. Bioethics, Psychiatry & Psychology. (3 cr.; A-F only; Periodic Fall & Spring) Explore philosophical and ethical issues in psychiatry and psychology. Potential topics include the moral responsibility of psychopaths for their actions, false memories of Satanic ritual abuse, insanity pleas, the sociology of institutionalization, clinical trials of psychiatric drugs, cosmetic psychopharmacology, recent work in experimental philosophy, and classic experiments in social psychology.

BTHX 8610. Medical Consumerism. (3 cr.; Student Option; Spring Even Year) Roots/implications of "medical consumerism." How consumerist model shapes concepts of disease/disability. Larger historical developments that have led to current situation. How movement toward consumerism changes the profession of medicine. How tools of medical enhancement shape the way we think about our identities and live our lives. Texts from philosophy, history, literature, law, film, and social sciences.

BTHX 8650. Bioethics, Psychiatry & Psychology. (3 cr.; A-F only; Periodic Fall & Spring) Explore philosophical and ethical issues in psychiatry and psychology. Potential topics include the moral responsibility of psychopaths for their actions, false memories of Satanic ritual abuse, insanity pleas, the sociology of institutionalization, clinical trials of psychiatric drugs, cosmetic psychopharmacology, recent work in experimental philosophy, and classic experiments in social psychology.

BTHX 8710. Ethical Issues in Global health. (3 cr.; Student Option; Every Fall) This course examines ethical issues in global health which encompasses issues of religion, morality, public policy, disability rights, and health system structure. During this course, we draw from the literature on policies, traditions in the ethics of health, public health, health care and transnational cases.

BTHX 8755. Plan B Capstone. (1-7 cr. [max 14 cr.]; No Grade Associated; Every Fall, Spring & Summer) Research project. Topic arranged between student/instructor. Written report required. prereq: Advanced Plan B MA student.

BTHX 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbld

BTHX 8800. Animal Ethics. (3 cr.; Student Option; Periodic Fall & Spring)
Human relationships with animals are changing and this course offers a venue for exploring some of the ethical issues in these evolving relationships. The course will discuss the differences between animal ethics and animal welfare and examine the morality and ethics of human-animal interactions in various contexts. These include cultural and historical views of animals; animals as companions; the use of animals in scientific research, entertainment, and service work; euthanasia; animal production and sustainability; and conservation issues.

BTHX 8900. Advanced Independent Study in Bioethics. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Students propose area for individual study with faculty guidance. Students write proposal, which includes outcome objectives and work plan. Faculty member directs student's work and evaluates project. prereq: instr consent

Bioinformatics (BIN)

BINF 5490. Topics in Bioinformatics. (1-6 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Independent or group study in bioinformatics. prereq: instr consent

Biology (BIOL)


BIOL 5309. Molecular Ecology And Ecological Genomics. (3 cr.; Student Option; Fall Even Year) Application of molecular tools (PCR, sequencing, AFLP, SNPs, QTL) and analyses of molecular data for understanding ecological/evolutionary processes. Strengths/weaknesses of techniques/analyses. Questions molecular tools are used to answer. prereq: BIOL 3407 or BIOL 4003

BIOL 5407. Ecology. (3 cr.; Student Option; Every Fall & Spring) Principles of population growth/interactions and ecosystem function applied to ecological issues, including regulation of human populations, dynamics/impacts of disease, invasions by exotic organisms, habitat fragmentation, and biodiversity. Lab. prereq: [One semester college biology, [MATH 1142 or MATH 1271 or MATH 1281 or equiv], grad student] or instr consent

BIOL 5409. Evolution. (3 cr.; Student Option; Every Fall) Diversity of forms in fossil record and in presently existing biology. Genetic mechanisms of evolution. Examples of ongoing evolution in wild/domesticated populations and in disease-causing organisms. Lab. prereq: One semester of college biology, grad student

BIOL 5910. Special Topics in Biology for Teachers. (1-4 cr. [max 12 cr.]; Student Option; Every Spring & Summer) Courses developed for K-12 teachers depending on topics or subtopics which might include any of the following: plant biology, animal biology, genetics, cell biology, biochemistry, microbiology, prepr: BA or BS in science or science education or elementary education or K-12 licensed teacher

In-depth study of special topic in life sciences.

BIOL 6793. Directed Studies. (1-7 cr.; Student Option; Every Fall, Spring & Summer) Individual study on selected topics/problems. Emphasizes either readings/use of scientific literature or laboratory/field techniques. prereq: MBS, 7 or max, instr consent

BIOL 6794. Directed Research. (1-7 cr.; S-N or Audit; Every Fall, Spring & Summer) Laboratory or field investigation of selected areas of research. prereq: MBS, instr consent

BIOL 6999. Capstone Project. (2 cr.; S-N or Audit; Every Fall, Spring & Summer) Independent, original investigation of a relevant subject, challenge, or issue within biological sciences. Project takes approximately 120 hours. prereq: MBS, instr consent

BIOL 8100. Improvisation for Scientists. (1 cr.; S-N or Audit; Every Fall) This is a 7-week course designed to practice a wide array of strategies in order to gain awareness and control over your personal expression. Students will develop more effective ways to expand their ability to navigate the stress generally associated with delivering content in front of others. By learning how to manage their personal expression more effectively, students will be able to use specific tools in order to adapt their expression to various settings (large audiences, small groups, or one on one interviews/counseling). Adapting exercises from techniques such as improvisation and storytelling, class will provide a comfortable and safe environment for students who want to expand their confidence when presenting for others.

Biomedical Engineering (BMEN)

BMEN 5001. Advanced Biomaterials. (3 cr.; A-F or Audit; Every Fall) Commonly used biomaterials. Chemical/physical aspects. Practical examples from such areas as cardiovascular/orthopedic applications, drug delivery, and cell encapsulation. Methods used for chemical analysis and for physical characterization of biomaterials. Effect of additives, stabilizers, processing conditions, and sterilization methods. prereq: 3301 or MatS 3011 or grad student or instr consent

BMEN 5031. Engineering Extracellular Matrices. (3 cr.; A-F only; Every Fall) This class explores the complex set of fibrous and linking proteins of tissues, namely the extracellular matrix (ECM). The ECM is crucial not only for maintaining the structure of tissues but also for guiding and maintaining cellular functions and fate processes. The purpose of the course is to become acquainted with ECM proteins and to investigate how control or manipulation of ECM proteins impacts on cell and tissue function with an emphasis on impacts for regenerative medicine. In the course of this study, we will apply fundamentals of physics, chemistry, and mathematics to make predictions, solve problems and optimize outcomes related to ECM engineering. Required prerequisites: Upper Division Undergraduate or Graduate level student standing in CSE. Recommended prerequisites: BMEN 2501, 3011/3105, 3111/3115, 3311/3315, or equivalents (introductory cell/molecular biology, biomaterials, biotransport, biomechanics).

BMEN 5041. Tissue Engineering. (3 cr.; Student Option; Every Fall) Fundamentals of wound healing and tissue repair; characterization of cell-matrix interactions; case study of engineered tissues, including skin, bone marrow, liver, vessel, and cartilage; regulation of biomaterials and engineered tissues. prereq: CSE upper div or grad student or med student or instr consent

BMEN 5101. Advanced Bioelectricity and Instrumentation. (3 cr.; Student Option; Periodic Spring) Instrumentation, computer systems. and processing requirements for clinical physiological signals. Electrode characteristics, signal processing, and interpretation of physiological events by ECG, EEG, and EMG. Measurement of respiration and blood volume/flow. prereq: [CSE upper div, grad student] or instr consent

BMEN 5111. Biomedical Ultrasound. (3 cr.; Student Option; Every Spring) Introduction to biomedical ultrasound, including physics of ultrasound, transducer technology, medical ultrasound imaging, photoacoustic imaging, applications of non-linear acoustics, and high-intensity ultrasound. prereq: [PHYS 1302 or equiv], [MATH 2374 or equiv] or instr consent

BMEN 5151. Introduction to BioMEMS and Medical Microdevices. (2 cr.; A-F or Audit; Every Spring) Design/microfabrication of sensors, actuators, drug delivery systems, microfluidic devices, and DNA/protein microarrays. Packaging, biocompatibility, ISO 10993 standards. Applications in medicine, research, and homeland security. prereq: CSE sr or grad student or medical student

BMEN 5201. Advanced Biomechanics. (3 cr.; Student Option; Periodic Fall & Spring) Introduction to biomechanics of musculoskeletal system. Anatomy, tissue material properties. Kinematics, dynamics, and control of joint/limb movement. Analysis of forces/motions within joints. Application to injury, disease. Treatment of specific joints, design of orthopedic devices/implants. prereq:
BMEN 5311. Advanced Biomedical Transport Processes. (3 cr.; Student Option; Every Spring)

BMEN 5321. Microfluidics in Biology and Medicine. (3 cr.; A-F or Audit; Every Fall)
Fundamentals of microfluidics. Fluid mechanics/transport phenomena in microscale systems. Pressure/surface driven flows. Capillary forces, electrokinetics, hydraulic circuit analysis. Finite element modeling for microfluidic systems. Design/ fabrication methods for microfluidic devices. prereq: [3111, AEM 4201, ChEn 4005, ME 3331 or ME 3332 or CSE grad student or instr consent]

BMEN 5351. Cell Engineering. (; 3 cr.; Student Option; Periodic Fall & Spring)
Engineering approaches to cell-related phenomena important to cell/tissue engineering. Receptor/ligand binding. Trafficing/signaling processes. Applications to cell proliferation, adhesion, and motility. Cell-matrix interactions. prereq: [2401, 2501 or concurrent registration is required (or allowed) in 5501], [MATH 2243 or MATH 2373] or CSE upper div or grad student or instr consent

BMEN 5361. 3D Bioprinting. (2 cr.; A-F only; Every Fall)
3D Bioprinting has recently emerged as a new biofabrication technology that merges many engineering fields (eg. BME, MechE, ChemE) with other disciplines such as Materials Science, Stem Cell Biology, Physiology, Surgery and Pharmacology. This course serves as an introduction to the field and how its disciplines interface, while providing the student with knowledge of many of the most common bioprinting methods and applications being developed today through lectures by experts in the field (academia and industry) as well as hands-on lab exercises in the UMN 3D Bioprinting Facility.

BMEN 5401. Advanced Biomedical Imaging. (; 3 cr.; A-F or Audit; Every Fall)
Functional biomedical imaging modalities. Principles/applications of technologies that offer high spatial/temporal resolution. Bioelectromagnetic and magnetic resonance imaging. Other modalities. prereq: CSE upper div or grad student or instr consent

BMEN 5411. Neural Engineering. (; 3 cr.; Student Option; Every Fall)
Theoretical basis. Signal processing techniques. Modeling of nervous system, its response to stimulation. Electrode design, neural modeling, cochlear implants, deep brain stimulation. Prosthetic limbs, micractuality control, prosthetic vision. Brain machine interface, seizure prediction, optical imaging of nervous system, place cell recordings in hippocampus. prereq: 3401 recommended

BMEN 5412. Neuromodulation. (3 cr.; A-F or Audit; Every Fall)
Fundamentals of bioengineering approaches to modulate the nervous system, including bioelectricity, biomagnetism, and optogenetics. Computational modeling, design, and physiological mechanisms of neuromodulation technologies. Clinical exposure to managing neurological disorders with neuromodulation technology.

BMEN 5413. Neural Decoding and Interfacing. (; 3 cr.; A-F or Audit; Every Spring)
Neural interface technologies currently in use in patients as well as the physical, neural coding, and hardware features relating to their implementation in humans. Practical and ethical considerations for implanting these devices into humans. prereq: 5411, [3201 or 3401 or equiv recommended]

BMEN 5421. Introduction to Biomedical Optics. (; 3 cr.; A-F or Audit; Periodic Spring)
Biomedical optical imaging/sensing principles, laser-tissue interaction, detector design, noise analysis, interferometry, spectroscopy. Optical coherence tomography, polarization, birefringence, flow measurement, fluorescence, nonlinear microscopy. Tours of labs. prereq: CSE sr or grad student

BMEN 5501. Biology for Biomedical Engineers. (; 3 cr.; Student Option; Periodic Fall & Spring)
Concepts of cell/tissue structure/function. Basic principles of cell biology. Tissue engineering, artificial organs. prereq: Engineering upper div or grad student

BMEN 5501. Cardiovascular Devices. (1 cr.; A-F or Audit; Every Spring)
Design of cardiovascular devices with experts from local medtech companies. Discussion of clinical need, the generic design (emphasizing use of engineering principles), typical testing and validation methods, and major limitations of the available devices. Design, analysis, and testing of these and related devices. prereq: BMEN 3011, 3111, 3211, or equivalents with instr consent

BMEN 5701. Cancer Bioengineering. (3 cr.; A-F or Audit; Every Fall)
Cancer-specific cell, molecular/genetics events. Quantitative applications of bioinformatics/systems biology, optical imaging, cell/matrix mechanics. Drug transport (with some examination of design of novel therapeutics). prereq: [Upper division CSE undergraduate, CSE graduate student] or instr consent

BMEN 5901. Special Topics in Biomedical Engineering. (; 3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Special topics in biomedical engineering.

BMEN 5920. Special Topics in Biomedical Engineering. (; 3 cr. [max 6 cr.]; Student Option; Every Fall)
Special topics in biomedical engineering.

BMEN 8001. Polymeric Biomaterials. (; 3 cr.; A-F or Audit; Every Spring)
Introduction to polymeric biomaterial research. Molecular engineering, characterization of properties, material-cell interaction, biocompatibility/bioactivity. Applications in biology and medicine. prereq: [5001, [CHEN 4214 or MAT 4214 or equiv] or instr consent

BMEN 8041. Advanced Tissue Engineering Lab. (3 cr.; A-F or Audit; Every Spring)
Tissue engineering refers to the generation of biological substitutes to restore, maintain or improve tissue function. Toward this end, tools and knowledge from several disciplines might be applied including biological sciences (molecular, cellular and tissue anatomy and physiology), engineering (transport phenomena, material science, mechanical characterization) and biotechnology (cell culture, gene transfer, metabolomics). This course will cover some introductory and advanced lab techniques used in tissue engineering.

BMEN 8101. Biomedical Digital Signal Processing. (; 3 cr.; A-F or Audit; Every Fall)
Signal processing theory for analyzing real world digital signals. Digital signal processing and mathematical algorithms used as basis for analysis of stochastic signals. Spectral analyses, noise cancellation, optimal filtering, blind source separation, beamforming techniques. prereq: [(MATH 2243 or MATH 2373), [MATH 2263 or MATH 2374]) or equiv

BMEN 8151. Biomedical Electronics and Implantable Microsystems. (3 cr.; Student Option; Every Spring)
This class is about bioelectronics and the synergy between electronics and biomedical applications. It discusses how to architect robust ultra-low-power electronics with applications in implantable, noninvasive, wireless, sensing, and stimulating biomedical systems. Half of the classes span feedback systems, transistor device physics, noise, and circuit-analysis techniques to provide a circuit-foundation. The other half are research papers that describe the utilization of these circuits in implantable and wearable systems. Some of these systems include cochlear implants for the deaf, brain implants for the blind and paralyzed, cardiac devices for noninvasive medical monitoring, and biomolecular sensing systems. Prerequisites: BMEN 5101 or equivalent background in bioinstrumentation and electric circuits.

BMEN 8201. Advanced Tissue Mechanics. (3 cr.; A-F or Audit; Every Spring)
Tissues exist in dynamic mechanical environments where they must maintain a fine balance between applied loads and internal tension. Active adaptability of biological materials can significantly complicate measurement of their mechanical behavior. This course will cover fundamental continuum approaches for determining the complex stress states of actively responsive tissues as well as the force-feedback relationships that drive early development and allow mature tissues to maintain mechanical equilibrium. Topics will include theoretical approaches for active force generation, soft tissue finite growth, extracellular matrix remodeling, and constrained mixtures. These methods are applicable to a wide range of biomechanical
BMEN 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

BMEN 8334. Laboratory Neuroengineering. (1 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) Lab rotation in neuroengineering. prereq: Grad student in CSE or neuroscience

BMEN 8335. Neuroengineering Practicum. (3 cr. [max 6 cr.]; A-F only; Every Spring) Topics/issues in neuroengineering. Ethics, professional conduct, conflicts, plagiarism, copyright, authorship, research design considerations, intellectual properties, review process, professional presentations, proposal writing. prereq: PhD student in BMEN, EE, ME, or NSCI or instr consent

BMEN 8381. Bioheat and Mass Transfer. (3 cr.; Student Option; Periodic Spring) Analytical/numerical tools to analyze heat/ mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications. prereq: CSE grad student, upper div transport/fluids course; [physics, biology] recommended

BMEN 8401. New Product Design and Business Development. (4 cr.; A-F or Audit; Every Fall) Student teams work with CSE and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype. prereq: BME graduate student, some design experience; 8401, 8402 must be taken same yr

BMEN 8402. New Product Design and Business Development. (4 cr.; A-F or Audit; Every Spring) Student teams work with CSE and CSOM faculty and company representatives to develop a product concept for sponsoring company. Assignments include concept/detail design, manufacturing, marketing, introduction strategy, profit forecasting, production of product prototype. prereq: 8401

BMEN 8411. Neuroengineering Seminar. (2 cr. [max 4 cr.]; S-N only; Every Fall & Spring) Lectures presented by researchers in the field of neuroengineering. Students will discuss speaker papers in advance of the talks and meet with presenters afterwards. Each student will also deliver one seminar presentation per semester.

BMEN 8421. Biophotonics. (3 cr.; A-F or Audit; Every Spring) Understanding light microscopy and the interaction of light with biological materials is widely applicable to numerous research programs. In fact, it is a fundamental approach to addressing critical questions at the cellular and subcellular scales. This course will emphasize the fundamentals of light microscopy and microscopes, fundamentals of fluorescence and fluorescence microscopy (transitions, quantum yield, bleaching, lifetime etc.) and practical applications of fluorescence microscopy (confocal microscopy for optical sectioning, multiphoton microscopy, harmonic generation, FRET, FRAP, and fluorescence lifetime in the time and frequency domains). Course material will span theory, practical applications of microscopy and published literature. prereq: Graduate students in physical sciences (engineering, physics, chemistry etc.), or graduate students with an undergraduate degree in the physical sciences or mathematics, or consent of instructor. In addition to previous course work in engineering and/or physics, a working understanding of microscopy is recommended. Although not required, concurrent or previous enrollment in BMEN 5421 (Biomedical Optics) is recommended.


BMEN 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

BMEN 8501. Dynamical Systems in Biology. (3 cr.; A-F or Audit; Every Fall) Nonlinear dynamics with specific emphasis on behavior of excitable systems (neurons/ cardiac myocytes). prereq: Grad student in engineering or physics or math or physiology or neuroscience

BMEN 8502. Physiological Control Systems. (3 cr.; A-F only; Every Spring) Simulation, identification, and optimization of physiological control systems. Linear and non-linear systems analysis, stability analysis, system identification, and control design strategies, including constrained, adaptive, and intelligent control. Analysis and control of physiological system dynamics in normal and diseased states. prereq: 8101 or equiv

BMEN 8511. Systems and Synthetic Biology. (3 cr.; A-F or Audit; Every Fall) Systems/synthetic biology methods used to characterize/engineer biological systems at molecular/cellular scales. Integration of quantitative experimental approaches/mathematical modeling to elucidate biological design principles, create new molecular/cellular functions.

BMEN 8601. Biomedical Engineering Seminar. (1 cr.; S-N or Audit; Every Fall) Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8602. Biomedical Engineering Seminar. (1 cr.; S-N or Audit; Every Spring) Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8611. Professional Skills and Ethics for Biomedical Engineers. (2 cr.; Student Option; Every Fall) This course covers a number of practical aspects surrounding research, including: how to prepare a fellowship application (or more generally a proposal); how to write a manuscript; how to give a seminar; career advice for non-academic career paths; how to network with companies; research ethics; data management; research integrity. The format of the course will be a two hour meeting each week. The first hour will cover specific issues using historical literature references with the second hour devoted to a guest lecture presentation on topics relevant to the themes of the course. Students will be required to complete the online Responsible Conduct of Research (RCR) Core Curriculum for Engineering and Technology and pass the final assessment as part of this course.

BMEN 8630. Biomedical Engineering Graduate Student Seminar. (1 cr.; max 3 cr.; S-N or Audit; Periodic Fall) Student presentations of current thesis research or other areas of biomedical engineering. prereq: Grad BMEN major

BMEN 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st 2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

BMEN 8710. Directed Research. (1-4 cr.; Student Option; Every Fall, Spring & Summer) TBD

BMEN 8720. Internship in Biomedical Engineering. (1-3 cr.; max 6 cr.; S-N or Audit; Every Fall, Spring & Summer) Supervised lab or industrial experience unrelated to student’s normal academic or employment experience. prereq: Grad BMEN major

BMEN 8777. Thesis Credits: Master’s. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

BMEN 8820. Plan B Project. (2-3 cr.; Student Option; Every Fall, Spring & Summer) Project chosen by student and adviser to satisfy M.S. Plan B project requirement. Written report required. prereq: BMEN MS student
**Biomedical Science (BMSC)**

**BMSC 8990. Research: Biomedical Sciences.** (1-7 cr. [max 42 cr.]; S-N or Audit; Periodic Fall) Content determined by interest of student in consultation with staff. prereq: Enrollment in MD/PhD program

**Bioproducts and Biosystems Eng (BBE)**

**BBE 5001. Chemistry of Biomass and Biomass Conversion to Fuels and Products.** (4 cr. ; A-F or Audit; Every Fall) Chemistry of biomass. Sustainable utilization for biofuels/bioproducts. Bio-based materials, chemicals, energy. Environmental implications. Chemical principles/reactions underlying the structure, properties, processing, and performance of plant materials. prereq: Grad student or instr consent

**BBE 5023. Process Control and Instrumentation.** (3 cr.; Student Option; Every Fall) Fundamental principles in system dynamics/control. Emphasizes process systems and problems faced by process engineers. prereq: Grad student or instr consent

**BBE 5095. Special Problems.** (1-5 cr.; Student Option; Every Fall, Spring & Summer) Advanced individual-study project. Application of engineering principles to specific problem. prereq: instr consent


**BBE 5302. Biodegradation of Bioproducts.** (3 cr.; Student Option; Every Spring) Organisms and their importance to bio-based products: deterioration, control, bioprocesses for benefit. prereq: Grad student or instr consent

**BBE 5303. Introduction to Bio-based Materials Science.** (3 cr.; Student Option; Every Spring) Principles of materials science, their application to bio-based materials. Project required.

**BBE 5305. Pulp and Paper Technology.** (3 cr.; Student Option; Every Spring) Pulping processes, fiber refining/processing, paper manufacturing, fiber/paper properties, papermaking, paper requirements, effluent treatment. Chemical/mechanical pulping, pulp preparation, secondary fiber, de-inking, wet end additives. Lab problems/exercises supplemented by lectures. Online course.

**BBE 5333. Off-road Vehicle Design.** (4 cr.; A-F only; Every Spring) Mechanics involved in designing/testing off-road vehicles. Vehicle mechanics, traction, performance. Complexity/modeling of vehicle interaction with soil, muskeg, snow. Case study or literature review. Develop paper for publication. prereq: [BIOE 2001, 4303] or [AEM 2021, AEM 3031]. [3012 or concurrent registration is required (or allowed) in 3012 or CEGE 3502 or concurrent registration is required (or allowed) in CEGE 3502], upper div CSE or instr consent

**BBE 5401. Bioproducts Separation and Purification Processes.** (3 cr.; A-F or Audit; Every Fall) Unit operations of bioproducts engineering/manufacture. Project required. prereq: Grad student or instr consent

**BBE 5402. Bio-based Products Engineering Lab II.** (1 cr.; A-F or Audit; Every Fall) Laboratory exercises in bi-based products engineering. prereq: Grad student or instr consent

**BBE 5403. Bio-based Products Engineering Lab I.** (1 cr.; A-F or Audit; Every Spring) Laboratory exercises in bio-based products engineering. prereq: Grad student or instr consent

**BBE 5404. Biopolymers and Biocomposites Engineering.** (3 cr.; A-F or Audit; Every Fall) Structure/properties of biopolymers. Engineering of composites from biopolymers/plant-based materials. prereq: grad student or instr consent

**BBE 5480. Special Topics.** (1-4 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Topics specified in Class Schedule.

**BBE 5513. Watershed Engineering.** (3 cr.; A-F or Audit; Every Fall) Application of engineering principles to managing surface runoff from agricultural, range, and urban watersheds. Design of facilities and selection of land use practices for controlling surface runoff to mitigate problems of flooding and degradation of surface-water quality. prereq: 3023, upper div CSE

**BBE 5523. Ecological Engineering Design.** (3 cr.; A-F only; Every Spring) Application of ecological engineering to design of remediation systems. Artificial ecosystems, ecosystem/wetland restoration, constructed wetlands, biological engineering for slope stability, waste treatments. Restoring ecological service of watersheds. prereq: [CHEM 1022 or CHEM 1062, CHEM 1066], BBE 3012, grad student or instr consent

**BBE 5535. Assessment and Diagnosis of Impaired Waters.** (3 cr.; A-F only; Every Fall) Assessing impaired waters and developing TMDL for conventional pollutants. Preparing/communicating legal, social and policy aspects. TMDL analysis of real-world impaired waters problem. Field trip to impaired waters site. prereq: Grad student or instr consent

**BBE 5608. Environmental and Industrial Microbiology.** (3 cr.; A-F only; Every Fall) Use of microbes/enzymes to detoxify contaminants in field or in containment facilities. Contaminants, sources, fates. Biological organisms, pathways, catalysts utilized in bioremediation. Site inspection practices, bioremediation technologies, application in real-world situations. prereq: [BIOL 1001 or BIOL 1009], CHEM 1011

**BBE 5713. Biological Process Engineering.** (3 cr.; A-F only; Every Spring) Material/energy balances. Homogeneous reactions of bioprocess engineering and biological systems. Fermentation engineering, reactor design fundamentals. Filtration, centrifugation, separation, absorption, extraction, chromatography. Biorefining. Conversion of biomass into bioenergy, biochemicals, and biomaterials. prereq: [3033, 4013 or concurrent registration is required (or allowed) in 4013], or instr consent

**BBE 5723. Food Process Engineering.** (3 cr.; A-F or Audit; Every Spring) Food processing engineering. Applications of material balance, energy balance, fluid dynamics, and heat/mass transfer to refrigeration, freezing, psychrometrics, dehydration, evaporation, non-thermal processing, and separation. Development/control for food products. prereq: [4013 or concurrent registration is required (or allowed) in 4013], or instr consent

**BBE 5733. Renewable Energy Technologies.** (3 cr.; A-F or Audit; Every Spring) Energy security and its environmental, economic and societal impacts. Current and emerging technologies for production and use, characteristics of renewable energy, key methods for efficient production, current and probable future, and impact on sustainable development. prereq: Grad student or instr consent

**BBE 5743. Nanobiotechnology & Nanobiotechnology.** (3 cr.; Student Option; Every Spring) This course will educate on the interdisciplinary areas of biotechnology/nanobiotechnology and nanobiotechnology, including engineering principles and inherent technological applications. prereq: Instructor consent

**BBE 5753. Air Quality and Pollution Control Engineering.** (3 cr.; A-F or Audit; Every Spring) Air quality and pollution control engineering systems. Air pollutant sources, emissions
transformations, dispersion, fate and impacts. Introduction to air quality and pollution laws, regulations and permits. Control technologies including energy conservation, cyclones, electrostatic precipitators, fabric filters, absorbers, adsorbers, incinerators and biofilters. Course Prerequisites Graduate student or instructor consent Credit will not be granted if credit has been received for CEGE 5561

BBE 8001. Seminar I. (1 cr.; A-F only; Every Fall) Presentation/discussions on current research topics, research philosophy/principles, proposal writing, professional presentations.

BBE 8002. Seminar II. (1 cr. [max 2 cr.]; A-F only; Every Fall) Organization/critique of seminars on new developments in biosystems and agricultural engineering, prereq: 8001 or concurrent registration is required (or allowed) in 8001 or equiv

BBE 8003. Research Seminar II. (1 cr. [max 2 cr.]; S-N or Audit; Every Spring) Moderate and critique seminars in biosystems and agricultural engineering. prereq: 8002 or equiv

BBE 8005. Supervised Classroom or Extension Teaching Experience. (2 cr.; S-N or Audit; Every Fall & Spring) Teaching experience is offered in the following departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; Plant Pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy. prereq: instr consent

BBE 8013. Parameter Estimation in Biosystems and Agricultural Engineering. (3 cr.; A-F or Audit; Periodic Fall & Spring) Procedures for estimating parameter values and parameter uncertainty from experimental data. Values and interpretation of linear and nonlinear models using ordinary and weighted least-square methods. Design of experiments. Application to biosystems and agricultural engineering problems. prereq: Stat 3021 or equiv, computer programming course

BBE 8094. Advanced Problems and Research. (2-6 cr.; Student Option; Periodic Fall & Spring) TBD prereq: 5095

BBE 8300. Research Problems. (1-10 cr.; Student Option; Every Fall & Spring) Independent research under faculty guidance. prereq: instr consent

BBE 8303. Machinery Modeling. (3 cr.; Student Option; Periodic Fall & Spring) Machinery systems modeling using multibody dynamics simulation software (MBS). Review models presented in literature. Report on limitations of modeling approaches used. Models developed in students’ areas of interest. prereq: [3012 or CEGE 3502], AEM 2021

BBE 8304. Advanced Topics in Wood Drying. (2 cr.; Student Option; Every Fall) Rheological behavior of first-dried solid wood. Significance of creep to stress-strain pattern, shrinkage, and degrade development in lumber drying. Interpretation/evaluation of schedules, processes, and primary/auxiliary equipment used in commercial drying processes. Energy consideration in drying processes. prereq: 4304

BBE 8307. Advances and Methods in Forest Products Pathology and Preservation. (2 cr.; Student Option; Every Spring) Principles of wood protection, methods of evaluating preservatives. Emphasizes international developments. prereq: 4303

BBE 8311. Mechanics of Wood and Wood Composites. (2 cr.; Student Option; Every Spring) Advanced topics on behavior of wood composites. prereq: instr consent

BBE 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

BBE 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

BBE 8513. Hydrologic Modeling of Small Watersheds. (3 cr.; Student Option; Spring Even Year) Study/representation of hydrologic processes by mathematical models. Stochastic meteorological variables, infiltration, overland flow, return flow, evapotranspiration, channel flows. Approaches for model calibration/evaluation. prereq: [3012 or CEGE 3502], hydrology course

BBE 8523. Coupled Heat, Moisture, and Chemical Transport in Porous Media. (3 cr.; A-F or Audit; Periodic Fall) Mathematical study of coupled heat, moisture, and chemical transport in porous media. Derivation of governing equations for coupled heat, moisture, and chemical transport. Derivation of numerical solution techniques to solve coupled equations. Comparison of numerical solutions to analytical solutions. prereq: [CSci 5301 or equiv], [Math 5512, Math 5513] or equiv, [Soil 5232 or equiv], computer programming

BBE 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.) (No description) prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 10 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

BA 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

BA 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.) (No description) prereq: Doctoral student, adviser and DGS consent

BLAW 6158. The study of laws affecting private business and publicly-traded companies.. (2 cr. [max 4 cr.]; A-F only; Every Spring) This course highlights topics that are important to any business manager, with particular emphasis on areas of interest for those aspiring to high level executive/management positions with publicly-traded companies. General topics include: contracts, real estate law, the law of agency, employment law, certain discrimination laws (including Minnesota’s fairly recent protections for women in the workplace), and forms of business entity. Public company subjects include: pros and cons of going public, the IPO process, federal securities laws and SEC regulations regarding public company reporting requirements, insider trading, the Sarbanes-Oxley Act of 2002 and its impact on corporate governance, trends in shareholder democracy rights and shareholder activism, and the role of boards and audit committees. Throughout the course, we will examine the impact of the Supreme Court on American business. prereq: MBA student

CMBA 5554. International Residency. (1.5 cr.; A-F only; Every Spring)
CMBA 5625. Entrepreneurship and Innovation. (3 cr.; A-F only; Every Spring) Entrepreneurial role of employee/management in increasing organizational value through creation/formation of new businesses, products, or markets within entities ranging from early stage companies to social ventures to F500 corporations.

CMBA 5710. Leadership. (1.5 cr.; A-F only; Every Fall) Self-awareness/insight concerning personal leadership/core values. Increase capabilities to understand potential personal derailment patterns/create effective strategies to address challenges. Develop lifelong executive leadership practices/habits for high performance in demanding circumstances.

CMBA 5711. Negotiation. (3 cr.; A-F only; Every Fall) Securing agreements between two or more parties who are interdependent and are seeking to maximize their own outcomes. Negotiation in various settings. Simulations, role-playing, cases.

CMBA 5712. Information Technology. (1.5 cr.; A-F only; Every Fall) Course prepares you with an inside-out and an outside-in perspective of how information technology is disrupting a variety of industries, how to compete in such an environment and how to strategically manage the IT function within companies to have an efficiency-innovation duality. Key principles covered in the class are developing a state-of-the-art IT strategy, getting first-hand exposure to ERP systems and learning the organizational changes involved in implementing such systems, applying disruptive and big-bang theories of IT enables disruption and learning the nuances of platform competition and multi-sided markets to fight such disruption.

CMBA 5713. Managerial Accounting. (3 cr.; A-F only; Every Fall) How to analyze accounting for management decisions. Planning/control. Transfer pricing, performance measurements, cost behavior, cost allocation, activity-based costing, standard costs.

CMBA 5714. Advanced Marketing. (3 cr.; A-F only; Every Fall) Product markets in which organization should compete. Sustainable competitive advantage. Matching marketing strategy with environment. Coordinating marketing/business functions. Organizing/managing marketing process. Cases.

CMBA 5715. Advanced Financial Management. (3 cr.; A-F only; Every Fall) Executive-level corporate financial policy. Rigorous case-oriented approach. Students apply principles of finance on their own initiative.

CMBA 5721. Advanced Management Topics. (1.5 cr. [max 3 cr.]; A-F only; Every Spring) Topics reflects strengths, talents, and interests of class. Topics integrate different aspects of curriculum while not being limited by specific area/paradigm.


CMBA 5723. Ethics. (1.5 cr.; A-F only; Every Fall & Spring) Role of ethics in corporate strategy. Stakeholder management, individual/collective responsibility, international business ethics. Business's responsibility to the environment. Truthful/tasteful advertising. Obligations to local community. Managing diverse workforce.

CMBA 5724. International Residency. (1.5 cr.; A-F only; Every Spring) Students travel to international location for 11 days. Discussions with international colleagues. Applying program concepts. Sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, trip assignment.

CMBA 5810. Introduction to Statistics and Business Analytics. (3 cr.; A-F only; Every Fall) This course focuses on the use of data to solve business problems and the development of skills necessary to (1) formulate a management problem as a statistical problem; (2) collect appropriate data and perform fundamental procedures of statistical analysis; and (3) to interpret, critically evaluate, and implement the results of the statistical analysis. In particular, the student should be able to: generate and use basic graphical and numerical descriptive methods; apply basic estimation and testing procedures; estimate and interpret the parameters of simple and multiple regression model; to test the utility of the model and to use it for estimation and prediction; think statistically about issues facing her/his organization; recognize when statistical methods are effective, and when they are not; and to translate, communicate, and critically evaluate the results of statistical analyses.

CMBA 5811. Financial Accounting. (3 cr.; A-F only; Every Fall) Students learn about the accounting system used by firms to measure and report their economic performance and financial position to external parties. Students analyze corporate financial reports to discover the impact of significant economic events. Discussions and cases focus on the role of financial reporting standards in informing financial intermediaries and contributing to the efficient allocation of capital in a modern economy.

CMBA 5812. Organizational Behavior. (3 cr.; A-F only; Every Fall) Course's main purpose is to prepare you to successfully engage and lead people to achieve organizational goals. Effective managers must not only develop winning strategies, but they must also implement them. Doing so requires a thorough understanding of organizational behavior. Broadly speaking, organizational behavior is the systematic study of how people behave in organizational settings. This course is designed to develop your understanding of the complexity of organizations and how they affect behavior, build your self-knowledge and people-leadership skills, and help you learn and apply appropriate tactics and tools to improve organizational functioning and facilitate personal career success. Course topics include organizational (e.g. structure and culture), interpersonal (e.g. power and influence, social networks, conflict), and individual (e.g. decision making, motivation) aspects of organizational behavior.

CMBA 5813. Competing In The Digital Age. (1.5 cr.; A-F only; Every Fall) Course prepares you with an inside-out and an outside-in perspective of how information technology is disrupting a variety of industries, how to compete in such an environment and how to strategically manage the IT function within companies to have an efficiency-innovation duality. Key principles covered in the class are developing a state-of-the-art IT strategy, getting first-hand exposure to ERP systems and learning the organizational changes involved in implementing such systems, applying disruptive and big-bang theories of IT enables disruption and learning the nuances of platform competition and multi-sided markets to fight such disruption.

CMBA 5814. Economics. (1.5 cr. [max 3 cr.]; A-F only; Every Fall) The goal is to improve corporate decision-making by developing better understanding of the economic environment. Emphasis is strategic, not theoretical (this is not a standard macro course.) We shall consider two primary kinds of economic phenomena (and models): i) long-run economic growth; ii) business cycles. Also and importantly, we will learn about what a central bank does and spend some time on the current world financial/macroeconomic mess. How could we do otherwise? Students will learn appropriate tools to analyze these phenomena and apply them to their own decision-making environments, both organizational and personal.

CMBA 5815. Marketing Management. (3 cr.; A-F only; Every Spring) This is a study of management of the marketing function. We strive for an understanding of foundational marketing concepts and of the skills needed for strategy development. We also consider the importance of integrating financial data, operational factors, and human resource issues along with marketing research pertaining to product offering decisions, distribution channels, pricing and communication.

CMBA 5816. Strategic Management. (3 cr.; A-F only; Every Spring) Course provides an integrated, top management viewpoint for business students. It frames the functional courses in the CE MBA Fall, 2018
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

CMBA 5817. Financial Management. (3 cr.; A-F only; Every Spring)
Students apply concepts of risk, return, and valuation to decisions that a corporate financial officer or person in small business must make about sources/uses of funds during changing financial markets.

CMBA 5818. Supply Chain and Operations. (3 cr.; A-F only; Every Spring)
A majority of the people and physical assets of a company are involved in operations. The operations function represents the physical core of every company: The systems and processes that generate the goods and services to be sold to customers. World-class operations can lead to a significant and enduring competitive advantage. Failing operations mean low productivity and bad press at best, and company failure at worst. Understanding operations means understanding processes and supply chains. This course is designed to develop a basic framework to comprehend key design decisions and trade-offs within that context. As such, the course encompasses both manufacturing and service operations. Course also highlights why successful supply chain and operations management has to be strategic in nature, and how the operations function relates to other business functions such as marketing or product development.

CMBA 5820. Negotiation Strategies: Creative Solutions for Difficult Problems. (3 cr.; A-F only; Every Fall)
Negotiation is the art and science of securing agreements between two or more parties who are interdependent and who are seeking to maximize their own outcomes. As such, this course deals with understanding the behavior of individuals, groups, and organizations in the context of competitive situations. We focus on understanding both the theory and process of negotiation in a variety of settings. This course is designed to be relevant to the broad spectrum of negotiation problems that are faced by managers and professionals. It is designed to complement the technical and diagnostic skills learned in other courses in the program. A basic premise of the course is that while a manager needs analytical skills to discover optimal solutions to problems, a broad array of negotiation skills are needed to get these solutions accepted and implemented. This course will allow participants the opportunity to develop these skills experientially and to understand negotiation in useful analytic frameworks. As such, considerable emphasis will be placed on simulations, role-playing, and cases.

CMBA 5821. Managerial Accounting. (3 cr.; A-F only; Every Fall)
This course presents the topic of management accounting in depth. The purpose of management accounting is to provide information to management for costing products and decision making as well as for planning, controlling, and evaluating business activities. The student who successfully completes this class will be able to identify a managerial issue and create a solution to the problem.

CMBA 5822. Applied Leadership. (1.5 cr.; A-F only; Every Fall)
The course objectives are to build stronger self-awareness and insight concerning personal leadership and core values, increase capabilities to understand potential personal derailment patterns and create effective strategies to address these challenges, better nurture and leverage strengths for executive leadership performance, effectively coach and motivate others as a key executive leadership attribute, and develop deeper lifelong executive leadership practices and habits for high performance in demanding circumstances. prereq: CMBA student

CMBA 5823. Competing Globally. (3 cr.; A-F only; Every Fall)
In this course we explore the many faces of global competition. We challenge the assumptions that global strategy is a precursor to success by exploring a set of complex forces that drive firms to internationalize. The course places special emphasis on emerging markets, given that they are home to most of the global growth and population, as well as institutional voids. We focus on factors that determine strategic choices firms make as they build their international presence, by exploring how firms: build international presence by selecting countries, and modes of entry; benefit from national competitive advantage in developed and emerging markets; diagnose and address cultural challenges of working across borders, organize to share knowledge across borders; build and sustain their multifaceted global legitimacy; collaborate across borders; prepare their managers to address cultural, personal, and career challenges in expatriate roles and on global teams.

CMBA 5824. Corporate Responsibility & Ethics. (1.5 cr.; A-F only; Every Fall)
In this course we will explore both ethical challenges in the contemporary business environment as well as the strategic opportunities offered by corporate social responsibility. Students will conduct stakeholder analysis, apply ethical principles, consider alternatives, and recommend and defend an "ethical" final decision. We will seek to answer the question "can business do good, and also do well?"

CMBA 5825. Strategic Marketing. (3 cr.; A-F only; Every Spring)
Marketing begins and ends with the buyer. Hence, marketing strategy is the study of delivering value to buyers in a manner that exceeds the value proposition of marketplace rivals, using both internal and external resources. From determining consumer needs to assuring customer satisfaction, a clear understanding of buyer behavior is critical to the successful formulation and implementation of marketing strategy. To that end, this course is designed to provide prospective general managers the intellectual tools necessary to design actionable marketing strategies. There will be a strong emphasis on managerial action and multiple theoretical perspectives will be discussed.

CMBA 5826. Corporate Strategy. (1.5 cr.; A-F only; Every Spring)
This course focuses on the strategic management of firm scope (i.e., choosing what your firm does and does not do). It provides understanding about strategic choices such as outsourcing or ?insourcing? activates and entering or leaving lines of business. We develop and employ a set of tools that provide a disciplined way to investigate these issues. Why companies exist, notion of added value, how companies add value through resources and incentives to develop resources, why a company would participate in more than one line of business, and what considerations should guide corporate renewal.

CMBA 5827. Advanced Financial Management. (3 cr.; A-F only; Every Spring)
Financial Management introduced the theory of corporate finance and the application of value creation principles to, mainly, business operating decisions at the level of the project or initiative. This course moves on to consider decisions at the firm level. Among the questions addressed in this course are how best to measure overall firm performance, how to best finance the company, including debt versus equity questions, when to include options in the firm?s financing arrangements, when to lease resources rather than buy them, when to pay a dividend and/or repurchase shares and whether mergers and acquisitions generate value added.

CMBA 5828. International Residency - Study Abroad. (1.5 cr.; A-F only; Every Spring)
Students travel to an international location for 9-10 days. This provides the opportunity to engage in discussions with international colleagues, apply program concepts, and develop a broader sensitivity to cultural and social differences. Pre-trip preparation, assignments, on-site discussions and activities, and post-trip assignments are required.

CMBA 5829. International Residency? Global Virtual Team Project. (1.5 cr.; A-F only; Every Spring)
The Virtual Team Project (VTP) provides Carlson School Executive MBA students with the unique opportunity to work in a collaborative team environment across cultures, industries, and markets alongside students from our Vienna Executive MBA program and our China Executive MBA program. As participants in the VTP, students
develop advanced skills in teamwork, cross-cultural collaboration, and business plan development within a dynamic environment shaped by academic rigor and the demands of real-world international business.

CMBA 5530. Advanced Management Topic Elective: Power & Influence. (1.5 cr.; A-F only; Every Spring) Elective courses are offered across cohorts on preference basis. Course topics may change from year to year and can cover a variety of areas including entrepreneurship/innovation, strategy, IT, and others.

CMBA 5531. Advanced Management Topic Elective. (1.5 cr.; A-F only; Every Spring) Elective courses are offered across cohorts on preference basis. Course topics may change from year to year and can cover a variety of areas from entrepreneurship/innovation, strategy, IT, and others.

CMBA 5532. Advanced Management Topic Elective. (1.5 cr.; A-F only; Every Spring) Elective courses are offered across cohorts on preference basis. Course topics may change from year to year and can cover a variety of areas from entrepreneurship/innovation, strategy, IT, and others.

CMBA 5533. Advanced Management Topics Elective. (1.5 cr.; A-F only; Every Spring) Elective courses are offered across cohorts on preference basis. Course topics may change from year to year and can cover a variety of areas from entrepreneurship/innovation, strategy, IT, and others.

Carlson School of Management (CSOM)

CSOM 8101. Methods and Topics in Applied Economics. (2-4 cr.; Student Option; Every Spring) Intermediate methods/topics in business research.

Center for Allied Health Prog (CAHP)

CAHP 5110. Foundations of Interprofessional Communication and Collaboration. (1 cr.; S-N only; Every Fall) Interprofessional approach to health care. Directed group activities in five two-hour sessions: personal/professional image, teamwork, self/peer assessment; health professions; professional identity/integrity; relationships between professions and those they serve. Includes online modules. prereq: Enrolled CLSP or OT student

Chemical Engineering (CHEN)

CHEN 5531. Electrochemical Engineering and Renewable Energy. (3 cr.; A-F only; Every Fall) Fundamentals of electrochemical engineering. Electrochemical mass transfer electrokinetics, thermodynamics of electrochemical cells, modern sensors. Formation of thin films and microstructured materials. Computer-based problems. prereq: [MATS 3011 or instr consent], [upper div CSE or grad student]

CHEN 5751. Biochemical Engineering. (3 cr.; A-F or Audit; Every Spring) Chemical engineering principles applied to analysis/design of complex cellular/enzyme processes. Quantitative framework for design of cells for production of proteins, synthesis of antibodies with mammalian cells, or degradation of toxic compounds in contaminated soil. prereq: [3005 or 4005], [concurrent registration is required (or allowed) in 3006 or concurrent registration is required (or allowed) in 4006], [concurrent registration is required (or allowed) in 3102 or concurrent registration is required (or allowed) in 4102]


Whole organ, body heat transfer issues. Blood flow, oxygenation. Heat/mass transfer in respiratory systems. Biotransport issues in artificial organs, membrane oxygenators, drug delivery applications. prereq: 3005 or 4005 or equiv

CHEN 5771. Colloids and Dispersions. (3 cr.; A-F or Audit; Every Fall) Preparation, stability, coagulation kinetics or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures. prereq: Physical chemistry

CHEN 8101. Fluid Mechanics I: Change, Deformation, Equations of Flow. (3 cr.; A-F or Audit; Every Fall) Equations of change of mass, momentum, angular momentum. Kinematics of deformation, convective transport. Applications to fluid statics/dynamics of Newtonian fluids. Examples of exact solutions of Navier-Stokes equations, useful simplifications. prereq: Chemical engineering grad student or instr consent

CHEN 8102. Principles and Applications of Rheology. (2 cr.; A-F or Audit; Periodic Spring) Deformation and flow of non-Newtonian and viscoelastic fluids, plastic materials, and perfectly elastic solids. Phenomenological and molecular interpretation of rheology of elastomers, polymer melts and polymer solutions, application of rheology to polymer processing. prereq: 8101


CHEN 8112. Rheology Laboratory Project. (1 cr.; A-F or Audit; Every Spring) How to make rheological lab measurements. Students select/characterize rheologically interesting material with help of instructor. Oral/written report. Half-semester course. prereq: 8101, [4702 or concurrent registration is required (or allowed) in 4702 or 8102 or concurrent registration is required (or allowed) in 8102]

CHEN 8115. Electron Microscopy of Soft Matter. (2 cr.; A-F or Audit; Periodic Fall) Operation principles of transmission electron microscope (TEM) and scanning electron microscope (SEM). How these instruments are applied in study of soft materials (e.g., liquid, semi-liquid material systems). Unique specimen preparation techniques, low image contrast, electron-beam radiation-damage, and limited signal-to-noise ratio. TEM/SEM digital imaging, prereq: Chemical engineering or materials science/engineering grad major or instr consent

CHEN 8201. Applied Math. (3 cr.; A-F or Audit; Every Fall) Integrated approach to solving linear mathematical problems. Linear algebraic equations. Linear ordinary and partial differential equations using theoretically numerical analysis based on linear operator theory. prereq: Chemical engineering grad student or instr consent


CHEN 8221. Synthetic Polymer Chemistry. (4 cr.; A-F or Audit; Every Fall) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations.
Chain conformation, solution thermodynamics, molecular weight characterization, physical properties. prereq: [Undergraduate organic chemistry course, undergraduate physical chemistry course] or instr consent


CHEN 8302. Physical Rate Processes II: Mass Transfer. (3 cr.; A-F or Audit; Periodic Fall) Applications of mass transfer. Membranes, including gas separation and reverse osmosis. Controlled drug release. Dispersion, including examples of pollution modeling. Adsorption/chromatography. Coupled heat/mass transfer, including cooling towers. Double-diffusive effects. prereq: Chemical engineering grad student or instr consent

CHEN 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

CHEN 8401. Physical and Chemical Thermodynamics. (3 cr.; A-F or Audit; Every Fall) Principles of thermodynamics with emphasis on solving problems encountered in chemical engineering and materials science. An organized exposition of fundamental concepts that will help students understand and analyze the systems they are likely to encounter while conducting original research. This course is for students who seek a much deeper understanding than a typical undergraduate course provides. prereq: Undergraduate engineering course or chemistry course in thermodynamics. Chemical Engineering graduate student, or instructor consent.

CHEN 8402. Statistical Thermodynamics and Kinetics. (3 cr.; A-F or Audit; Every Spring) Introduction to statistical mechanical description of equilibrium and non-equilibrium properties of matter. Emphasizes fluids, classical statistical mechanics. prereq: Chemical engineering grad student or instr consent

CHEN 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent


CHEN 8502. Process Control. (3 cr.; A-F or Audit; Periodic Fall) For linear systems: stability, controllability, observability, pole-placement via state feedback state observers, output feedback, and robustness of control systems. For nonlinear systems: solution properties, stability analysis, singular perturbations, feedback linearization via state feedback, and direct synthesis via output feedback. prereq: Chemical Engineering grad major or instr consent

CHEN 8503. Chemical Rate Processes: Homogeneous Reactions. (3 cr.; A-F or Audit; Periodic Fall) Description/characterization of chemically reacting systems. Theories of elementary reactions. Experimental methods for investigating elementary reactions. Applications of chemical kinetics to complex reactions, such as combustion, flames, and the atmosphere. prereq: Chemical engineering grad student or instr consent

CHEN 8555. Chemical Engineering Teaching Practicum. (1-6 cr.; max 12 cr.) (No Grade Associated; Every Fall, Spring & Summer) Experience in instruction including grading of student work, holding of office hours, and in special cases, lecturing. Students will work with and receive feedback from a faculty member in CEMS. prereq: Grad ChEn major and DGS permission

CHEN 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.) (No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr


CHEN 8754. Systems Analysis of Biological Processes. (3 cr.; Student Option; Every Spring) Relating biological processes at molecular level to physiological level of cells/organisms/populations. Methodology for analyzing data. Quantification of molecular interplays. prereq: Grad student in [life sciences or chemical/physical sciences or engineering]; ChEn students must take A/F

CHEN 8771. Interfaces and Colloids. (3 cr.; A-F or Audit; Every Fall) Interfacial tension/thermodynamics, capillarity, contact angle, wettability, adhesion, preparation/stability of colloids. DLVO theory, electrokinetic phenomena, micelles, rheology of dispersions. prereq: Physical Chemistry

CHEN 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.) (No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CHEN 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.) (No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

CHEN 8900. Seminar. (1 cr.; S-N or Audit; Every Fall) Presentation and discussion of papers concerning newer developments in chemical engineering, materials science, and related fields.

CHEN 8901. Seminar. (1 cr.; max 9 cr.) (S-N only; Every Spring) Presentation and discussion of papers concerning the newer developments in chemical engineering.

CHEN 8902. Seminar: Finite Element Methods of Computer-aided Analysis. (1 cr.; A-F or Audit; Every Spring) Fundamentals of finite element method as applied mathematics. How to construct finite element codes and put them into operation. prereq: Chemical engineering grad student or instr consent

CHEN 8993. Directed Study. (1-12 cr.; Student Option; Every Fall, Spring & Summer)

CHEN 8994. Directed Research. (1-12 cr.; Student Option; Every Fall, Spring & Summer)

CHEN 8995. Special Topics. (1-4 cr.; Student Option; Every Fall, Spring & Summer) New or experimental courses offered by department or visiting faculty

Chemical Physics (CHPH)

CHPH 8081. M.S. Plan B Project I. (4 cr.; A-F only; Every Fall, Spring & Summer) Topic arranged by student adviser. Written report required. prereq: Grad chem phys major

CHPH 8082. M.S. Plan B Project II. (4 cr.; A-F only; Every Fall, Spring & Summer) Topic arranged by student adviser. Written report required. prereq: Grad chem phys major

CHPH 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

CHPH 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent
CHEM 8601. Seminar: Modern Problems in Chemical Physics. (4 cr.; Student Option; Every Spring)
Modern physical methods, techniques, and ideas used in chemical physics. Some of these are: Fundamentals of quantum mechanics, quantum electrodynamics, statistical mechanics, solid-state theory, molecular theory of liquids, and computational methods. prereq: Grad chem physics major or instr consent

CHEM 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; dept consent for 3rd/4th registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

CHEM 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CHEM 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

Chemistry (CHEM)

CHEM 5210. Materials Characterization. (4 cr.; Student Option; Every Spring)
Modern tools/techniques for both bulk- and thin-film characterization. Topics may include ion-solid interactions, Rutherford backscattering, secondary ion mass spectrometry, solid-state NMR, x-ray photoelectron spectroscopy, small-angle x-ray/neutron scattering, transmission/scanning electron/probe microscopy, near-field scanning optical microscopy, porosimetry, adsorption techniques, and ellipsometry. prereq: grad student or instr consent

CHEM 5245. Introduction to Drug Design. (3 cr.; A-F or Audit; Periodic Fall)
Concepts that govern design/discovery of drugs. Physical, biologic, medicinal chemical principles applied to explain rational design and mechanism of action drugs. prereq: 2302 or equiv

CHEM 5755. X-Ray Crystallography. (4 cr.; A-F or Audit; Every Spring)
Essentials of crystallography as applied to modern, single crystal X-ray diffraction methods. Practical training in use of instrumentation in X-ray crystallography faculty in Department of Chemistry. Date collection, correction/refinement, structure solutions, generation of publication materials, use of Cambridge Crystallographic Structure Database. prereq: Chem grad student or instr consent

CHEM 8011. Mechanisms of Chemical Reactions. (4 cr.; Student Option; Every Fall)
Reaction mechanisms and methods of study. Mechanistic concepts in chemistry. Gas phase reactions to mechanisms, "electron pushing" mechanisms in organic reactions, mechanism of enzymatic reactions. Kinetic schemes and other strategies to investigate mechanisms. prereq: 2302 or equiv

CHEM 8021. Computational Chemistry. (4 cr.; Student Option; Every Spring)

CHEM 8066. Professional Conduct of Chemical Research. (1 cr.; S-N or Audit; Periodic Fall)
Builds sensitivity to ethical issues in chemical research. Readings/case studies, small-group/large-group discussion, summarizing comments from instructors/guests/panels having special expertise. Weekly seminar. prereq: Chem grad student

CHEM 8081. M.S. Plan B Project I. (1-4 cr.; A-F or Audit; Every Fall, Spring & Summer)
Satisfies project requirement for Plan B master's degree. May appear on M.S. degree program, but does not count toward 14-credit minimum in major field. Topic arranged by student adviser; written report required. 8081 required; 8082 optional. prereq: grad chem major

CHEM 8082. M.S. Plan B Project II. (1-4 cr.; A-F or Audit; Every Fall, Spring & Summer)
Satisfies project requirement for Plan B master's degree. May appear on M.S. degree program, but does not count toward 14-credit minimum in major field. Topic arranged by student adviser; written report required. 8081 required; 8082 optional. prereq: grad chem major

CHEM 8151. Analytical Separations and Chemical Equilibria. (4 cr.; Student Option; Every Fall & Spring)
Advanced treatment of principles of analytical chemistry, chemical equilibria, and dynamics. Chromatographic and other modern analytical scale separation techniques. Emphasizes column dynamics and retention mechanisms. prereq: instr consent

CHEM 8152. Analytical Spectroscopy. (4 cr.; Student Option; Every Fall)
Survey of analytical spectroscopic methods. Design/application of spectroscopic instruments, including signal generation, acquisition, and interpretation. May include nuclear magnetic resonance, electron paramagnetic resonance, infrared and ultraviolet/visible spectroscopy, and mass spectrometry. prereq: grad chem major or instr consent

CHEM 8153. Extracting Signal From Noise. (5 cr.; A-F or Audit; Every Spring)
Use of analog/digital electronics and computational methods in experiments. Passive circuits, operational amplifiers, filters, oscillators and Laplace transform techniques in analysis, domain conversion for data acquisition/control, statistics, experimental design. Introduction to chemometrics, Fourier analysis, convolution/deconvolution, curve fitting. prereq: [4101 or equiv], differential equations course

CHEM 8155. Advanced Electroanalytical Chemistry. (4 cr.; Student Option; Every Spring)
Thermodynamics/kinetics of electron/ion transfer, electric double layer, mass transfer by diffusion/migration. Ion-selective electrodes, chronocoulometry, cyclic voltammetry, chronocoulometry, cyclic voltammetry, pulse voltammetry, ion-transfer voltammetry, impedance spectroscopy, bioelectroanalysis, rotating disk electrodes, microelectrodes, chemically modified electrodes. Scanning electrochemical microscopy. EC-STM, quartz crystal microbalance.

CHEM 8157. Bioanalytical Chemistry. (4 cr.; A-F or Audit; Periodic Spring)
Theory and practical aspects of analytical methods used in determination/characterization of biologically important materials. Enzymatic/kinetic methods in study of proteins, carbohydrates, lipids, and nucleic acids.

CHEM 8159. Nuclear Magnetic Resonance Spectroscopy. (4 cr.; Student Option; Periodic Fall)
Detailed understanding of relaxation processes, chemical exchange, quadrupolar effects, NMR, NMR hardware, and solid state NMR. NMR imaging and Pulsed Field Gradient (PGF) NMR are discussed. prereq: Sem of organic chem

CHEM 8180. Special Topics in Analytical Chemistry. (2-4 cr.; Student Option; Periodic Fall)
Topics (and availability) vary by year depending on instructor and development of the field. prereq: Grad chem major or instr consent

CHEM 8201. Materials Chemistry. (4 cr.; A-F or Audit; Every Fall)
Crystal systems/unit cells, phase diagrams, defects/interfaces, optical/dielectric properties, electrical/thermal conductivity, X-ray diffraction, thin film analysis, electronic structure, polarons/phonons, solid state chemistry, liquid/molecular crystals, polymers, magnetic/optical materials, porous materials, ceramics, piezoelectric materials, biomedical materials, catalysts. prereq: [4701, 3902] or instr consent

CHEM 8211. Physical Polymer Chemistry. (4 cr.; Student Option; Every Spring)

CHEM 8221. Synthetic Polymer Chemistry. (4 cr.; Student Option; Every Fall)
Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties. prereq: [Undergrad organic
CHEM 8280. Special Topics in Materials Chemistry. (2-4 cr.; Student Option; Periodic Fall & Spring)
Topics (and availability) vary by year depending on instructor and development of the field. prereq: Grad chem major or instr consent

CHEM 8321. Organic Synthesis. (4 cr.; Student Option; Every Fall)
Core course; fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry. prereq: 2302 or equiv

CHEM 8322. Advanced Organic Chemistry. (4 cr.; Student Option; Every Spring)
Modern studies. Topics, which vary by year, include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry. prereq: 2302 or equiv

CHEM 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

CHEM 8352. Physical Organic Chemistry. (4 cr.; Student Option; Every Spring)
Fundamental concepts, mechanistic tools for analyzing organic reaction mechanisms. Solvation, reactive intermediates, gas phase chemistry, photochemistry, strained-ring chemistry. prereq: 4011 or 8011

CHEM 8361. Interpretation of Organic Spectra. (4 cr.; Student Option; Every Fall)
Practical application of nuclear magnetic resonance, mass, ultraviolet, and infrared spectral analyses to solution of organic structural problems. prereq: 2302 or equiv

CHEM 8380. Special Topics in Organic Chemistry. (1-4 cr.; Student Option; Periodic Spring)
Topics (and availability) vary by year depending on instructor and development of the field. prereq: grad chem major or instr consent

CHEM 8411. Introduction to Chemical Biology. (4 cr.; Student Option; Every Fall)
Chemistry of amino acids, peptides, proteins, lipids, carbohydrates, and nucleic acids. Structure, nomenclature, synthesis, and reactivity. Overview of techniques used to characterize these biomolecules. prereq: 2302 or equiv

CHEM 8412. Chemical Biology of Enzymes. (4 cr.; Student Option; Periodic Spring)
Enzyme classification with representative examples from current literature. Strategies used to decipher enzyme mechanisms. Chemical approaches for control of enzyme catalysis. prereq: 2302 or equiv

CHEM 8413. Nucleic Acids. (4 cr.; Student Option; Periodic Fall)
Chemistry and biology of nucleic acids: structure, thermodynamics, reactivity, DNA repair, chemical oligonucleotide synthesis, antisense approaches, ribozymes, overview of techniques used in nucleic acid research, interactions with small molecules and proteins. prereq: 2302 or equiv

CHEM 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

CHEM 8480. Special Topics in Biological Chemistry. (2-4 cr.; Student Option; Periodic Spring)
Topics (and availability) vary by year, depending on instructor and development of the field. prereq: Grad chem major or instr consent

CHEM 8541. Dynamics. (4 cr.; Student Option; Periodic Fall)
Mathematical methods for physical chemistry. Classical mechanics/dynamics, normal modes of vibration. Special topics such as rotational motion, Langevin equation, Brownian motion, time correlation functions, collision theory, cross sections, energy transfer, molecular forces, potential energy surfaces, classical electrostatics, Shannon entropy. prereq: Undergrad physical chem course

CHEM 8551. Quantum Mechanics I. (4 cr.; Student Option; Every Fall)
Review of classical mechanics. Postulates of quantum mechanics with applications to determination of single particle bound state energies and scattering cross-sections in central field potentials. Density operator formalism with applications to description of two level systems, two particle systems, entanglement, and Bell inequality. prereq: undergrad physical chem course

CHEM 8552. Quantum Mechanics II. (4 cr.; Student Option; Every Spring)
Second Quantization/Density matrices; Molecular Electronic Structure Theory; Hartree-Fock Theory; Electron Correlation; Configuration Interaction; Perturbation Theory; Energy Derivatives; Coupled-Cluster;Density Functional Theory; Relativistic Quantum Chemistry; prereq: 8551

CHEM 8561. Thermodynamics, Statistical Mechanics, and Reaction Dynamics I. (4 cr.; Student Option; Every Fall)
Two-part sequence. Thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications, including ideal gases/crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from microscopic viewpoint. prereq: undergrad physical chem course

CHEM 8562. Thermodynamics, Statistical Mechanics, and Reaction Dynamics II. (4 cr.; Student Option; Every Spring)
Two-part sequence. Thermodynamics, equilibrium statistical mechanics, ensemble theory, partition functions. Applications, including ideal gases/crystals. Theories of simple liquids, Monte Carlo, and molecular dynamics simulations. Reaction dynamics from microscopic viewpoint. prereq: 8561

CHEM 8563. Molecular Simulations. (2 cr.; Student Option; Every Spring)
Principles of Monte Carlo/molecular dynamics simulations. Algorithms, simulation set-up/analysis, applications to chemical systems. Hands-on computational project that requires writing of computer code. prereq: grad chem major or instr consent

CHEM 8564. Laser Spectroscopy. (2 cr.; Student Option; Every Spring)
Fundamentals of light-molecule interactions/manifestation in spectroscopic observables. Time correlation functions, spectroscopic llineshapes, linear/nonlinear material responses, material susceptibilities. Role of lasers in measuring quantities. prereq: grad chem major or instr consent

CHEM 8565. Chemical Reaction Dynamics. (2 cr.; Student Option; Periodic Spring)
Fundamentals of chemical reaction dynamics including potential energy surfaces, collision theory, statistical mechanical background and transition state theory, variational transition state theory, activation energy, tunneling, unimolecular reactions, energy transfer, reactions in solution, solvation free energy, potential of mean force, quasithermodynamic treatment, reactions in solution, diffusion control, Kramers? theory, and photochemistry

CHEM 8566. Spin Dynamics. (2 cr.; Student Option; Periodic Spring)
Chemistry 8566 is a 2-semester course on spin dynamics. The course prerequisites are described in the CSE Bulletin. Briefly, they are: one year of college-level chemistry, one year of college-level physics, and one year of college-level calculus. All of the prerequisites should have been completed before enrollment in this course. Students who do not satisfy the course prerequisites, please contact the instructor.

CHEM 8567. Biophysical Chemistry. (2 cr.; Student Option; Periodic Spring)
CHEM 8567 is a graduate level course which emphasizes how macromolecular and membrane structure and dynamics impact biological function. Topics to be covered include high-resolution structure determination, biomolecular spectroscopy, and microscopy as applied to folding, solvation, and reaction dynamics. The objectives for this course are to become well-versed in the language of biophysics, at a level sufficient to understand and critically evaluate the literature and to understand fundamental concepts related to structure determination and structure-function relationships of biomolecules, and to be able to apply those concepts to a variety of biological systems.

CHEM 8568. Chemical Bonding at Surfaces. (2 cr.; Student Option; Periodic Spring)
A brief overview of surface science, chemical reactions at surfaces, and interactions of surfaces with light. Students will also be exposed to physical principles of chemical reactions such as transition-state theory and kinetics in within the framework of surface science.
CHEM 8580. Special Topics in Physical Chemistry. (2-4 cr. [max 8 cr.]; Student Option; Periodic Spring) Topics (and availability) vary depending on instructor and development of the field. prereq: grad chem major or instr consent

CHEM 8601. Seminar: Modern Problems in Chemistry. (1 cr.; S-N or Audit; Every Fall & Spring) Weekly seminar series on modern chemical topics. prereq: grad chem major or instr consent

CHEM 8602. Seminar Presentation: Modern Problems in Chemistry. (1 cr.; A-F or Audit; Every Fall & Spring) Weekly seminar series on modern chemical topics presented by students. prereq: grad chem major or instr consent

CHEM 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CHEM 8700. Advanced Concepts in Medicinal Chemistry: Combinatorial Methods in Chemical Biology. (2 cr.; A-F or Audit; Periodic Fall) Principles of current combinatorial methods for generation of biological/chemical libraries. Emphasizes utility in biology and in drug design. Material is drawn from primary literature. prereq: [2302 or equiv], [BioC 4331 or equiv]

CHEM 8715. Physical Inorganic Chemistry. (4 cr.; Student Option; Every Fall) Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, M(3)ssbauer and mass spectroscopy, magnetic measurements, X-ray diffraction. prereq: 4701 or equiv, grad chem major or instr consent

CHEM 8725. Organometallic Chemistry. (4 cr.; Student Option; Periodic Fall) Synthesis, reactions, structures, and other important properties of main group and transition metal organometallic compounds; treatment in terms of modern electronic and structural theory; emphasis on their use as stoichiometric and homogeneous catalytic reagents in organic and inorganic systems. prereq: 4701 or equiv, grad chem major or instr consent

CHEM 8735. Bioinorganic Chemistry. (4 cr.; Student Option; Periodic Fall) Survey of role of metal ions in biology; emphasizes structure, function, and spectroscopy of metalloproteins and their synthetic analogs. prereq: 4701 or equiv, grad chem major or instr consent

CHEM 8745. Advanced Inorganic Chemistry. (4 cr.; Student Option; Periodic Spring) Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity. prereq: 8715, grad chem major or instr consent

CHEM 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CHEM 8780. Special Topics in Inorganic Chemistry. (2-4 cr.; Student Option; Periodic Fall) Topics (and availability) vary by year depending on instructor and development of the field. prereq: Grad chem major or instr consent

CHEM 8880. Special Topics in Chemistry. (2-4 cr.; Student Option; Every Spring) Topics (and availability) vary depending on instructor and development of the field. prereq: Grad chem major or instr consent

CHEM 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Chicano Studies (CHIC)


CHIC 5412. Comparative Indigenous Feminisms. (GP; 3 cr.; Student Option; Periodic Fall & Spring) The course will examine the relationship between Western feminism and indigenous feminism as well as the interconnections between women of color feminism and indigenous feminism. In addition to exploring how indigenous feminists have theorized from ‘the flesh’ of their embodied experience of colonialism, the course will also consider how indigenous women are articulating decolonization and the embodiment of autonomy through scholarship, cultural revitalization, and activism.

CHIC 5920. Topics in Chicana(o) Studies. (3 cr.; Student Option; Every Fall & Spring) Multidisciplinary themes in Chicana(o) studies. Issues of current interest.

CHIC 5993. Directed Studies. (1-3 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis. prereq: instr consent

Child & Adolescent Psychiatry (CAPY)

CAPY 5660. ADHD Throughout the Life Span: Perspectives on Diagnosis, Assessment, and Developmental Course. (2-12 cr.; Student Option; Every Fall & Summer) ADHD, from its earliest presentation to its later adult manifestations. Clinical depression, diagnostic criteria. Disorders that commonly coexist with ADHD. Standard assessment procedures for making a diagnosis. Developmental changes in clinical procedures. prereq: Upper div

CAPY 5672. Children’s Exposure to Domestic Violence: Effects on Child Functioning, Treatment Implications. (1 cr.; Student Option; Periodic Spring) Effects of exposure to domestic violence in context of development, from infancy to late adolescence. Assessment strategies, best practices in intervention/prevention for vulnerable children and adolescents. Multidisciplinary approaches to working with children exposed to violence (e.g., judicial, medical, law enforcement partnerships).

CAPY 7201. Diagnostic Practicum in Child and Adolescent Psychiatry. (1-6 cr.; H-N or Audit; Every Fall, Spring & Summer) Multidisciplinary evaluations of children, adolescents, and their families are presented for discussion, dynamic and diagnostic formulations, and disposition planning in a conference setting. Consultation to schools, residential treatment centers, and community agencies may be included. prereq: instr consent

CAPY 7203. Child and Adolescent Psychiatry for Psychology Interns: Fairview-University Medical Center. (1-6 cr.; O-N or Audit; Every Fall, Spring & Summer) Assessment/therapeutic interventions with children, adolescents, and families in child/adolescent psychiatric settings. prereq: instr consent

CAPY 7521. Outpatient Clinical Child and Adolescent Psychiatry for Primary Care Physicians. (2-12 cr.; O-N or Audit; Every Fall, Spring & Summer) Supervised diagnostic and therapeutic experiences in an outpatient setting. Consultation to schools, residential treatment centers, and community agencies may be included. prereq: cr ar, reg med

CAPY 7602. Introductory Readings and Research Methods in Child, Adolescent, and Family Psychiatry. (2-6 cr.; H-N or Audit; Every Fall, Spring & Summer) Child development, diagnostic/therapeutic techniques, psychopathology. Readings/discussions with faculty. prereq: Med student, instr consent

CAPY 7603. Clinical Child Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer) In this elective, the student will have an opportunity to experience the clinical practice of child and adolescent psychiatry across...
Child Psychology (CPSY)

CPSY 5171. Practicum: Applying Instructional Methods in the Elementary School. (2 cr.; S-N only; Every Fall) Practicum: Applying Instructional Methods in Elementary School is a semester long, full day experience during which teaching candidates gradually increase teaching responsibilities through observation and guided practice in an elementary (grade K-3) classroom, in a co-teaching model. The practicum experience is taken in the Elementary Methods Teaching Block. Methods course teaching assignments are done during the practicum experience.

CPSY 5181. Clinical Experience in Elementary School Teaching. (10 cr. [max 20 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students spend full days in the elementary classroom gradually assuming responsibility for teaching the class. Students prepare a portfolio based on criteria given. One seminar per week.

CPSY 5187. Capstone Project: Improvement of Teaching in Early Childhood Education. (2-4 cr.; Student Option No Audit; Every Fall, Spring & Summer) This is the capstone for teaching candidates in the M.Ed. in Early Childhood Education. Students will complete an in-depth reflective teaching portfolio and parallel assignments. The course requires demonstration of the linking of child development theory, knowledge of developmentally appropriate teaching, and reflective practice. prereq: Completion of all requirements for Early Childhood Teacher Licensure, other than CI 5181, which is taken concurrently.

CPSY 5241. Practicum in Early Childhood Education. (3 cr.; A-F only; Every Fall & Spring) This course offers a great introduction to the early childhood experience for those interested in working with young children. Helpful first course to explore Early Childhood major (can also count in CPSY BA). Students will review early development and learn how this knowledge is applied in educational and early care settings. Time spent observing early childhood programs through practicum experiences around the city.

CPSY 5251W. Social and Philosophical Foundations of Early Childhood Education. (WI; 3 cr.; A-F only; Every Fall) This course traces the history of early childhood education from Plato to the present, as well as explores various program models and the standards movement, including the Minnesota Early Learning Indicators. The course includes lecture, discussion, videos and vignettes, assignments, and requires students to begin developing a personal teaching philosophy. It is also a writing intensive course which incorporates writing instruction and professional writing expectations throughout all course assignments and activities.

CPSY 5252. Facilitating Social and Emotional Learning in Early Childhood Development. (3 cr.; A-F only; Every Fall) This course explores social and emotional development throughout the early childhood (0-8) years. Explore the variety of ways that social interactions and emotional understanding occur in young children with a special emphasis on the role of adults in facilitating these processes. Students will encounter a blend of theory and application as they learn to promote children's mental health, under特殊 circumstances such as trauma, and respond to challenging behaviors across early learning settings. prereq: CPSY 2301 or equiv or inst consent. For Early Childhood or ECSE students.

CPSY 5253. Facilitating Cognitive and Language Learning in Early Childhood Education. (3 cr.; A-F only; Every Fall) Overview of cognitive and language characteristics of children ages 0-8 years and of how teachers can plan curriculum to facilitate children's development in these areas. prereq: CPSY 2301 or equiv or inst consent. For Early Childhood or ECSE students.

CPSY 5254. Facilitating Creative and Motor Learning in Early Childhood Education. (2 cr.; A-F only; Every Spring) Learn how young children develop creativity and motor skills from birth - age 8. Engage in hands-on exploration of creative classroom materials and responsive action-oriented and applied assignments with small groups of children in early childhood education settings. prereq: CPSY 2301 or equiv or inst consent. For Early Childhood and ECSE students.

CPSY 5261. Early Learning in Infancy and Toddlerhood. (3 cr.; Student Option; Periodic Summer) This course provides an understanding of infant and toddler development. It offers multiple perspectives and current research related to the timetable of infant and toddler development, as well as the role of caregivers, environment, and culture in development. Special attention will be given to policies/programming that concern infants, toddlers, and their families. Students will be expected to understand the nuanced and varied ways in which development unfolds, including areas of exceptionality, as well as explore the roles of professionals and community members in supporting infant and toddler development.

CPSY 5281. Student Teaching in Early Childhood Education. (6-8 cr.; S-N or Audit; Every Fall & Spring) Student teaching plus weekly seminar for students pursuing the Early Childhood teaching licensure. Application of theory/research relating to teaching preschool children. Student teach either 5 mornings per week (7:45-12:30) for 8 credits or 3 afternoons per week (11:45-4:30) for 6 credits. In addition, ALL students participate in weekly (Fridays 12:30-2) seminars. prereq: Early Childhood or ECSE student. Recommended completion of CPSY 5252, 5253, and 5254 prior to student teaching.

CPSY 5301. Advanced Developmental Psychology. (3 cr.; A-F or Audit; Every Fall & Summer) This course is an exploration of life span development through the lenses of social, cultural, cognitive, biological, and learning theories and research. A primary emphasis of the class is on gaining better conceptual understanding of different perspectives on healthy development in order to support informed practical understanding of how to help children, adolescents, and adults progress through the developmental periods and to help them with the challenges they face across their lifespan. This course is intended for graduate students. Undergraduate students should take CPSY 2301 or 3301 and not also 5301.

CPSY 5302. Cognitive and Biological Development. (3 cr.; Student Option; Every Fall) This course concerns the development and function of thinking skills throughout the lifespan, touching upon several aspects of what makes humans unique. How are humans able to perceive, evaluate, interpret, infer, remember, symbolize, plan, evaluate, problem solve, and hypothesize? What influences the very emergence of such abilities and the nature of their function? What obstacles interfere with the development or the quality of cognitive processes? Brain development and other biological factors, and our relationships and other environmental factors influence our thinking and its development. Throughout this course, we will discuss how knowledge about cognitive development can influence our work with children, adolescents, and adults, in daily life, professional practice, and public policy. Among the many applications of our knowledge of cognitive development, in this course we will focus on select examples relevant to parenting, education, and media exposure, and on topics initiated by students. The course will address individual differences and cultural differences in cognitive development, and how knowledge about variation in typical cognitive development provides an important foundation for understanding atypical cognitive development.

CPSY 5303. Social and Emotional Development. (3 cr.; Student Option; Every Spring) What are the roots of becoming who we are, as individuals in society? What roles do others play? Parents, siblings, peers, teachers, and communities -- play in the socialization of an individual, and how stable are the forces and outcomes of these influences? This course focuses on social development throughout the human lifespan, with an emphasis on how biology, culture, and relationships influence that development. Throughout this course,
we will discuss how knowledge about social development can inform our interpretation of social issues and guide our reaction to them, in terms of behaviors, practices, and public policy. Among the many possible applications of social development, we focus in particular (but not exclusively) on positive psychology, widespread social problems such as poverty and social disparities, and prevention science. We emphasize individual differences in social development, and attend to the interplay between social development and cognition, learning, and biological development.

CPSY 5304. Research Methods in Applied Child and Adolescent Development. (3 cr.; Student Option; Every Spring) Applied child and adolescent development research builds upon traditions of general, clinical, developmental, and educational psychology research, while focusing on efforts to address social needs, social problems, and public policy. Knowledge of scientifically sound and effective approaches to studying social problems and solutions will support those individuals who lead, contribute to, or use research. That is, knowledge gained from this course will support your development as an investigator or research associate, and it will also empower your role as a savvy consumer of the research you intend to apply to practice or policy.

CPSY 5306. Ethics and Professionalism in Applied Child and Adolescent Development. (2 cr.; A-F only; Every Fall) This course concerns ethical principles, issues, and codes relevant to research and practice in applied developmental psychology. These ethical considerations pertain to the work of professionals and researchers in communities, school, medical, and social agencies that serve children, youth, families, and adults. Throughout the course, we will consider the general principles that guide ethical behaviors and decision-making across settings, unique issues that may arise in specific settings, and the roles served by formal codes of conduct. We will also consider the roots of ethical thinking, behavior, and decision-making, and the social and cultural influences on individuals' developing sense of ethics.

CPSY 5310. Current Issues in Applied Child and Adolescent Development. (3 cr.; Student Option No Audit; Periodic Fall & Spring) Applied Child and Adolescent Development (ACAD) evolved from social scientists' efforts to contribute to solving problems in society. At its inception in the early 1980s, Werteil described the applied developmental scientist as ??being increasingly called upon to participate as social change agents and public policy advisers?? (occupying) an important position in many health care, education, human service and public policy settings. ACAD also focuses on positive psychology, supporting healthy development as a preventative vs. only reactive approach to positive change; and appreciates the reciprocal relation between research and practice. This seminar course provides students with a sample of the wide range of current issues faced by applied developmental scientists.

CPSY 5360. Special Topics in Developmental Psychology. (1 cr. [max 3 cr.]; Student Option; Every Summer) Study in specialized areas of developmental psychology. Topics/credits vary.

CPSY 5413. Early Childhood and Public Policy. (3 cr.; Student Option; Every Fall) State, federal, and international policies and legislative activity touching first five years of a child’s life. Family, community, and institutional roles in promoting children’s social, cognitive, and emotional development. Issues related to health, mental health, poverty, developmental delays, and special needs.

CPSY 5414. Individualized Learning Experience in Early Childhood and Public Policy. (1-3 cr.; Student Option; Periodic Spring) Individualized, applied learning experience. Focuses on early childhood policy development, research, or evaluation. Students attend an early childhood policy lecture series and participate in small discussion groups and follow-up activities. Prereq: Early Childhood Policy Certificate student, instr consent

CPSY 5501. Foundations in Infant and Early Childhood Mental Health I. (3 cr.; A-F only; Fall Odd Year) History, theory, research, concepts, and issues in infant mental health. Issues pertinent to difficulties in development. Readings, visual material. Expert guest lectures. Prereq: [Baccalaureate degree in early-childhood-related field from an accredited U.S. institution or documented equiv], experience in early childhood [research or practice]


CPSY 5506. Infant Observation Seminar I. (1 cr.; S-N only; Spring Odd Year) How an infant develops in context of family relationships over a 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5508. Infant Observation Seminar II. (1 cr.; S-N only; Summer Odd Year) How an infant develops in context of family relationships over a nine- to twelve-month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5511. Infant Observation Seminar III. (1 cr.; S-N only; Fall Even Year) How an infant develops in context of family relationships over 9-12 month period. Students observe an infant for one hour a week, write a narrative, and discuss observations.

CPSY 5513. Early Childhood Assessment. (3 cr.; A-F only; Summer Odd Year) The course introduces processes and evidence-based methods of early childhood assessment and diagnosis from a developmental, multi-disciplinary framework. Prereq: [Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]

CPSY 5515. Assessment in Infant and Early Childhood Mental Health: NCAST. (2 cr.; S-N only; Summer Odd Year) Achieving reliability in two observational measures of parent-child interaction: (1) nursing child assessment feeding (2) teaching Scales. Discussion, lecture, videotapes, listening/observation tasks. Prereq: [Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]

CPSY 5518. Prevention and Intervention in Early Childhood: Principles. (3 cr.; A-F only; Fall Even Year) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups. Prereq: 5501, 5503, 5506, 5508

CPSY 5521. Prevention and Intervention in Early Childhood: Practice. (3 cr.; A-F only; Spring Odd Year) Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

CPSY 5523. Reflective Supervision in Infant and Early Childhood Mental Health: Community-based. (1 cr.; S-N only; Spring Even Year) Principles/strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

CPSY 5525. Reflective Supervision in Infant and Early Childhood Mental Health: Clinical. (1 cr.; S-N only; Spring Even Year) Principles and strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

CPSY 5601. Child Life Theory, Practice and Program Development. (3 cr.; A-F only; Every Fall) With a strong foundation in the theory and science of child development, Child Life Specialists promote effective coping for children experiencing the stress and uncertainty of illness, injury, disability, and hospitalization. Child Life Specialists translate the theory of developmental science into practice and advocate for patient- and family-centered care in medical settings. This course will provide an overview of history, fundamental theories, relevant research, and application of the Child Life Professional Practice. The Official Documents of the Child Life Council (2011) will be analyzed as a source of guiding principles for professional practice. An introduction to Child Life program development is also examined in this course. This course must be taken prior to a child life internship.
CPSY 5602. Developmental Perspectives on Illness and Injury in Healthcare. (3 cr.; A-F only; Every Spring)
With a strong foundation in the theory and science of child development, Child Life Specialists promote effective coping for children experiencing the stress and uncertainty of illness, injury, disability, and hospitalization. Child Life Specialists translate the theory of developmental science into practice and advocate for patient- and family-centered care in medical settings. This course will provide an overview of developmental theories as they apply to children and adolescents experiencing illness and injury in healthcare. Child Life preparation, relaxation interventions, and patient support practices for ill children will be examined.

CPSY 5603. Therapeutic Play for Child Life Practice. (3 cr.; A-F only; Every Spring)
With a strong foundation in the theory and science of child development, Child Life Specialists promote effective coping for children experiencing the stress and uncertainty of illness, injury, disability, and hospitalization. Child Life Specialists translate the theory of developmental science into practice and advocate for patient- and family-centered care in medical settings. This course will provide an overview of the theoretical framework of play across childhood development and its role within pediatric healthcare settings and Child Life practice. Students will gain a professional understanding of therapeutic play interventions essential for facilitation of children’s coping and adjustment in various healthcare experiences.

CPSY 5604. Therapeutic Relationships: Supporting Children in Healthcare. (3 cr.; A-F only; Every Fall)
With a strong foundation in the theory and science of child development, Child Life Specialists promote effective coping for children experiencing the stress and uncertainty of illness, injury, disability, and hospitalization. Child Life Specialists translate the theory of developmental science into practice and advocate for patient- and family-centered care in medical settings. This course will provide an overview of the role of Child Life professionals in therapeutic relationships with patients, caregivers and families. The theoretical foundations of therapeutic relationships will be examined and students will gain a working knowledge of the philosophies and principles underpinning patient and family-centered care.

CPSY 5605. Childhood Death and Bereavement. (3 cr.; A-F only; Every Fall)
With a strong foundation in the theory and science of child development, Child Life Specialists promote effective coping for children experiencing the stress and uncertainty of illness, injury, disability, and hospitalization. Child Life Specialists translate the theory of developmental science into practice and advocate for patient- and family-centered care in medical settings. This course will provide an overview of the fundamental theories of children’s concept of death and the grief process across development. Students will gain an understanding of how Child Life Specialists collaborate with multidisciplinary care teams to support and provide culturally competent care to pediatric patients and their families at end-of-life and bereavement.

CPSY 5981. Cross-Cultural Experiences in Education and English Teaching in Brazil. (GP; 12 cr. [max 24 cr.]; S-N only; Periodic Fall & Spring)
This course provides an experiential introduction to the process of learning and teaching a second language to young children in an international setting. Students will engage in inquiry, planning, classroom teaching and reflection as they participate on a team developing curriculum in a partial day English immersion classroom. Through readings, videos, a homestay experience, small group projects, classroom observations, and participation as part of a team of English teachers in Brazil, students will gain an introduction to Brazilian culture, learn the basics of the local education system, and experience firsthand what it is like to learn a new language. Students will next be exposed to some of the basic elements of early childhood second language teaching, will help to plan and co-deliver relevant and appropriate curriculum, write lesson plans and engage in reflective practice with their teaching team. Finally, because of the cultural immersion element of the class, students will be supported to 1) reflect on their personal cultural adjustment process, 2) develop an effective working relationship with their co-teachers, and 3) consider the ethical dilemma present in the provision of educational opportunity to Brazil’s marginalized communities.

CPSY 5991. Independent Study in Child Development. (1-12 cr. [max 24 cr.]; Student Option No Audit; Periodic Fall & Spring)
Independent study arranged with child development faculty member.

CPSY 5996. Field Experience in Applied Child and Adolescent Development. (1-12 cr; S-N only; Periodic Fall, Spring & Summer)
Emphasizes field experiences focusing on the development of children and adolescents as individuals or members of groups; may include interactions with children and adolescents in natural settings, or research on applied topics or with atypical populations.

CPSY 8101. Graduate Fellowship Proposal Writing Seminar. (1 cr.; S-N only; Every Fall)
The primary purpose of this course is to prepare students to submit a competitive NSF Graduate Research Fellowship proposal. Students submitting to other organizations are welcome to join the course, but all of the assignments and focus will be on increasing NSF and predoctoral fellowship competitiveness. This course is intended primarily for doctoral students in their first or second year of study.

CPSY 8102. Writing Developmental Psych Grants for NIH and NSF. (1-3 cr. [max 4 cr.]; A-F only; Spring Odd Year)
Research/identify potential funding sources at NIH/NSF, create right fit between proposals/agency program goals, address guideline of proposals, write effective key elements of proposal, understand review criteria, complete grant review, interpret feedback from reviews. prereq: Doctoral students in second year of study or beyond

CPSY 8301. Developmental Psychology: Cognitive Processes. (4 cr.; Student Option; Every Fall)
Perceptual, motor, cognitive, and language development, and biological bases of each. Conceptual framework of research issues. prereq: Doctoral student, instr consent

CPSY 8302. Developmental Psychology: Social and Emotional Processes. (4 cr.; Student Option; Every Spring)
Normative issues and individual differences in social development from infancy through adolescence. Emphasizes developmental psychopathology, life span considerations. prereq: Doctoral student, instr consent

CPSY 8304. Developmental Research Methods. (3 cr.; Student Option; Every Spring)
Review of research strategies and designs for conducting research in developmental psychology, as well as strengths and weaknesses of each. Students will learn to (a) communicate about empirical research, (b) critically review methods used in empirical studies, and (c) design research to maximize knowledge gained, while recognizing its limitations.

CPSY 8307. Prelim Seminar. (1 cr.; S-N only; Every Spring)
Prepare for written preliminary examination during summer of second year of doctoral study. Critically discuss issues/themes in field using key readings suggested by faculty/past readings from core child development doctoral courses. prereq: Child psychology PhD student in second year of study

CPSY 8311. Landmark Issues and Great Controversies in Child Development. (2 cr.; S-N or Audit; Every Fall)
History of developmental psychology and child development movement in context of conceptual/theoretical controversies. Presentations by students/instructor. prereq: CPSy doctoral student or instr consent

CPSY 8321. Seminar in Teaching Developmental Psychology. (1 cr.; Student Option; Every Fall)
Apprentices attend weekly seminar meetings covering all aspects of university teaching. Planning course coverage, teaching techniques, developing learning activities and examinations. Preparation for CPSY 8322. prereq: CPSy doctoral student or instr consent

CPSY 8322. Apprenticeship in Teaching Developmental Psychology. (1-3 cr.; S-N only; Every Spring)
Co-instruct a section of a CPSY undergraduate course. Plan syllabus, prepare/deliver lectures, devise active learning activities, prepare exams/assignments, and grade. Meet with apprenticeship supervisor to discuss teaching
progress/issuses. prereq: Child psychology
doctoral student
CPSY 8333. FTE: Master's. (1 cr.; No
Grade Associated; Every Fall, Spring &
Summer)
(No description) prereq: Master's student,
adviser and DGS consent
CPSY 8360. Special Topics in
Developmental Psychology. (1-3 cr. [max
12 cr.]; Student Option; Every Fall & Spring)
Intensive study in specialized areas of
developmental psychology. Topics/credits vary.
prereq: Doctoral student
CPSY 8444. FTE: Doctoral. (1 cr.; No
Grade Associated; Every Fall, Spring &
Summer)
(No description) prereq: Doctoral student,
adviser and DGS consent
CPSY 8606. Advanced Developmental
Psychopathology. (3 cr.; Student Option;
Every Fall)
Alternative formulation of childhood disorders,
emphasizing competency training rather than
medical nosology. prereq: Doctoral student or
instructor consent
CPSY 8607. Developmental Neurobiology of
Stress and Emotion. (3 cr.; Student Option;
Periodic Fall)
Maladaptive responses to stress are
components of both the etiology and
expression of many psychiatric disorders.
In addition, individuals differ in their stress
vulnerability, with some seeming to thrive
despite the odds, and others succumbing to
even relatively mild adversity. These individual
differences are likely the interactions of genes
and experiences; early experiences may be
particularly noteworthy.
CPSY 8608. Clinical Intervention with
Children. (3 cr.; Student Option; Periodic
Spring)
This course is a graduate seminar designed
to introduce students to child treatment
theory and techniques. The course has
two objectives: (1) to introduce students to
current clinical theory and research, relevant
to clinical practice with children, and (2)
to teach students basic clinical skills and
interventions that will prepare them for their first
child psychotherapy case during their clinical
practicum. The course will cover a variety of
topics, including the therapeutic relationship
and the therapeutic process, an introduction to
different modalities of child psychotherapy (with
a focus on cognitive-behavioral and behavioral
interventions), and ?real life? clinical practice
issues (working with minority populations,
working in a managed care environment, and
broader children?s mental health issues).
CPSY 8660. Advanced Developmental
Psychology. (1-4 cr. [max 21 cr.]; Student
Option; Periodic Fall & Spring)
Intensive study in advanced areas of
developmental psychology. Topics/credits vary.
prereq: Doctoral student
CPSY 8666. Doctoral Pre-Thesis Credits.
(1-6 cr. [max 12 cr.]; No Grade Associated;
Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not
passed prelim oral; no required consent for
1st/2nd registrations, up to 12 combined cr;
depth consent for 3rd/4th registrations, up to 24
combined cr; doctoral student admitted before
summer 2007 may register up to four times, up
to 60 combined cr
CPSY 8777. Thesis Credits: Master's. (1-18
cr. [max 50 cr.]; No Grade Associated; Every
Fall, Spring & Summer)
(No description) prereq: Max 18 cr per
semester or summer; 10 cr total required [Plan
A only]
CPSY 8888. Thesis Credit: Doctoral. (1-24
cr. [max 100 cr.]; No Grade Associated; Every
Fall, Spring & Summer)
(No description) prereq: Max 18 cr per
semester or summer; 24 cr required
CPSY 8980. Research Seminar in Child
Psychology. (1-3 cr. [max 15 cr.]; Student
Option; Every Fall, Spring & Summer)
Participation in organized research group in
developmental psychology. prereq: Doctoral
student
CPSY 8993. Directed Study in Child
Psychology. (0-1 cr.; Student Option; Every
Fall & Spring) tbd prereq: Doctoral student or
instructor consent
CPSY 8994. Research Problems in Child
Psychology. (0-4 cr. [max 24 cr.]; Student
Option: Every Fall & Spring)
Individual empirical investigation. prereq:
Doctoral student or instructor consent
CPSY 8996. Directed Field Experiences in
Child Psychology. (0-6 cr.; S-N or Audit;
Every Fall, Spring & Summer)
Emphasizes field experiences focusing on
intellectual and/or social development of
children as individuals or members of groups;
may include interactions with children in natural
settings, or research on applied topics or with
atypical populations. prereq: Doctoral student,
instructor consent

**China Executive MBA (CHMB)**

CHMB 5800. Organizational Behavior. (3
cr.; A-F only; Every Fall)
Theories/frameworks for analyzing behavior of
individuals, groups, and the organization itself.
Emphasizes making decisions and developing
action plans that enable managers to provide
effective leadership. Personnel selection,
reward/compensation systems, collective
bargaining.

CHMB 5801. Financial Accounting. (3
cr.; A-F only; Every Fall)
External accounting system used by firms
to measure their economic performance
and financial position. Students analyze
corporate financial reports to discover impact
of significant economic events. Rise of financial
reporting standards and financial intermediaries
in efficient allocation of capital in a modern
economy. Discussions, cases.

(3 cr.; A-F only; Every Fall)
Exploratory data analysis, basic inferential
procedures, statistical process control,
regression analysis.

CHMB 5803. Operations Management. (3
cr.; A-F only; Every Fall)
How to manage operations function in
manufacturing/service organizations.
Emphasizes strategic impact of operations
decisions. Operations strategy, process design,
productivity improvement, quality management,
business process re-engineering, service
quality, forecasting, demand management,
inventory management, production planning,
project management, scheduling, supply
chain management, international operations
management.

CHMB 5804. Managerial Accounting. (3
cr.; A-F only; Every Fall)
How to analyze accounting for use in
management decisions. Planning and control.
Transfer pricing, performance measurements,
cost behavior, cost allocation, activity based
costing, standard costs.

CHMB 5805. Financial Management. (3
cr.; A-F only; Every Spring)
Theory/practice of finance from analytical
approach. Students apply basic financial
concepts of risk, return, and valuation to
decisions that a corporate financial officer or
person engaged in small business must make
about sources/uses of funds during changing
financial markets.

CHMB 5806. Marketing Management. (3
cr.; A-F only; Every Spring)
Developing/implementing most appropriate
combination of variables to carry out a firm's
strategy in its target markets. Applying analytic
perspectives, concepts, and decision tools
of marketing to decisions in product offering,
distribution, pricing, and communication.

CHMB 5807. Business Strategy. (3 cr.; A-F
only; Every Spring)
Formulating strategy for an enterprise.
Shaping mission, product-market choice, and
organizational character. Shaping allocation of
resources to meet organizational circumstances
and conflicting stakeholder interests. Situational
analysis, strategy development. Written/oral
presentation of strategic analyses/recommendations.

CHMB 5808. Strategic Marketing. (3 cr.; A-F
only;)
Product markets in which an organization
should compete. Sustainable competitive
advantage that should be developed. Matching
marketing strategy with the environment.
Coordination between marketing and other
business functions. Organization/management
of marketing. Case studies.

CHMB 5809. Advanced Financial
Management. (3 cr.; A-F only;)
Executive level corporate financial policy.
Students are challenged to apply basic
principles of finance on their own initiative.
Rigorous case-oriented approach.

CHMB 5810. International Environment. (1.5
cr.; A-F only; Every Fall)
How to develop an integrative framework for dealing with international activities of a newly exporting company or a full-fledged multinational. How international environment constrains decision-making, how currency prices are determined, and how to manage exchange risk in coordination with strategic choices of the firm. prereq: China Executive MBA student

CHMB 5811. Information Technology Management. (; 3 cr.; A-F only;) Managing information resources/technology. Students gain exposure to various information technologies, examine their applications, explore competitive advantages associated with information technology, and address organizational/managerial implications.

CHMB 5813. Ethics and Leadership. (; 3 cr.; A-F only; Every Fall & Spring) Role that ethics can play in corporate strategy. Key concepts include stakeholder management, individual/collective responsibility, and international business ethics. Theoretical considerations applied to issues such as a business's responsibility to the environment, truthful/tasteful advertising, obligations to local community, and managing a diverse workforce.

CHMB 5815. International Human Resources Management. (; 3 cr.; A-F only; Every Spring) Topics reflect the strengths, talents, and interests of the class. Integrates different aspects of the curriculum while not being limited by a specific area or paradigm.

CHMB 5816. International Residency. (6 cr.; A-F only; Every Fall & Spring) Students travel to an international location for 11 days and engage in discussions with international colleagues, apply program concepts, and develop a broader sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, and trip assignment are required.

CHMB 5817. China's Economy. (; 1.5 cr.; A-F or Audit; Every Spring) Focusing on China's economy, this course is designed as a required course for all China Executive MBA students. prereq: China Executive MBA student

CHMB 5818. Law and Business. (; 3 cr. [max 6 cr.]; A-F only; Every Spring) Legal/regulatory environment of business operations in China.

Chinese (CHN)

CHN 5011. Research Methods. (; 4 cr.; Student Option; Periodic Fall) Introduction to the sources and approaches of research in language and literature. prereq: 3032 or 3112

CHN 5040. Readings in Chinese Texts. (3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring) Students read authentic materials of various types to increase reading/speaking ability. Topics specified in Class Schedule. prereq: 4042 or equiv or instr consent

CHN 5041. Media Chinese. (3 cr.; A-F or Audit; Every Fall) Conducted 100% in Mandarin Chinese, this course trains students to comprehend media Chinese by listening to and viewing Chinese television programs and online/internet resources. Course content includes international and Chinese national news, social issues, historical events, and interpersonal relations relevant to modern Chinese society, history, and culture. Students must have taken 3-4 years of college-level Chinese or demonstrate the same level of Chinese proficiency.

CHN 5042. Contemporary Chinese Texts 1949-present. (3 cr.; A-F or Audit; Periodic Fall & Spring) Advanced Chinese language course focused on contemporary Chinese short stories, novels, and prose written since 1949, especially from 1978 to the present. These literary works explore various aspects of contemporary Chinese society, history, and culture including: social prejudices and discrimination against the mentally and physically disadvantaged, the Anti-Rightist Movement, the Cultural Revolution, the drug problem, male-female relationships, education, parental love (and lack thereof), traditional Chinese views of life, rape and sex, influence from the West, and more. Class discussion focuses on the use of the language, the social interpretation of the texts, and the Chinese cultural and philosophical implications found in those works. prereq: CHN 4042 or instructor consent. Recommended: CHN 5041

CHN 5120. Topics in Chinese Linguistics. (; 4 cr. [max 8 cr.]; Student Option; Periodic Fall) Studies of the structure and change in the Chinese language. prereq: 4121 or 4125

CHN 5211. Introductory Classical Chinese I. (3 cr.; Student Option; Periodic Fall) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or instr consent

CHN 5212. Introductory Classical Chinese II. (3 cr.; Student Option; Periodic Spring) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or its equivalent or instr consent

CHN 5213. Literary Chinese in the Analects. (3 cr.; Student Option No Audit; Every Fall) The "Analects" is a collection of the sayings of Confucius and his disciples. As one of the most revered classics in the Chinese tradition, it is essential for understanding Chinese cultural values, and contains complex philosophical themes for critical thinking. Linguistically, the "Analects" provides an excellent example of the classical Chinese language, and is the source of many common Chinese idioms. This class takes key passages from the "Analects" in the original and aims to equip students with a holistic understanding of Chinese language, culture, and history. Prerequisite: CHN 3022 or instructor consent.

CHN 5393. Directed Study. (1.5 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

CHN 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

CHN 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

CHN 8494. Directed Research. (1-5 cr. [max 16 cr.]; Student Option; Every Fall & Spring) Individual study/research with guidance of a faculty member.

CHN 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CHN 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CHN 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Civil, Environ, and Geo-Engin (CEGE)

CEGE 5094. Civil Engineering Research. (1-4 cr.; Student Option; Every Fall & Spring) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology/municipal, environmental, or transportation problems. Investigations, reports, tests, designs. prereq: instr consent

CEGE 5180. Special Topics. (1-4 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring) Topics vary depending on faculty and student interests. prereq: instr consent

CEGE 5211. Traffic Engineering. (3 cr.; A-F or Audit; Periodic Spring) Principles of vehicle and driver performance as they apply to the safe and efficient operation of highways. Design and use of traffic control devices. Capacity and level of service. Trip
CEGE 5212. Transportation Policy, Planning, and Deployment. (3 cr.; A-F or Audit; Every Fall) Principles/techniques related to transportation systems. Historical perspective, characteristics of travel demand, demand management. Pre-travel/booking systems. Case studies. Field projects. Prereq: Upper Division CE, EnvE, or GeoE student, grad student, or instructor consent

CEGE 5213. Transit Planning and Management. (3 cr.; A-F only; Every Fall) Principles/techniques related to transit systems. Historical perspective, characteristics of travel demand, demand management. Pre-travel/booking systems. Case studies. Field projects. Prereq: Upper Division CE, EnvE, or GeoE student, grad student, or instructor consent


CEGE 5541. Prestressed Concrete Design. (3 cr.; A-F or Audit; Fall Odd Year) Design of prestressed concrete structures. Time dependent effects, behavior, flexure, shear, torsion, deflections, continuous systems. Prereq: CEGE 4401, upper division CSE or grad student or instr consent

CEGE 5415. Masonry Structures. (3 cr.; A-F or Audit; Periodic Fall) Masonry materials and their production. Mortars, grouts. Design of unreinforced and reinforced masonry structural systems. Walls, columns, lintels. Codes/specifications, testing. Prereq: CEGE 3401, upper division CSE or grad student or instr consent; 4401 recommended

CEGE 5511. Urban Hydrology and Water Quality. (4 cr.; A-F or Audit; Every Fall) Urban hydrology for small watersheds and the management of storm water quality and quantity. Prereq: CEGE 4501, upper division CSE or grad student or instructor consent

CEGE 5541. Environmental Water Chemistry. (3 cr.; max 4 cr.; A-F or Audit; Fall Even Year) Introduction to water chemistry. Physical chemical principles, geochemical processes controlling chemical composition of waters, behavior of contaminants that affect the suitability of water for beneficial uses. Prereq: CEGE 3501, Chem 1061, Chem 1062, upper division CSE or grad student or instructor consent

CEGE 5542. Experimental Methods in Environmental Engineering. (3 cr.; A-F or Audit; Periodic Spring) Tools necessary to conduct research in environmental engineering and chemistry. Theory of operation of analytical equipment. Sampling and data handling methods, statistical analyses, experimental design, laboratory safety. Lecture, laboratory. Prereq: CEGE 3501, (CEGE 5541 recommended) Chem 1022, upper division CSE or grad student or instructor consent

CEGE 5414. Fluid Mechanics. (4 cr.; A-F or Audit; Fall Odd Year) Environmental fluid mechanics is the study of the interaction of fluid flows that occur in aquatic ecosystems with the growth and behavior of living organisms. Prereq: CEGE 3502 or AEM 4201 or Chem 3005, upper division CSE or grad students or instructor consent

CEGE 5551. Environmental Microbiology. (3 cr.; A-F or Audit; Fall Even Year) Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biogeochemistry, and human health. Prereq: Upper division CSE or grad student or instructor consent

CEGE 5552. Environmental Microbiology Laboratory. (1 cr.; A-F only; Fall) Basic microbiological techniques: isolation, identification/enumeration of bacteria, BOD, biodegradable kinetics, disinfection. Lab. Prereq: CEGE 5551 or concurrent registration is required (or allowed) in CEGE 5551

CEGE 5570. Design for Sustainable Development - India. (3-9 cr.; A-F only; Every Summer) In this interdisciplinary course in Bangalore (India's fast-growing entrepreneurship hub) you will work in teams with local partners to research and design sustainable solutions to development challenges of water, energy, waste, agriculture, transportation, and health. Prereq: Open to graduate students from all majors

CEGE 5582. Design for Sustainable Development - Nicaragua. (3-9 cr.; A-F only; Every Summer) His interdisciplinary course will introduce you to innovative approaches to complex sustainable development problems. You will work in teams to research and design solutions to real social and environmental challenges while living with host families and developing your intercultural competence. Prereq: Open to graduate students from all majors

CEGE 5501. Mass and Heat Transfer. (3 cr.; max 4 cr.; A-F or Audit; Periodic Fall) Examples of free and moving boundary problems: metal solidification, filling, polymer molding, flow in porous media, ground freezing. Solutions: analytical, fixed finite difference, fixed finite element, front tracking schemes, general deforming finite element methods. Prereq: 8401 or instr consent

CEGE 5581. Water Resources Engineering. (4 cr.; A-F or Audit; Periodic Fall) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, tests, or designs. Prereq: instr consent

CEGE 5582. Design for Sustainable Development - Nicaragua. (3-9 cr.; A-F only; Every Summer) In this interdisciplinary course in Bangalore (India's fast-growing entrepreneurship hub) you will work in teams with local partners to research and design sustainable solutions to development challenges of water, energy, waste, agriculture, transportation, and health. Prereq: Open to graduate students from all majors

CEGE 5580. Experiential Education Abroad. (1-5 cr.; max 495 cr.; S-N only; Every Fall, Spring & Summer) Special engineering studies abroad. Studies/reports supervised by staff.

CEGE 8022. Numerical Methods for Free and Moving Boundary Problems. (3 cr.; A-F or Audit; Periodic Fall) Examples of free and moving boundary problems: metal solidification, filling, polymer molding, flow in porous media, ground freezing. Solutions: analytical, fixed finite difference, fixed finite element, front tracking schemes, general deforming finite element methods. Prereq: 8401 or instr consent

CEGE 8094. Civil Engineering Research. (1-4 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, tests, or designs. Prereq: instr consent

CEGE 8220. Seminar. Transportation. (1 cr.; max 3 cr.; S-N or Audit; Every Fall & Spring) Content depends on instructor and student. Sample topics: traffic safety, traffic flow theory, transportation materials, transportation planning, transportation economics.

CEGE 8202. Networks and Places: Transportation, Land Use, and Design. (4 cr.; A-F or Audit; Every Fall) Pre-travel/booking systems. Case studies. Field projects. Prereq: Upper Division CE, EnvE, or GeoE student, grad student, or instructor consent

CEGE 8211. Theory of Traffic Flow. (4 cr.; Student Option; Every Fall) Relationship between land use and transportation. Developing synthetic design skills for linking land use transportation in urban/regional settlements. Economic, political, legal, institutional frameworks for planning. Parallel computer lab, practicum assignment.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

CEGE 8212. Advanced Travel Demand Modeling and Supply Analysis. (3 cr.; Student Option; Fall Odd, Spring Even Year) Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software. prereq: 5211 or equiv, Stat 5021

CEGE 8213. Advanced Transportation Technologies Seminar. (1 cr.; S-N or Audit; Periodic Fall & Spring) Advanced technologies specifically related to transportation. Topics drawn from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.


CEGE 8215. Transportation Data Analysis. (3 cr.; Student Option; Spring Even Year) Maximum likelihood methods for generalized linear models, with logit/probit models. Linear regression as special cases. Applications to gap acceptance, discrete choice, speed/headway distributions, accident modeling. Introduction to Bayesian inference. prereq: [5210 or 5212]; [Stat 5021 or equiv]

CEGE 8216. Urban Traffic Operations. (3 cr.; Student Option; ) Capacity analysis techniques for urban streets, optimal traffic signal timing, coordination, real time control. Traffic signal hardware, including detectors/controllers. Operational techniques for traffic management. Use of computer program packages in traffic engineering practice. Freeway operations/control.


CEGE 8231. Advanced Pavement Engineering. (3 cr.; Student Option; Periodic Fall) Advanced concepts in pavement analysis and design; computation of stresses and strains in flexible and rigid pavement systems; review of Bourness theory, Burmeister model, and Westergaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage, prereq: 4231 or instr consent

CEGE 8233. Advanced Bituminous Materials Characterization. (3 cr.; Student Option; Periodic Fall) Applications of viscoelasticity, rheology, elastoplasticity, and fracture mechanics to bituminous materials characterization. Lectures, discussions of advanced research reading assignments, laboratory assignments. prereq: [4042, grad student] or instr consent

CEGE 8300. Seminar: Geomechanics. (1-3 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring) Presentations on various topics.


CEGE 8311. Advanced Rock Mechanics. (3 cr.; A-F or Audit; Periodic Fall) Stress transformations; principal stresses and directions. Friction and behavior of rock joints; stability of frictional sliding. Elastic waves; acoustic emission and seismic measurements. Fragmentation and rock breakage. prereq: CSE grad student, 4311 or GeoE 4311 or instr consent


CEGE 8322. Storage and Flow of Granular Materials. (3 cr.; A-F or Audit; Periodic Fall) Plasticity of granular media. Static and dynamic method of slices. Storage and flow of granular materials in bins and hoppers. Stress concentrations, arching, piping. Experiments on granular material properties and flow. prereq: CSE grad student, 4301 or instr consent


CEGE 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

CEGE 8336. Boundary Element Methods I. (3 cr.; A-F or Audit; Fall Even Year) Introduction to boundary element methods for elastostatics; stress discontinuity, displacement discontinuity, and direct boundary integral methods. Derivation of basic mathematical solutions from the theory of elasticity. Applications in geomechanics. prereq: CSE grad student

CEGE 8337. Boundary Element Methods II. (3 cr.; A-F or Audit; Periodic Fall) Transient and nonlinear problems. prereq: 8336. GeoE 8336 or instr consent


CEGE 8352. Advanced Groundwater Mechanics II. (3 cr.; A-F or Audit; Periodic Fall) Applying complex methods, including conformal mapping, in groundwater mechanics; solving problems with free boundaries using
the hodograph method; drains in aquifers with free boundaries; superposition of solutions with drains; singular Cauchy integrals; boundary elements. prereq: 4351, CSE grad student or instr consent

CEGE 8361. Engineering Model Fitting. (3 cr.; A-F or Audit; Fall Even Year)
Parameter estimation and inverse modeling for civil and geological engineering. Formulating engineering model fitting problems; comparing and selecting various fit criteria; implementing numerical algorithms; analyzing and interpreting results using both statistical and qualitative tools; designing future measurement plans. prereq: CSE grad student or instr consent

CEGE 8400. Seminar: Structures. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring)
Content depends on instructor and student. Sample topics: theory of elasticity, optimization, reliability, wave propagation, soil dynamics, experimental equipment, wind forces on structures, structural failures, modern construction practices.

CEGE 8401. Fundamentals of Finite Element Method. (3 cr.; A-F or Audit; Every Spring)
Elements of calculus of variations; weak and strong formulations of linear continuum and structural problems. Isoparametric elements and numerical integration. Basic concepts of error analysis and convergence. Analysis of plates and shells. Introduction to mixed methods and time dependent problems. prereq: 4411 or instr consent

CEGE 8402. Nonlinear Finite Element Analysis. (3 cr.; A-F or Audit; Periodic Fall)
Large strains and work conjugate stresses. Equilibrium and principle of virtual work for nonlinear problems. Nonlinear elasticity and plasticity. Finite element discretization and nonlinear algebraic equations. Linearization and solution algorithms for nonlinear problems. Structural stability. prereq: 8401 or instr consent; offered alt yrs

CEGE 8411. Plate Structures. (3 cr.; A-F or Audit; Periodic Fall)
Analysis of plate structures based on the small-deflection elastic Kirchhoff-Love theory. Classical and numerical analysis methods. Skew and orthotropic plate structures. Elements of large deflection theory and stability of plates. prereq: 5411 or instr consent; offered alt yrs

CEGE 8412. Shell Structures. (3 cr.; A-F or Audit; Periodic Fall)
Static analysis of thin elastic shells based on Love's postulates. Membrane and bending theories. Thermal stresses in cylinders. Buckling of shells of revolution. Offered alternate years. prereq: CSE grad or instr consent

CEGE 8413. Fracture and Scaling. (3 cr.; A-F or Audit; Periodic Spring)
Linear elastic fracture mechanics, cohesive fracture, scaling, strength statistics. prereq: 5411

CEGE 8421. Structural Dynamics. (3 cr.; A-F or Audit; Every Fall)
Response of discrete/continuous systems to dynamic loading. Formulation/solution of problems of one or more degrees of freedom. Modal analysis. Numerical integration and transform techniques. Response of dynamic systems to base motion using response spectrum methods. prereq: 3401, AEM 2012 or instr consent; concurrent registration is required (or allowed) in 4411 recommended

CEGE 8422. Earthquake Engineering. (3 cr.; A-F or Audit; Periodic Spring)
Introduction to earthquake engineering; response spectra; energy absorption capacity of structures; estimation of damping; earthquake resistant design; seismic design codes; base isolation; soil-structure interaction. Blast resistant design. Wind effects on structures. prereq: 8421 or instr consent

CEGE 8431. Structural Stability. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Classification of discrete/continuous conservative/nonconservative systems. Buckling analysis of, e.g., structural members, frameworks, and plates by classical/numerical methods. Offered alternate years. prereq: CSE grad student or instr consent

CEGE 8432. Analysis of Thin-Walled Members. (3 cr.; A-F or Audit; Periodic Fall)
Analysis of thin-walled structural members based on Vlasov theory and its modifications. Members with open and closed cross sections. Second-order effects and buckling. Influence of inelastic material behavior on buckling. prereq: 5411 or instr consent; offered alt yrs

CEGE 8441. Ductile Behavior of Steel Structures. (3 cr.; A-F or Audit; Fall Even Year)
Advanced topics in behavior of steel structures; Modeling techniques for material/geometric nonlinearity. Plastic analysis. Introduction to plasticity of continuum bodies. Computer methods. Seismic design, code provisions. prereq: 4411 or equiv

CEGE 8442. Analysis of Structural Systems. (3 cr.; A-F or Audit; Periodic Fall)
Advanced theory and computational techniques for analyzing complex structural building systems. Using comprehensive geometric and material nonlinear analysis for designing steel and composite structures. prereq: CEGE 5411 or equivalent

CEGE 8443. Fracture of Materials and Structures. (3 cr.; A-F or Audit; Every Spring)
Foundations of engineering fracture mechanics. Analytical, computational, and experimental tools to analyze/design solid structures and materials containing cracks. Predicting structural performance, designing experiments. Metals, concretes, rocks, ceramics, advanced composites, biological structures, micro-devices. prereq: 4401 or instr consent

CEGE 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

CEGE 8451. Behavior of Reinforced Concrete Structures. (3 cr.; A-F or Audit; Every Fall & Spring)
Advanced topics; experimental and theoretical background to design code provisions. Moment-curvature analysis of members. Shear; torsion; disturbed regions. Beam column joints; shear walls. Effects of earthquake loading. Limit analysis. prereq: 4412 or instr consent

CEGE 8461. Structural Reliability. (3 cr.; A-F or Audit; Periodic Fall)

CEGE 8490. Special Topics. (1-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring)
Topics vary depending on faculty and student interests. prereq: instr consent

CEGE 8500. Environmental Seminar. (1 cr. [max 3 cr.]; S-N or Audit; Every Spring)
Broad coverage of topics in environmental engineering and science. Speakers consist primarily of graduate students in these areas, but presentations may also be given by University faculty and guest speakers. prereq: grad CC major or instr consent

CEGE 8501. Environmental Fluid Mechanics I. (4 cr. A-F or Audit; Every Fall)
Basic laws of mass, energy, and momentum transport in environmental fluid flow. Exact and approximate solutions for viscous flow. Irrotational flow; gravity waves. Similitude and inspectional analysis. Laminar boundary layers and slender flows. Application to engineering and environmental problems. prereq: 3502 or equiv or instr consent

CEGE 8502. Environmental Fluid Mechanics II. (4 cr.; A-F or Audit; Every Fall & Spring)
Reynolds equations. Developed and developing turbulent boundary layers and slender flows, and their interaction with inviscid flow. Jets, plumes, wakes and shear layers. Statistical description of turbulence; data analysis. prereq: 8501 or instr consent

CEGE 8503. Environmental Mass Transport. (4 cr.; A-F or Audit; Periodic Fall)
Principles of intraphase and interfacial chemical transport and fate in the environment, specifically the processes of diffusion, dispersion, and convection. Application to surface water and atmospheric mixing; dispersion in groundwater, and transport between these media. prereq: 3502, 3501 or equiv or instr consent

CEGE 8504. Theory of Unit Operations. (4 cr.; A-F or Audit; Periodic Fall & Spring)
Theoretical basis, design, operation of chemical/physical processes used in treating/controlling water quality. Adsorption, ion exchange, sedimentation, thickening, filtration, gas transfer, coagulation, flocculation, membrane processes, disinfection. prereq: 5541

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
CEGE 8505. Biological Processes. (3 cr.; A-F or Audit; Every Spring)
Theoretical principles underlying chemical and biological wastewater treatment processes, including aerobic and anaerobic treatment for organic carbon and nutrient removal. Mathematical models of microbial growth kinetics and mass transport in suspended growth and attached film applications are developed. prereq: 4502, 4501 or instr consent

CEGE 8506. Stochastic Hydrology. (4 cr.; A-F or Audit; Periodic Fall)
Analysis and synthesis of hydrologic series and systems; derived distributions; uncertainty and risk analysis; flood frequency analysis; multivariate time series analysis; correlation and spectral analysis; series of long-range dependence; linear estimation; geostatistics; sampling networks; hydrologic forecasting. prereq: Stat 3021 or equiv or instr consent

CEGE 8507. Advanced Methods in Hydrology. (4 cr.; A-F or Audit; Periodic Fall)
Notions of scale-invariance, scaling, and multiscaling in geophysical processes; methods of multiscaling analysis; wavelet transforms; time-frequency-scale analysis and fractal analysis. Applications in atmospheric, hydrologic, and geomorphologic processes. prereq: 8506

CEGE 8508. Ecological Fluid Mechanics. (4 cr.; A-F or Audit; Every Fall)
Fluid mechanics of microbiological processes in lakes, rivers, and wetlands. Small-scale fluid motion, nutrient uptake, growth kinetics, ecosystem metabolism, scaling, lab/field microstructure measurements. prereq: 3502 or equiv

CEGE 8511. Mechanics of Sediment Transport. (3 cr.; A-F or Audit; Every Fall)
Particle motion in fluids. Criteria for incipient motion. Formulations for bedload and suspended load. Bedform mechanics and hydraulic resistance relations. Channel stability, aggradation and degradation, alluvial stream morphology. prereq: 3502 and 4501 or instr consent

CEGE 8521. The Atmospheric Boundary Layer. (4 cr.; A-F or Audit; Periodic Summer)
Land-atmosphere interactions and turbulent transport in the atmospheric boundary layer (ABL), the lowest part of the atmosphere. ABL development and dynamics. Turbulence, surface energy balance, spectral analysis, similarity theory. Flow over homogeneous and heterogeneous surfaces. Atmospheric stability, measurement, simulation of turbulent fluxes. prereq: CSE or COAFES grad student or instr consent

CEGE 8541. Aquatic Chemistry. (3 cr.; A-F or Audit; Periodic Spring)
Advanced course on water chemistry; physical chemical principles and geochemical processes controlling the chemical composition of natural waters, soil- and sediment-water interactions. Emphasizes behavior of inorganic contaminants in natural waters and engineered systems and dissolved natural organic matter. prereq: 4541 or instr consent

CEGE 8542. Chemistry of Organic Pollutants in Environmental Systems. (3 cr.; A-F or Audit; Periodic Fall)
Structural characteristics and physico-chemical properties of organic contaminants in aquatic systems. Emphasizes PCBs, PAHs, dioxins, insecticides, herbicides, and chlorinated solvents. Factors affecting their transport/ transformation. Structure- and property-activity relationships, their use in predicting organic chemical behavior. prereq: [4541, 5541] or instr consent

CEGE 8551. Environmental Microbiology: Molecular Theory and Methods. (4 cr.; A-F or Audit; Fall Even Year)
Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

CEGE 8552. Groundwater Microbiology: Laboratory. (4 cr.; A-F or Audit; Periodic Fall)
Subsurface microbial ecology, biogeochemical cycling, metabolic classification of subsurface bacteria, modeling bacterial transport, diagnosis of microbial induced fouling (MIF) events, bioremediation of contaminated aquifers. Lectures and four lab hours per week. prereq: grad CE major or instr consent, exposure to basic environ engr and microbiol

CEGE 8553. Biofilms. (3 cr.; A-F or Audit; Periodic Fall)
Science/engineering concepts to investigate formation/function of biofilms. Properties/composition of biofilms, transport/ transformation processes in biofilms, communication in biofilms, mathematical modeling. Applications in environmental engineering. prereq: 4551 or instr consent

CEGE 8561. Analysis and Modeling of Aquatic Environments I. (3 cr.; A-F or Audit; Every Spring)

CEGE 8562. Analysis and Modeling of Aquatic Environments II. (3 cr.; A-F or Audit; Every Spring)

CEGE 8566. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CEGE 8577. Thesis Credits: Master's. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CEGE 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Clinical Laboratory Science (CLS)

CLS 5090. Special Laboratory Methods. (1-2 cr.; A-F or Audit; Every Fall & Spring)
Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab. preq: instr consent

CLS 5100. Virology, Mycology, and Parasitology for Medical Technologists. (2 cr.; A-F or Audit; Every Spring)
Lab diagnosis of viral, fungal, and parasitic infections. Lecture. preq: microbiology course with lab, biochem course

CLS 5120. Seminar: Clinical Laboratory Science. (1 cr.; [max 3 cr.]; S-N or Audit; Every Fall & Spring)
Current literature. Presentation/discussion of research. preq: instr consent

CLS 5121. Journal Presentations. (1 cr.; [max 2 cr.]; S-N or Audit; Every Fall & Spring)
Critical analysis, evaluation, discussion of current journal articles in student's specialty area. preq: 1st yr CLS grad student

CLS 5125. Practicum Teaching. (1-2 cr.; A-F or Audit; Every Fall & Spring)
Supervised teaching experience, develop skills using instructional materials, tests, and measurements. preq: instr consent

CLS 5129. Elements of Laboratory Administration. (2 cr.; A-F or Audit; Every Fall & Spring)
Leadership styles, employee selection and evaluation, communications, motivation, morale, discipline, job descriptions, record keeping, budgets, cost accounting, purchasing, product evaluation, lab safety, labor relations, government regulations. preq: instr consent

CLS 5130. Practicum in Laboratory Administration. (2 cr.; A-F or Audit; Every Fall & Spring)
Supervised experience and assignment of specific problems related to lab service and management in health care institutions. preq: instr consent

CLS 5140. Techniques for Teaching. (2 cr.; A-F or Audit; Every Fall & Spring)
Developing objectives, classroom activities, and evaluation criteria for medical technology education. preq: instr consent

CLS 5165. Advanced Clinical Immunohematology. (3 cr.; A-F or Audit; Every Fall & Spring)
Observation, study, and practice in special problems, advanced techniques, and methodology. preq: instr consent

CLS 5402. Molecular Diagnostics. (1 cr.; A-F only; Every Fall)
Basic theory/application of molecular diagnostics in clinical lab. Lecture, lab. preq: instr consent

CLS 5768. Advanced Hematology. (5-10 cr.; A-F or Audit; Every Fall, Spring & Summer)
Practical experience collecting bone marrow from patients. Diagnosing hematological diseases by evaluating and interpreting cells from clinical specimens of bone marrow, peripheral blood, and, if applicable, lymph nodes. preq: instr consent

CPMS 5101. Introduction to Clinical Physiology and Movement Science. (3 cr.; A-F or Audit; Every Fall & Spring)
Overview of clinical physiology and clinical movement science. For students in such diverse fields as bioengineering, kinesiology, neuroscience, physical therapy, psychology, public health, occupational therapy.

CPMS 5201. Colloquium in Clinical Physiology and Movement Science. (1 cr.; S-N or Audit; Every Fall & Spring)
Interdisciplinary course meets 1st and 3rd week of the month. Current research areas, scientific methods, and interpretation of results in the areas of clinical movement science and clinical physiology. preq: Undergrad level in basic anatomy and physiology is highly recommended

CPMS 8201. Seminar in Clinical Physiology and Movement Science. (4 cr.; S-N or Audit; Every Fall & Spring)
Meets 1st and 3rd week of the month. Current research areas, scientific methods, and the interpretation of results in the areas of clinical movement science and clinical physiology.

Cognitive Science (CGSC)

CGSC 8000. Seminar: Philosophy of the Cognitive Sciences. (3 cr.; S-N or Audit; Every Fall & Spring)
Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics and epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences, relation of cognitive science to epistemology and various philosophical problems. preq: Grad cog sci minor or instr consent

CGSC 8001. Proseminar in Cognitive Science. (2 cr.; S-N or Audit; Every Fall & Spring)
Survey of major topics, including theoretical assumptions, methods, and samples of current research. preq: Grad cog sci minor or instr consent

CGSC 8041. Cognitive Neuroscience. (4 cr.; A-F or Audit; Every Fall & Spring)
Relations between brain activity and cognitive function in mammals. Working memory, attention, decision processing, executive
function, categorization, planning, sequence processing. Behavioral/physiological perspectives. Disruption of cognitive function following brain damage. Extracellular recording of single neuron activity in nonhuman primates. Functional neuroimaging/magnetoencephalography in humans. prereq; instr consent

CGSC 8360. Seminar: Topics in Cognitive Science. (1-4 cr. [max 24 cr.]; Student Option; Periodic Fall & Spring) Lectures and in-depth discussion on a topic.

CGSC 8410. Perspectives in Learning, Perception, and Cognition. (2 cr. [max 24 cr.]; S-N only; Every Fall & Spring) Lectures/discussions in cognitive sciences by local/visiting faculty.

CGSC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student, adviser consent, DGS consent

CGSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CGSC 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer, 24 cr required

CGSC 8991. Independent Study. (1-4 cr. [max 15 cr.]; Student Option; Every Fall, Spring & Summer) Independent study. prereq: instr consent

Col of Food, Agr & Nat Res Sci (CFAN)

CFAN 5480. Topics in CFANS. (1-4 cr. [max 8 cr.]; Student Option; Periodic Fall, Spring & Summer) Lectures by visiting scholar(s) or regular faculty member. Topics specified in Class Schedule. prereq: Grad student

CFAN 5500. International Field Studies Seminar. (1-3 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring) Interface the future with natural resource, environmental, economic, food safety, public policy, ethical issues transcending national borders. Seminars take place in various countries/regions. Active learning, lectures, discussion tutorials, field trips, reports, exams. prereq: instr consent

CFAN 5501. Costa Rica--Sustainable Development. (3 cr.; A-F only; Every Spring) Costa Rica's development strategy. Agriculture, tourism, energy, urbanization. Synergies/tension between economic, social, environmental impacts. How organizations maximize benefits associated with sustainable development. prereq: grad student, instr consent

CFAN 5518. Environmental Issues in New Zealand. (GP; 3 cr.; A-F only; Every Spring) This Global Seminar, Environmental Issues in New Zealand, is open to any undergraduate or graduate students regardless of major. Priority for enrollment is given to University of Minnesota students, but students from other institutions may attend if space is available. There are no course prerequisites and all instruction is in English. New Zealand is a modern country with friendly people and awesome scenery. Our daily news is filled with reports on climate change, water scarcity and pollution, soaring energy costs, and food shortages. Solutions must consider environmental, economic, and social implications of our management strategies. Frequently there are tradeoffs between benefits and costs. University students as future leaders of business, government, and social programs should understand how to analyze environmental issues. What are the issues? Who is affected? What alternatives exist to solve them? What are the environmental, economic, and social tradeoffs between these alternatives? What are reliable sources of information? How can each of us contribute to solutions? New Zealand has undergone significant changes in its plant and animal composition following the invasion of humans and the exotic species they introduced. Alarmed by these changes, New Zealanders recently have made significant strides in recognizing environmental issues and seeking sustainable solutions. They offer valuable lessons for U.S. students to bring home and apply to our own environmental issues.

CFAN 8101. Professional Skills for Scientists. (2 cr.; S-N only; Spring Odd Year) Presentations, discussions, and exercises in leading people and in managing money, time, operations, and projects within the context of research and development in the food, agricultural, and natural resource sciences.

Coll of Science, Engineering (CSE)

CSE 5101. Introduction to Engineering Design for Teachers. (3 cr.; Student Option No Audit; Every Summer) History, career opportunities, portfolios, visualization, geometry, modeling, construction, analysis, documentation. Part of Project Lead the Way curriculum. Prereq-college consent.

CSE 5102. Principles of Engineering for Teachers. (3 cr.; Student Option No Audit; Every Summer) Communication/documentation, design process, engineering systems, strength of materials, testing, reliability, statics/dynamics. Part of Project Lead the Way curriculum. Prereq-college consent.

CSE 5104. Civil Engineering and Architecture. (3 cr.; Student Option No Audit; Every Summer) Overview of civil engineering and architecture, their interrelationship/dependence on each other. Students use software to solve real world problems. Project/site planning. Project documentation/presentation. Part of Project Lead the Way. Prereq-college consent.

CSE 5105. Gateway to Technology. (3 cr.; Student Option No Audit; Every Summer) Activity-oriented middle school curriculum to help students in grades six-eight explore math, science, and technology. Five independent, nine-week units: design/modeling, automation/robotics, magic of electrons, science of technology, and flight/space. Prereq-college consent.

College of Liberal Arts (CLA)

CLA 8000. Topics in Graduate Studies. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall, Spring & Summer) This is a topics course related to graduate students in CLA.

Communication Studies (COMM)

COMM 5110. Special Topics in Communication Theory. (3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) Advanced theoretical problems. See department office for current offering.

COMM 5211. Critical Media Studies: Theory and Methods. (3 cr.; A-F only; Every Spring) Survey of theories, research methods, and scholars dominating critical media studies since late 1920s. prereq: Grad student or instr consent

COMM 5221. Media, Race, and Identity. (3 cr.; Student Option; Periodic Fall) Critical media studies perspective on cultural politics of race and ethnicity. Social construction of race, politics of racism, media representations of race. prereq: 3211 or instr consent

COMM 5231. Media Outlaws. (3 cr.; Student Option; Fall Even Year) People working outside of mainstream media institutions who find creative/provocative ways to use media as space for cultural, political, or economic critique/resistance.

COMM 5250. Environmental Communication. (3 cr.; A-F only; Every Spring) Historical, cultural, material contexts within which environmental communication takes place. Understand environmental communication as well as develop communication strategies that lead to more sustainable social practices, institutions, systems.

COMM 5261. Political Economy of Media Culture. (3 cr.; Student Option; Fall Even Year) Organizational practices of media communicators. Media content as link between communicators and audiences. How viewers use/process media content. prereq: 3211 or instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
COMM 5401. Advanced Theories of Communication. (3 cr.; Student Option; Every Fall, Spring & Summer) Survey of major theoretical approaches to communication including, positivism, constructivism, and systems. prereq: 3401 or grad

COMM 5402. Advanced Interpersonal Communication. (3 cr.; Student Option; Every Spring) Social scientific approaches to interpersonal communication. Theory, research findings. prereq: 3401 or 3402

COMM 5411. Small Group Communication Research. (3 cr.; A-F or Audit; Every Spring) Survey of small group communication research; theory and practice. Group decision-making and leadership. prereq: 3411 or instr consent

COMM 5431. The Process of Persuasion. (3 cr.; Student Option; Every Fall & Spring) Communication campaigns (e.g., advertising, political) illustrating persuasive processes and theories. Research paper required. prereq: 3431

COMM 5441. Communication in Human Organizations. (3 cr.; Student Option; Every Fall, Spring & Summer) Communication in organizational settings. Organizational structure and dynamics and their effect upon the communication process. Individual projects.

COMM 5451W. Intercultural Communication Processes. (WI; 3 cr.; Student Option; Periodic Fall) Theory and research on cultural differences in values, norms, behaviors, and perceptions that affect communication across cultures internationally and domestically.

COMM 5611. Survey of Rhetorical Theory. (3 cr.; Student Option; Periodic Fall) Rhetorical theory, from ancient to contemporary period. Application to public discourse.

COMM 5615W. Introduction to Rhetorical Criticism. (WI; 3 cr.; Student Option; Every Spring) Analysis of public discourse using various theoretical perspectives. prereq: 1101; 3601 recommended

COMM 5617. History and Criticism of U.S. Public Discourse: 1630-1865. (3 cr.; Student Option; Periodic Fall) How discourse has been used to establish or maintain power. Speeches and public debates used to examine American public address from 17th century (e.g., Puritan sermons) to the Civil War. prereq: Jr

COMM 5970. Directed Study. (1-3 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. Instructor and department consent is required.

COMM 5994. Communication Research Practicum. (1-3 cr. [max 9 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students participate in research group. prereq: instr consent

COMM 8000. Communication Studies Research Colloquium. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring) The Friday Colloquium is a mix of research presentations by scholars in Communication Studies and related fields, and workshops on professional development. The Colloquium provides graduate students with a broader introduction to the field, cutting edge work, and opportunities for developing their interests and skills. The content and specific requirements of COMM 8xxx will vary by year, depending upon the faculty member who coordinates the colloquium series and the direction provided by the Director of Graduate Studies. In the fall of each year, the professional development portion of the Colloquium will focus on teaching. Professional development sessions in the spring may include: navigating the job market, publishing, networking, or alternative academic career paths, depending on the range of speakers and interests of the cohort.

COMM 8100. Communication Studies Research Colloquium. (0 cr.; S-N only; Every Fall & Spring) The Friday Colloquium is a mix of research presentations by scholars in Communication Studies and related fields, and workshops on professional development. The Colloquium provides graduate students with a broader introduction to the field, cutting edge work, and opportunities for developing their interests and skills. The content and specific requirements of COMM 8xxx will vary by year, depending upon the faculty member who coordinates the colloquium series and the direction provided by the Director of Graduate Studies. In the fall of each year, the professional development portion of the Colloquium will focus on teaching. Professional development sessions in the spring may include: navigating the job market, publishing, networking, or alternative academic career paths, depending on the range of speakers and interests of the cohort.

COMM 8101. Introduction to Graduate Communication Studies. (3 cr.; A-F or Audit; Every Fall) COMM 8101 is a required course that provides beginning graduate students with a foundation for understanding the discipline of communication studies from the perspective of a graduate student, scholar, and faculty citizen.

COMM 8110. Seminar: Communication Research Methods. (3 cr.; max 15 cr.; Student Option; Every Fall, Spring & Summer) Evaluation of research methods in speech-communication. prereq: undergrad degree in spch-comm or equiv

COMM 8210. Seminar: Selected Topics in U.S. Electronic Media. (3 cr.; max 18 cr.; Student Option; Periodic Fall & Spring) Literature survey; evaluating research on topics; conducting independent research project on a particular topic. prereq: 5210 or instr consent; offered when feasible

COMM 8211. Critical Communication Studies: History, Theory, Method. (3 cr.; Student Option; Every Fall, Spring & Summer) Qualitative research methods for studying media institutions, texts, audiences, and contexts.

COMM 8231. Seminar: National and International Electronic Media Systems. (3 cr.; Student Option; Periodic Fall) Historical and contemporary aspects of national and international electronic media systems. Roles of national and international regulatory bodies. Approaches to programming and evidence of effectiveness. prereq: 4231 or instr consent

COMM 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

COMM 8402. Seminar: Interpersonal Communication. (3 cr.; Student Option; Every Fall, Spring & Summer) Evaluate and develop new perspectives for analyzing, diagnosing, and managing interpersonal communication problems. prereq: 5402 or instr consent

COMM 8403. Seminar: Emotion and Communication. (3 cr.; Student Option; Every Fall, Spring & Summer) Major theories of emotion and the role of emotion in communication.

COMM 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) Development of ideas/methods for research project, M.A. Plan B project, or Ph.D. dissertation. prereq: instr consent

COMM 8452. Seminar: Methods of Intercultural/Diversity Facilitation. (3 cr.; Student Option; Every Fall, Spring & Summer) Theories of and techniques for managing effective intercultural communication and diversity. Intercultural training. prereq: 4451 or 5452 recommended

COMM 8502. Seminar: Communication Theory Construction. (3 cr.; Student Option; Periodic Fall & Spring) Logic of communication theory development and modification from a social scientific perspective. Types of communication theories. prereq: 5421 or instr consent

COMM 8504. Seminar: Rhetorical Criticism. (3 cr.; Student Option; Every Fall, Spring & Summer) Rhetorical criticism theories and methods. Rhetoric as applied to literary studies and the growth of hermeneutics as vantage points for reassessing rhetorical methods. prereq: 5615 or instr consent

COMM 8606. Seminar: Rhetorical Analysis of Campaigns and Movements. (3 cr.; Student Option; Periodic Fall)
Literature and methodology in historical and contemporary rhetorical campaigns and movements.

COMM 8611. Seminar: Rhetoric. (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) History/criticism of rhetorical theory. Research in rhetoric. prereq: 5611 or instr consent

COMM 8625. Seminar: Communication Ethics. (3 cr.; A-F or Audit; Periodic Fall) Independent research on communication ethics in interpersonal, group, organizational, intercultural, and media settings. Theories of ethics and methods of analysis. prereq: Ethics course or instr consent

COMM 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; dept consent for 3rd/4th registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

COMM 8777. Thesis Credits: Master's. (1-18 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

COMM 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

COMM 8910. Advanced Topics in Communication Studies. (3 cr. [max 18 cr.]; Student Option; Periodic Fall & Spring) Literature survey; evaluating research on topics; conducting independent research project on a particular topic.

COMM 8994. Directed Research. (1-3 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Supervised research project.

Compar Study in Discourse/Soc (CSDS)

CSDS 5302. Aesthetics and the Valuation of Art. (3 cr.; Student Option; Periodic Fall & Spring) Society, ideology, aesthetic value in light of recent critical theories of visual art, music, literature. Mediations of place, social class, gender, ideology on aesthetic judgment in post-renaissance Western culture.

CSDS 5305. Vision and Visuality: An Intellectual History. (3 cr.; A-F only; Periodic Fall & Spring) Central role of vision/visuality in modernity. Modern age as scopic regime. Ways that ideas/ideologies of perception have shaped aesthetic experience within social existence.

CSDS 5401. Origins of Cultural Studies. (3 cr.; Student Option; Periodic Fall & Spring) Intellectual map of the creation of cultural studies as a unique approach to studying social meanings. Key figures and concepts, including nineteenth- and early twentieth century precursors.

CSDS 5555. Introduction to Semiotics. (3 cr.; Student Option; Periodic Spring) Problems of the sign. Sign function/production. Signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifying practices (e.g., literature, cinema, daily life).

CSDS 5993. Directed Study. (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring) Guided individual reading and study. prereq: instr consent

CSDS 8001. Basic Research Seminar: Comparative Studies in Discourse and Society I. (3 cr.; Student Option; Every Fall) Key texts, positions, problems in field of comparative critical theory. Historical precursors, influential contemporary debates, disciplinary genealogies.

CSDS 8002. Basic Research Seminar in Comparative Studies in Discourse and Society II. (3 cr.; Student Option; Every Spring) Key texts, positions, problems in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, disciplinary genealogies.

CSDS 8333. FTE: Master's. (3 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

CSDS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

CSDS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; dept consent for 3rd/4th registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

CSDS 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

CSDS 8902. Methodologies Colloquium. (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring) Presentations by CL/CSDS faculty. Methods in relation to field as a whole. Library component. Meetings with research librarians. prereq: CSDS grad major or instr consent

CSDS 8910. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr. [max 24 cr.]; Student Option; Every Fall & Spring) Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics vary by instructor and semester.

CSDS 8920. Advanced Topics in Comparative Studies in Discourse and Society. (3 cr. [max 15 cr.]; Student Option; Every Fall) Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CSDS 8993. Directed Study in Comparative Studies in Discourse and Society. (1-4 cr. [max 48 cr.]; Student Option; Every Fall & Spring) Directed Study in Comparative Studies in Discourse and Society prereq: instr consent

CSDS 8994. Directed Research in Comparative Studies in Discourse and Society. (1-4 cr.; Student Option; Every Fall & Spring) Directed Research in Comparative Studies in Discourse and Society prereq: instr consent

Comparative & Molecular Biosci (CMB)

CMB 5200. Statistical Genetics and Genomics. (4 cr.; A-F or Audit; Fall Even Year) Statistical issues in genetics. Gene detection, including statistical analysis/designs for linkage study and for mapping quantitative trait loci. Linkage analysis using pedigree data for codominant/dominant markers. Using radiation hybrid mapping and single cell typing. Design issues in linkage analysis, parentage testing, and marker polymorphism.


CMB 5571. Pathogenomics and Molecular Epidemiology - Learning to Fly. (3 cr.; A-F only; Every Spring) This course is designed provide an introduction to the use of molecular methods in our understanding of the pathogenesis, etiology, and transmission of infectious diseases that are important to both animals and public health. This is intended as a hands-on course for the student to learn techniques related to genome
sequencing, pangenome analysis, phylogenetic analysis, and metagenomic analysis, and then apply these techniques towards their own research.

CMB 5594. Directed Research in Comparative and Molecular Biosciences. (1-4 cr.; Student Option; Every Fall, Spring & Summer) Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab. prereq: Jr, instr consent


CMB 5912. Creativity. (1 cr.; Student Option; Every Spring) Creativity will be explored and used to provide new perspectives on a variety of professional goals, activities and challenges. Lectures will be followed by a mixture of individual and group activities to provide a guided exploration of how these creative approaches can be applied to many situations. Students will learn skills to expand their vision, become more adept at problem solving, design more innovative research, inspire themselves and others and become more fascinating communicators.

CMB 5915. Essential Statistics for Life Sciences. (3 cr.; A-F or Audit; Every Fall) This course is a broad overview of the principles and methods of statistical analysis used in life sciences research, including biological, veterinary, and translational research, and provides the background a new researcher needs to understand and apply commonly used statistical methods and the preparation needed for more advanced coursework. Classes will include general instruction and background information, detailed examples of how to perform the analyses, with actual data sets, and discussion on how the topic has been applied in biological research, including reading and assessing papers in the field. Computing will be performed using the R software environment, though students may use alternate software with permission. Topics will include: Descriptive statistics and exploratory graphics Understanding statistical inference and interpreting P-values and confidence intervals. One and two sample inference, including t-tests, proportion tests, and non-parametric alternatives Linear regression, including the effects of confounders ANOVA methods, including pairwise comparisons and multiple comparisons

CMB 8012. Basic Concepts in Skeletal Biology. (2 cr.; A-F or Every Spring) Cells (osteoblasts, osteoclasts, chondrocytes) that make up skeleton. Transcription/signaling networks regulating cell growth/differentiation. Mechanisms of bone remodeling. Regulation of bone by agents such as hormones. prereq: CMB grad student or instr consent

CMB 8100. Research Rotation in Comparative and Molecular Biosciences. (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring) Current developments in faculty research. Topics specific to research adviser's area of interest. Eight weeks.

CMB 8134. Ethical Conduct of Animal Research. (3 cr.; Student Option; Every Fall) Ethical considerations in the use of animal subjects in agricultural, veterinary, and biomedical research. Federal, state, and University guidelines relating to proper conduct for acquisition and use of animals for laboratory, observational, epidemiological, and clinical research. Regulatory requirements. Bases for proper conduct. Societal impact on scientific investigations utilizing animal subjects.

CMB 8202. Mechanisms of Animal Health and Disease II. (3 cr.; A-F or Audit; Every Fall) Multi-perspective approach to critically evaluating journal articles, as done for peer-reviewed journals. Aspects of host/pathogen interactions, including molecular/genetic mechanisms of host resistance/pathogenesis.


CMB 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

CMB 8344. Mechanisms of Hormone Action. (2 cr.; Student Option; Fall Even Year) Mechanisms of hormone/cytokine action. Focuses on major signal transduction apoptosis. Topics incorporate pharmacology, biochemistry, and cell biology of hormone action in relevant physiological systems. Lectures on basic principles. Specialized lectures. Discussion of primary literature. prereq: Course in biochemistry or cell biology or instr consent

CMB 8361. Neuro-Immune Interactions. (3 cr.; Student Option; Fall Odd Year) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. Offered fall of even-numbered years. prereq: [MICB 5218 or equiv], [NSC 5561 or equiv]

CMB 8371. Mucosal Immunobiology. (3 cr.; A-F or Audit; Periodic Fall) Host immune processes at body surfaces. Innate/adaptive immunity at mucosal surfaces. Interactions/responses of various mucosal tissues to pathogens. Approaches to target protective vaccination to mucosal tissues. Lectures, journal. prereq: [MICA 8001 or equiv or instr consent

CMB 8394. Research in Comparative Biomedical Sciences. (1-6 cr.; max 18 cr.) Student Option; Every Fall, Spring & Summer) Directed research determined by student's interests, in consultation with faculty mentor. prereq: Grad CMB major

CMB 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

CMB 8481. Advanced Neuropharmaceutics. (4 cr.; A-F or Audit; Fall Even Year) Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutic benefit. Pharmaceutical/pharmacological issues specific to direct drug delivery to CNS. prereq: instr consent

CMB 8550. Comparative and Molecular Biosciences Seminar. (1 cr.; max 8 cr.) S-N or Audit; Every Fall & Spring) Student/faculty presentations of their own research or a directed topic. prereq: Biol sciences grad student

CMB 8560. Research and Literature Reports. (1 cr.; max 2 cr.) S-N or Audit; Every Fall & Spring) Current developments in cellular and molecular mechanisms of animal health and disease.

CMB 8571. Pathogenomics and Molecular Epidemiology - Learning to Fly. (3 cr.; A-F or Audit; Every Spring) This course is designed provide an introduction to the use of molecular methods in our understanding of the pathogenesis, etiology, and transmission of infectious diseases that are important to both animals and public health. This is intended as a hands-on course for the student to learn techniques related to genome sequencing, pangenome analysis, phylogenetic analysis, and metagenomic analysis, and then apply these techniques towards their own research.

CMB 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CMB 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

CMB 8910. Statistical Principles of Research Design. (3 cr.; A-F or Audit; Every Spring)
This course is a broad overview of the principles and techniques of research design and methods used in veterinary and translational research, and provides the background a new researcher needs to understand the literature and make good decisions about what is appropriate for their research, prereq: intro grad level stats course or it's equivalent

### Comparative Literature (CL)

**CL 5302. Aesthetics and the Valuation of Art.** (3 cr.; Student Option; Periodic Fall & Spring) Society, ideology, aesthetic value in light of recent critical theories of visual art, music, literature. Mediations of place, social class, gender, ideology on aesthetic judgment in post-renaissance Western culture.

**CL 5305. Vision and Visuality: An Intellectual History.** (3 cr.; A-F only; Periodic Fall & Spring) Central role of vision/visuality in modernity. Modern age as scopic regime. Ways that ideas/ideologies of perception have shaped aesthetic experience within social existence.

**CL 5401. Origins of Cultural Studies.** (3 cr.; Student Option; Periodic Fall & Spring) Intellectual map of the creation of cultural studies as a unique approach to studying social meanings. Key figures and concepts, including nineteenth- and early twentieth century precursors.

**CL 5555. Introduction to Semiotics.** (3 cr.; Student Option; Periodic Spring) Problems of the nature of the sign; sign function; sign production; signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Applying semiotics to various signifying practices (e.g., literature, cinema, daily life).

**CL 5992. Directed Reading in Comparative Literature.** (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring) Guided individual reading and study. prereq: instr consent

**CL 8001. Basic Research Seminar in Comparative Literature I.** (3 cr.; Student Option; Every Fall) Key texts, positions, problematics in field of comparative critical theory. Historical precursors, influential contemporary debates, disciplinary genealogies.

**CL 8002. Basic Research Seminar in Comparative Literature II.** (3 cr.; Student Option; Every Fall) Key texts, positions, problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, disciplinary genealogies.

**CL 8333. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

**CL 8362. Modernity and Its Others.** (4 cr.; Student Option; Periodic Fall & Spring) Dialectical interrogation of Western and non-Western theories of modernity. Reckoning with differences and variations in its history, providing an account of the normative category of modernity (designated as European), and alternative articulations around the globe.

**CL 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**CL 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**CL 8777. Thesis Credits: Master’s.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**CL 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

**CL 8901. Intro to the Profession: Critical Methods of Research, Pedagogy, and Creative Work in the Humanities.** (3 cr.; Student Option; Every Spring) Preparates graduate majors for teaching. Issues of pedagogy. Preparing syllabi for specific courses that graduate instructors teach. Required for students planning to teach in Department of Cultural Studies and Comparative Literature. prereq: Grad comp lit major

**CL 8902. Methodologies Colloquium.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring) Presentations by CL/CSDS faculty. Methods in relation to field as a whole. Library component. Meetings with research librarians. prereq: CL grad major or instr consent

**CL 8910. Advanced Topics in Comparative Literature.** (3 cr. [max 24 cr.]; Student Option; Every Fall & Spring) Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

**CL 8920. Advanced Topics in Comparative Literature.** (3 cr. [max 15 cr.]; Student Option; Periodic Fall & Spring) Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

**CL 8992. Directed Reading in Comparative Literature.** (1-4 cr. [max 12 cr.]; Student Option; Every Fall & Spring) tbd prereq: instr consent

**CL 8994. Directed Research in Comparative Literature.** (1-4 cr. [max 48 cr.]; Student Option; Every Fall & Spring) Directed research. prereq: instr consent

### Computer Engineering (CMPE)

**CMPE 8333. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

**CMPE 8777. Thesis Credits: Master’s.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

### Computer Science (CSCI)

**CSCI 5103. Operating Systems.** (3 cr.; Student Option; Every Fall) Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples. prereq: 4061 or instr consent

**CSCI 5105. Introduction to Distributed Systems.** (3 cr.; Student Option; Periodic Spring) Distributed system design and implementation. Distributed communication and synchronization, data replication and consistency, distributed file systems, fault tolerance, and distributed scheduling. prereq: [5103 or equiv] or instr consent

**CSCI 5106. Programming Languages.** (3 cr.; Student Option; Every Fall) Design and implementation of high-level languages. Course has two parts: (1) language design principles, concepts, constructs; (2) language paradigms, applications. Note: course does not teach how to program in specific languages. prereq: 4011 or instr consent

**CSCI 5115. User Interface Design, Implementation and Evaluation.** (3 cr.; Student Option; Every Fall) Theory, design, programming, and evaluation of interactive application interfaces. Human capabilities and limitations, interface design and engineering, prototyping and interface construction, interface evaluation, and topics such as data visualization and World Wide Web. Course is built around a group project. prereq: 4041 or instr consent

**CSCI 5117. Developing the Interactive Web.** (3 cr.; Student Option; Spring Even Year) Hands-on design experience using modern web development tools. Students work in teams to develop software programs using each of four toolkits. Analyze developments in forum posts and classroom discussions. prereq: 4131 or 5131 or instr consent; upper div or grad in CSci recommended

**CSCI 5123. Recommender Systems.** (3 cr.; Student Option; Fall Odd Year) An overview of recommender systems, including content-based and collaborative algorithms for recommendation, programming of recommender systems, and evaluation and
metrics for recommender systems. prereq: Java programming and 2033 and 3081, or instructor consent.

CSCI 5125. Collaborative and Social Computing. (3 cr.; Student Option; Spring Even Year)
Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience. prereq: 5115 or instr consent

CSCI 5127W. Embodied Computing: Design & Prototyping. (WI; 3 cr.; Student Option; Fall Even Year)
In this course, you will learn and apply the principles of embodied computing to human-centered challenges. Through a semester-long team project, you will learn and demonstrate mastery of human-centered embodied computing through two phases: (1) investigating human needs and current embodied practices and (2) rapidly prototyping and iterating embodied computing solutions. One of the ways you will demonstrate this mastery is through the collaborative creation of a written document and project capstone video describing your process and prototype. prereq: CSci 4041, upper division or graduate student, or instructor permission; CSci 5115 or equivalent recommended.

CSCI 5143. Real-Time and Embedded Systems. (3 cr.; A-F only; Periodic Spring)
Real-time systems that require timely response by computer to external stimulus. Embedded systems in which computer is part of machine. Increasing importance of these systems in commercial products. How to control robots and video game consoles. Lecture, informal lab. prereq: [4061 or instr consent], experience with C language

CSCI 5161. Introduction to Compilers. (3 cr.; Student Option; Every Spring)
Techniques for translating modern programming languages to intermediate forms or machine-executable instructions/their organization into compiler. Lexical analysis, syntax analysis, semantic analysis, data flow analysis, code generation. Compiler project for prototypical language. prereq: [2021, 5106] or instr consent

CSCI 5204. Advanced Computer Architecture. (3 cr.; Student Option; Every Fall)
Instruction set architecture, processor microarchitecture, memory, I/O systems. Interactions between computer software and hardware. Methodologies of computer design. prereq: 4203 or EE 4363

CSCI 5211. Data Communications and Computer Networks. (3 cr.; Student Option; Every Fall)
Concepts, principles, protocols, and applications of computer networks. Layered network architectures, data link protocols, local area networks, network layer/routing protocols, transport, congestion/flow control, emerging high-speed networks, network programming interfaces, networked applications. Case studies using Ethernet, Token Ring, FDDI, TCP/IP, ATM, Email, HTTP, and WWW. prereq: [4061 or instr consent], basic knowledge of [computer architecture, operating systems, probability], grad student

CSCI 5221. Foundations of Advanced Networking. (3 cr.; Student Option; Spring Even Year)
Design principles, protocol mechanisms. Network algorithms, implementation techniques. Advanced network architectures, state-of-art/emerging networking technologies/applications, network modeling. Simulation, experiments. prereq: 4211 or 5211 or equiv; intro course in computer networks recommended

CSCI 5231. Wireless and Sensor Networks. (3 cr.; Student Option; Spring Odd Year)
Enabling technologies, including hardware, embedded operating systems, programming environment, communication, networking, and middleware services. Hands-on experience in programming tiny communication devices. prereq: 4211 or 5211 or instr consent

CSCI 5251. Introduction to Computer Security. (3 cr.; Student Option; Every Fall)
Concepts of computer, network, and information security. Risk analysis, authentication, access control, security evaluation, audit trails, cryptography, network/database/application security, viruses, firewalls. prereq: 4061 or equiv or instr consent

CSCI 5302. Analysis of Numerical Algorithms. (3 cr.; Student Option; Every Spring)
Additional topics in numerical analysis. Interpolation, approximation, extrapolation, numerical integration/differentiation, numerical solutions of ordinary differential equations. Introduction to optimization techniques. prereq: 2031 or 2033 or instr consent

CSCI 5304. Computational Aspects of Matrix Theory. (3 cr.; Student Option; Every Fall)

CSCI 5403. Computational Complexity. (3 cr.; Student Option; Periodic Fall & Spring)
Computational models, complexity measures in each model, and related complexity classes. prereq: 4041 or instr consent

CSCI 5421. Advanced Algorithms and Data Structures. (3 cr.; Student Option; Every Fall & Spring)
Fundamental paradigms of algorithm and data structure design. Divide-and-conquer, dynamic programming, greedy method, graph algorithms, amortization, priority queues and variants, search structures, disjoint-set structures. Theoretical underpinnings. Examples from various problem domains. prereq: 4041 or instr consent

CSCI 5451. Introduction to Parallel Computing: Architectures, Algorithms, and Programming. (3 cr.; Student Option; Every Spring)
Parallel architectures design, embeddings, routing. Examples of parallel computers. Fundamental communication operations. Performance metrics. Parallel algorithms for sorting. Matrix problems, graph problems, dynamic load balancing, types of parallelisms. Parallel programming paradigms. Message passing programming in MPI. Shared-address space programming in OpenMP or threads. prereq: 4041 or instr consent

CSCI 5461. Functional Genomics, Systems Biology, and Bioinformatics. (3 cr.; Student Option; Every Spring)
Computational methods for analyzing, integrating, and deriving predictions from genomic/proteomic data. Analyzing gene expression, proteomic data, and protein-protein interaction networks. Protein/gene function prediction, Integrating diverse data, visualizing genomic datasets. prereq: 3003 or 4041 or instr consent

CSCI 5465. Introduction to Computing for Biologists. (3 cr.; Student Option; Fall Odd Year)
This course is designed for graduate students in biology or other related sciences that wish to learn fundamental computing skills that will enable them to develop their own computational approaches for meaningful interpretation of scientific data. Students will complete programming assignments in Python and R. No previous programming knowledge assumed. Prereq: Introductory biology course; non-CSE students only.

CSCI 5471. Modern Cryptography. (3 cr.; Student Option; Periodic Fall & Spring)
Introduction to cryptography. Theoretical foundations, practical applications. Threats, attacks, and countermeasures, including cryptosystems and cryptographic protocols. Secure systems/networks. History of cryptography, encryption (conventional, public key), digital signatures, hash functions, message authentication codes, identification, authentication, applications. prereq: [2011, 4041, [familiarity with number theory or finite fields]] or instr consent

CSCI 5481. Computational Techniques for Genomics. (3 cr.; Student Option; Every Fall)

CSCI 5511. Artificial Intelligence I. (3 cr.; Student Option; Every Fall)
CSCI 5512. Artificial Intelligence II. (3 cr.; Student Option; Every Spring) Uncertainty in artificial intelligence. Probability as a model of uncertainty, methods for reasoning/learning under uncertainty, utility theory, decision-theoretic methods. prereq: [STAT 3021, 4041] or instr consent

CSCI 5521. Introduction to Machine Learning. (3 cr.; Student Option; Periodic Fall) Problems of pattern recognition, feature selection, measurement techniques. Statistical decision theory, nonstatistical techniques. Automatic feature selection/data clustering. Syntactic pattern recognition. Mathematical pattern recognition/artificial intelligence. prereq: [2031 or 2033], STAT 3021 or instr consent

CSCI 5523. Introduction to Data Mining. (3 cr.; Student Option; Periodic Fall & Spring) Data pre-processing techniques, data types, similarity measures, data visualization/exploration. Predictive models (e.g., decision trees, SVM, Bayes, K-nearest neighbors, bagging, boosting). Model evaluation techniques. Clustering (hierarchical, partitional, density-based), association analysis, anomaly detection. Case studies from areas such as earth science, the Web, network intrusion, and genomics. Hands-on projects. prereq: 4041 or equiv or instr consent

CSCI 5525. Machine Learning. (3 cr.; Student Option; Fall Every Year) Models of learning. Supervised algorithms such as perceptrons, logistic regression, and large margin methods (SVMs, boosting). Hypothesis evaluation. Learning theory. Online algorithms such as winnow and weighted majority. Unsupervised algorithms, dimensionality reduction, spectral methods, Graphical models. prereq: Grad student or instr consent

CSCI 5551. Introduction to Intelligent Robotic Systems. (3 cr.; Student Option; Periodic Fall) Transformations, kinematics/reverse kinematics, dynamics, control. Sensing (robot vision, force control, tactile sensing), applications of sensor-based robot control, robot programming, mobile robotics, microrobotics. prereq: 2031 or 2033 or instr consent

CSCI 5552. Sensing and Estimation in Robotics. (3 cr.; Student Option; Periodic Spring) Bayesian estimation, maximum likelihood estimation, Kalman filtering, particle filtering. Sensor modeling and fusion. Mobile robot motion estimation (odometry, inertial, laser scan matching, vision-based) and path planning. Map representations, landmark-based localization, Markov localization, simultaneous localization/mapping (SLAM), multi-robot localization/mapping. prereq: [5551, Stat 3021] or instr consent

CSCI 5561. Computer Vision. (3 cr.; Student Option; Every Spring) Issues in perspective transformations, edge detection, image filtering, image segmentation, and feature tracking. Complex problems in shape recovery, stereo, active vision, autonomous navigation, shadows, and physics-based vision. Applications. prereq: 5511 or instr consent

CSCI 5607. Fundamentals of Computer Graphics 1. (3 cr.; Student Option; Every Fall) Fundamental algorithms in computer graphics. Emphasizes programming projects in C/C++. Scan conversion, hidden surface removal, geometrical transformations, projection, illumination/shading, parametric cubic curves, texture mapping, antialiasing, ray tracing. Developing graphics software, graphics research. prereq: concurrent registration is required (or allowed) in 2033, concurrent registration is required (or allowed) in 3081


CSCI 5609. Visualization. (3 cr.; Student Option; Fall Every Year) Fundamental theory/practice in data visualization. Programming applications. Perceptual issues in effective data representation, multivariate visualization, information visualization, vector field/volume visualization. prereq: [1913, 4041] or equiv or instr consent

CSCI 5611. Animation & Planning in Games. (3 cr.; Student Option; Fall Odd Year) Theory behind algorithms used to bring virtual worlds to life. Computer animation topics. Real-time, interactive techniques used in modern games. Physically-based animation, motion planning, character animation, simulation in virtual worlds. prereq: 4041 or 4611 or instr consent

CSCI 5619. Virtual Reality and 3D Interaction. (3 cr.; Student Option; Spring Odd Year) Introduction to software, technology/applications in virtual/augmented reality, 3D user interaction. Overview of current research. Hands-on projects. prereq: 4611 or 5607 or 5115 or equiv or instr consent

CSCI 5707. Principles of Database Systems. (3 cr.; Student Option; Every Fall) Concepts, database architecture, alternative conceptual data models, foundations of data manipulation/analysis, logical data models, database designs, models of database security/integrity, current trends. prereq: [4041 or instr consent], grad student


CSCI 5715. From GPS and Virtual Globes to Spatial Computing. (3 cr.; Student Option; Spring Even Year) Mathematical concepts, geo-information, representations, algorithms, data-structures/access methods, analysis, architectures, interfaces, reasoning, time. prereq: Familiarity with Java, C++, or Python

CSCI 5801. Software Engineering I. (3 cr.; Student Option; Every Fall) Advanced introduction to software engineering. Software life cycle, development models, software requirements analysis, software design, coding, maintenance. prereq: 2041 or instr consent

CSCI 5802. Software Engineering II. (3 cr.; Student Option; Periodic Spring) Introduction to software testing, software maturity models, cost specification models, bug estimation, software reliability models, software complexity, quality control, and experience report. Student groups specify, design, implement, and test partial software systems. Application of general software development methods and principles from 5801. prereq: 5801 or instr consent

CSCI 5890. Special Topics in Computer Science. (1-3 cr.; max 27 cr.; Student Option; Periodic Fall & Spring) Lectures and informal discussions on current topics in computer science. prereq: instr consent; may be repeated for cr

CSCI 5991. Independent Study. (1-3 cr.; max 9 cr.; Student Option; Every Fall, Spring & Summer) Independent study arranged with CS faculty member. prereq: instr consent; may be repeated for cr

CSCI 5994. Directed Research. (1-3 cr.; max 9 cr.; Student Option; Every Fall, Spring & Summer) Directed research arranged with faculty member. prereq: instr consent; may be repeated for cr

CSCI 5996. Curricular Practical Training. (1-3 cr.; max 3 cr.; S-N or Audit; Every Fall, Spring & Summer) Industrial work assignment involving advanced computer technology. Reviewed by faculty member. Grade based on final report covering work assignment. prereq: [CSci or CompE] major, instr consent

CSCI 8001. Introduction to Research in Computer Science I. (1 cr.; A-F only; Every Fall) First of two-part sequence course. Students must take both parts to complete course and receive grade. Conducting literature review. Identifying research questions. Writing a research proposal. Research areas in CS. Practical research skills. Research ethics. Resources. prereq: 1st yr CS PhD student
CSCI 8002. Introduction to Research in Computer Science, II. (2 cr. ; A-F only; Every Spring)
Second of two-part sequence course. Students must take both parts to complete course and receive grade. Conducting literature review. Identifying research questions. Writing a research proposal. Research areas in CS. Practical research skills. Research ethics. Resources. prerequisite: 8001, 1st yr CS PhD student

CSCI 8101. Advanced Operating Systems. (; 3 cr. ; Student Option; Periodic Fall)
Successful research systems and existing theory of systems design. Goal is not merely to catalog systems or learn mathematics, but to develop a sense of elegance of design that leads to successful systems. prerequisite: 5103 or instr consent

CSCI 8102. Foundations of Distributed Computing. (; 3 cr. ; Student Option; Periodic Spring)
Fundamental principles underlying design of distributed and multiprocessor operating systems. Foundations of distributed computing systems; shared multiprocessor systems. prerequisite: 8101 or instr consent

CSCI 8115. Human-Computer Interaction and User Interface Technology. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Current research issues in human-computer interaction, user interface toolkits and frameworks, and related areas. Research techniques, model-based development, gesture-based interfaces, constraint-based programming, event processing models, innovative systems. HCI in multimedia systems. prerequisite: 5115 or instr consent

CSCI 8117. Understanding the Social Web. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Research on the social web, Read, present, and discuss papers, do homework using social web research techniques such as data analysis and simulation. Semester research project. prerequisite: CS grad or instr consent

CSCI 8161. Advanced Compiler Techniques. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Techniques for uniprocessors and parallel computers. Fundamental program analysis algorithms such as data flow analysis and data dependence analysis. Variety of code generation and transformation techniques. prerequisite: 4061 or instr consent

CSCI 8205. Parallel Computer Organization. (; 3 cr. ; Student Option; Every Spring)
Design/implementation of multiprocessor systems. Parallel machine organization, system design. Differences between parallel, uniprocessor machines. Programming models. Synchronization/communication. Topologies, message routing strategies. Performance optimization techniques. Compiler, system software issues. prerequisite: 5204 or EE 5364 or instr consent

CSCI 8211. Advanced Computer Networks and Their Applications. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Current research issues in traffic and resource management, quality-of-service provisioning for integrated services networks (such as next-generation Internet and ATM networks) and multimedia networking. prerequisite: 5211 or instr consent

CSCI 8271. Security and Privacy in Computing. (; 3 cr. ; A-F or Audit; Periodic Fall)
Recent security/privacy issues in computer systems/networks. Threats, attacks, countermeasures. Security research, authentication, network security, wireless security, computer system security, anonymous system, pseudonym, access control, intrusion detection system, cryptographic protocols. How to pursue research in security and design secure systems. prerequisite: [5211, 5103] or instr consent; 5471 or EE 5248 or Math 5248 or equiv recommended

CSCI 8314. Sparse Matrix Computations. (; 3 cr. ; Student Option; Periodic Spring)
Sparsity and sparse matrices. Data structures for sparse matrices. Direct methods for sparse linear systems. Reordering techniques to reduce fill-in such as minimal degree ordering and nested dissection ordering. Iterative methods. Preconditioning algorithms. Algorithms for sparse eigenvalue problems and sparse least-squares. prerequisite: 5304 or numerical linear algebra course or instr consent

CSCI 8333. FTE: Master's. (; 1 cr. ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Master's student, adviser and DGS consent

CSCI 8363. Numerical Linear Algebra in Data Exploration. (; 3 cr. ; Student Option; Periodic Spring)
Computational methods in linear algebra, matrix decompositions for linear equations, least squares, eigenvalue problems, singular value decomposition, conditioning, stability in method for machine learning, large data collections. Principal directions, unsupervised clustering, latent semantic indexing, linear least squares fit. Markov chain models on hyperlink structure. prerequisite: 5304 or instr consent

CSCI 8442. Computational Geometry and Applications. (; 3 cr. ; Student Option; Periodic Spring)
Designing efficient algorithms and data structures for geometric problems. Models of computation, convex hulls, geometric duality, multidimensional search, Voronoi diagrams and Delaunay triangulations, linear programming in fixed dimensions, lower bound techniques. Applications, advanced topics. prerequisite: 5421 or instr consent

CSCI 8444. FTE: Doctoral. (; 1 cr. ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Doctoral student, adviser and DGS consent

CSCI 8551. Intelligent Agents. (; 3 cr. ; Student Option; Periodic Fall)
Theories of intelligent agents. Agent architectures; knowledge representation, communication, cooperation, and negotiation among multiple agents; planning and learning; issues in designing agents with a physical body; dealing with sensors and actuators; world modeling. prerequisite: 5511 or instr consent

CSCI 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. ; max 12 cr.) ; No Grade Associated; Every Fall, Spring & Summer)
tbd prerequisite: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CSCI 8701. Overview of Database Research. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Research papers from journals and conferences on current topics in databases, such as database research methodologies, relational implementation techniques, active databases, storage systems, benchmarking, distributed and parallel databases, new data models, prototype systems, data mining, and future directions. prerequisite: 5708 or instr consent

CSCI 8715. Spatial Data Science Research. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Motivation, models of spatial information, querying spatial data, processing strategies for spatial queries, multi-dimensional storage/ access methods, spatial graph datasets, spatial data mining, trends (e.g., spatio-temporal databases, mobile objects, raster databases), research literature, how to pursue research. prerequisite: 4707 or 5707 or 5715 or GIS 5571 or GIS 5573

CSCI 8725. Databases for Bioinformatics. (; 3 cr. ; Student Option; Periodic Spring)
DBMS support for biological databases, data models. Searching integrated public domain databases. Queries/analyses, DBMS extensions, emerging applications. prerequisite: 4707 or 5707 or instr consent

CSCI 8735. Advanced Database Systems. (; 3 cr. ; A-F or Audit; Periodic Fall)
Database systems for emerging applications, nontraditional query processors, multi-dimensional data indexing. Current research trends. prerequisite: 4707 or 5707 or 5708

CSCI 8760. Plan B Project. (; 3 cr. ; S-N or Audit; Every Fall & Spring)
Project arranged between student and faculty. prerequisite: CSci MS student, instr consent

CSCI 8777. Thesis Credits: Master's. (; 1-18 cr. ; max 50 cr.) ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CSCI 8801. Advanced Software Engineering. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Software reusability, internet/intranet programming, software reengineering, and software safety. prerequisite: 5801 or instr consent

CSCI 8888. Thesis Credit: Doctoral. (; 1-24 cr. ; max 100 cr.) ; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Max 18 cr per semester or summer; 24 cr required

CSCI 8970. Computer Science Colloquium. (; 1 cr. ; S-N or Audit; Every Fall & Spring)
Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSCI 8980. Special Advanced Topics in Computer Science. (1-3 cr. [max 27 cr.]; Student Option; Every Fall & Spring) Lectures and informal discussions. prereq: instr consent

CSCI 8991. Independent Study. (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring) Independent study with professor. prereq: instr consent

CSCI 8994. Directed Research in Computer Science. (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring) Directed research with professor. prereq: instr consent

Conservation Sciences (CONS)

CONS 8001. Conservation Biology Seminar. (1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Topics vary. prereq: instr consent

CONS 8004. Economic and Social Aspects of Conservation Biology. (3 cr.; Student Option; Every Fall) Economic/social aspects of conservation biology. Ecological economics, human dimension of conservation biology, values of conserving species/ecosystems. prereq: CBio student or instr consent

CONS 8093. Directed Study Experience. (1-5 cr. [max 6 cr.]; S-N or Audit; Periodic Fall) Directed Study Experience prereq: instr consent

CONS 8095. Contemporary Problems in Conservation Biology. (1 cr.; S-N or Audit; Every Fall & Spring) Comprehensive review of conservation biology issue. Written exam, prereq: 8004, FW 8452, instr consent

CONS 8103. Research in Support of Resource Management: a Dialog With Land Managers. (2 cr.; S-N only; Fall Odd Year) Effective communication between researchers and natural resource managers. Organized around research needs of land managers. Students select topics of interest from these needs and, as small teams, prepare short research proposals to address each topic.

CONS 8201. How to Excel in Graduate School. (2 cr. [max 8 cr.]; S-N only; Every Fall) Overview of history/philosophy of science as framework for writing thesis or dissertation. How to conduct research. Time management.

CONS 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

CONS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

CONS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CONS 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

CONS 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral thesis credit. prereq: Max 18 cr per semester or summer; 24 cr required; prior to passing written and oral prelims, must have: 1 yr coursework in program; approval on a degree program; 1-2 pg research proposal (approved by adviser) to DGS asst

Continuing Dental Education (CDED)

CDED 6101. Postgraduate Contemporary Esthetic Dentistry I: Level I—Lecture/Laboratory Series. (5 cr.; S-N or Audit; Every Fall, Spring & Summer) Dental materials, occlusion, dental photography, smile design, anterior ceramic restorations, posterior ceramic restorations. Color, bleaching, and endoesthetics. Anterior composite restorations. Posterior composite restorations, fiber-reinforced composite bridges, in-office indirect restorations, partial/full denture esthetics, implant esthetics, perio esthetics, practice management for contemporary esthetic dentistry. Lectures, discussion, lab applications.

CDED 6202. Postgraduate Contemporary Esthetic Dentistry: Level II—Patient Series. (5 cr.; S-N or Audit; Every Fall, Spring & Summer) Dental photography, anterior/posterior composite restorations, indirect anterior restorations, direct posterior restorations. Lectures, case presentations. Clinical experience with multi-unit, complex restorative problems. prereq: 6101


CDED 7302. Postgraduate Contemporary Esthetic Dentistry: Level III—Orthodontic and Periodontal Esthetics. (1-1.5 cr.; S-N or Audit; ) How periodontal/orthodontic therapies may be used to enhance esthetic outcome of restorative cases. How to use cephalometric analysis for evaluating facial esthetics. When to use limited orthodontic treatment before restorative treatment. How to eliminate uneven gingival contours, lengthen crowns, recontour interdental papilla, and optimize periodontal esthetics around dental implants. Lectures, workshop with removable appliances. Surgical demonstrations, discussions of cases from practice.

CDED 7303. Postgraduate Contemporary Esthetic Dentistry: Level III—Dental Implants. (2 cr.; S-N or Audit; ) How to use dental implants as part of restorative treatment plan. Patient selection/ treatment planning, surgical phases of implant placement, restorative phases of implant placement, perioesthetics related to dental implants. Lectures, lab, clinical demonstrations, discussion of cases from practice.


CDED 7306. Postgraduate Contemporary Esthetic Dentistry: Level III—Diagnostic Box. (1 cr.; S-N or Audit; ) Advanced techniques for photographic, cosmetic, and occlusal analysis. How to customize gender, age, and personality into case design. Emphasizes effective case presentation and staff involvement. Lecture, lab, clinical experience with diagnostic records, cosmetic previews.

CDED 7307. Postgraduate Contemporary Esthetic Dentistry: Level III—Technology in Restorative Dentistry. (1 cr.; S-N or Audit; ) How to incorporate new technologies into practice. Composite curing technology, digital radiography, high tech software programs CAD/CAM technology digital cameras, diagnodont, intraoral cameras, other new high tech equipment. CEREC, digital radiography, digital cameras, diagnodont, high tech software systems. Small group interaction with faculty.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

University of Minnesota Twin Cities Catalog Fall, 2018
CDED 7401. Postgraduate Contemporary Esthetic Dentistry: Level III—Research Design. (1 cr.; S-N or Audit; )
Analyzing research findings, writing a research proposal. Problem-based dental literature. Evaluate claims made by dental manufacturers. Methods of research design, data collection/interpretation. Methods to pose a research question, prepare a research plan, and apply analytical skills to everyday practice.

CDED 7402. Postgraduate Contemporary Esthetic Dentistry: Level III—Independent Research Paper. (3-5 cr.; S-N or Audit; Periodic Fall & Spring)
Independent research paper under supervision of faculty mentor. Selected topic must pose a research question, follow established research protocol, and advance knowledge in the field of contemporary restorative/esthetic dentistry. prereq: 7401

COPT 5001. Elementary Coptic. (3 cr.; Student Option; )
Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic. (3 cr.; Student Option; Periodic Fall)
Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts. prereq: 5001 or equiv

CSPH 5115. Cultural Awareness, Knowledge and Health. (3 cr.; Student Option; Every Spring)
How knowledge can become resource for individual, family, community health. Interactive glimpse of wisdom of cultural communities. Develop capacity to see culture within professional education/practice. Cultural constructs underpinning medical system, role of culture in interaction between practitioner/patient, role of reconnection to cultural heritage in healing. prereq: Jr or Sr or grad student or instr consent

CSPH 5118. Whole Person, Whole Community: The Reciprocity of Wellbeing. (3 cr.; Student Option No Audit; Every Fall & Spring)
This course explores the symbiotic and reciprocal relationship between individual and community health and wellbeing, as well as the many factors/forces which influence that relationship. Drawing upon recent studies in the area of reciprocal/symbiotic effects between individual wellbeing and community wellbeing, this course will include the following core topics: definitions of community and related dimensions of wellbeing, importance of Individual/Community reciprocity (Social Justice, Equity, Safety, and Trust), historical trauma and healing, and individual action and personal empowerment in community transformation. Utilizing elements of the Center for Spirituality & Healing's Wellbeing model and modes of contemplative practice, this course will ultimately assist learners through phases of individual reflection and mindfulness for the purpose of creating more open and reciprocal relationships with entities they describe as their communities. An extension of recent studies in the area of the reciprocal (or rippling) effect between individual wellbeing and community wellbeing this course will guide individuals in identifying the various communities in which they live or participate, the roles they "play" within those communities and why/how this knowledge can help prepare them for action and leadership. Main themes of the course will include: - Mindfulness, Reflection and Healing: Historical Trauma and Marginalization. - Roles and Reciprocity: Justice, Equity, Security and Trust between individuals and their communities. - Transformation: Individual Action/Leadership as Bridge between Personal and Community Wellbeing.

CSPH 5121. Whole Systems Healing: Health and the Environment. (2 cr.; Student Option; Every Fall & Spring)
Selected interfaces between human health and the environment. Using complexity theory as a theoretical framework, students use phenomenological methodologies to analyze and describe the interrelated dynamics of human and natural systems. Case studies. Develop strategies to optimize the healthy functioning of human/environmental systems. prereq: Jr or Sr or grad student

CSPH 5201. Spirituality and Resilience. (2 cr.; Student Option; Every Spring & Summer)
Links between resilience and spirituality. Applications of resilience/heath realization model to students' professional and personal lives. Review of literature, theory, and research. prereq: Jr or Sr or grad student or instr consent

CSPH 5211. Peacemaking and Spirituality: A Journey Toward Healing and Strength. (2-3 cr.; Student Option; Every Fall & Summer)
Influence of spirituality upon process of resolving conflict and making peace in intense interpersonal/intrapersonal conflicts in multiple health care and social work settings, including in families, between patients/clients and nurses/social workers, within communities, among friends, between co-workers, or within ourselves. prereq: Jr or Sr or grad student or instr consent

CSPH 5212. Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community. (3 cr.; Student Option; Every Spring & Summer)
Contemplative/mindfulness practice. Tapping into reservoir of strength, compassion, and wisdom that fosters expressions of unconditional love, reconciliation, and forgiveness. Shifting from ego centered cognitive analysis/assessment to heart centered presence and deep listening grounded in humility/compassion. Native American circle process, including use of talking piece. prereq: Jr or Sr or grad student or instr consent

CSPH 5215. Forgiveness and Healing: A Journey Toward Wholeness. (3 cr.; Student Option; Every Spring & Summer)
Impact of forgiveness on process of interpersonal healing. Forgiveness/healing in health care and social work settings from multiple spiritual/secular traditions. prereq: Jr or Sr or grad student or instr consent

CSPH 5225. Meditation: Integrating Body and Mind. (2 cr.; Student Option; Periodic Fall)
Meditation as a physical, emotional, intellectual, and spiritual inquiry. Students examine a variety of texts and develop ability to enter a state of calm, meditative awareness. prereq: Jr or Sr or grad student or instr consent

CSPH 5226. Advanced Meditation: Body, Brain, Mind, and Universe. (1 cr.; Student Option; Periodic Fall)
Students work to integrate meditation practice into daily life, cultivating awareness of the fundamental oneness of body, brain, mind, and universe. Mind-body interactions in health. "Hard problem" of consciousness in brain science. Emergence of compassion, wisdom, and healing in non-discursive awareness. prereq: [5225, Jr or Sr or grad student] or instr consent

CSPH 5311. Introduction to Traditional Chinese Medicine. (2 cr.; A-F or Audit; Every Spring & Summer)
Philosophical roots of Shamanism, Confucianism, Taoism, and Buddhism. Influence of these philosophies on Chinese medicine. Evolution of concepts of the tao, Yin-
Yang, microcosm, macrocosm. Development of herbal medicine, Tui Na, Qi Gong, acupuncture, moxibustion. Traditional Chinese medicine etiology of disease, physiology, diagnosis, therapy, disease prevention, ethics, psychology, cosmology. prereq: Jr or sr or grad student or instr consent

CSPH 5313. Acupuncture. (1 cr.; Student Option; Every Fall & Summer) Principles and research-based guidelines for use, and techniques of stimulation of acupressure points. Methods for self care and care of others. Treatment of pain conditions, chronic health conditions, palliative care, oncology, women's health care.

CSPH 5315. Traditional Tibetan Medicine: Ethics, Spirituality, and Healing. (2 cr.; Student Option; Periodic Fall) Ethics, spirituality, and healing from the perspective of traditional Tibetan medicine. Belief that illness results from imbalance and that treating illness requires correcting underlying imbalance. How to apply these principles, integrate them into clinical practice, and consult with a traditional Tibetan doctor. prereq: Jr or sr or grad student or instr consent

CSPH 5317. Yoga: Ethics, Spirituality, and Healing. (2 cr.; Student Option; Every Summer) Students test claim that systematic yoga practice leads to optimal health. Yoga's philosophy, scientific evidence, practical application. Students propose research-based programs for integrating yoga into personal/professional life.

CSPH 5318. Tibetan Medicine, Ayurveda, and Yoga in India. (4 cr.; Student Option No Audit; Every Fall & Summer) Students study with expert practitioners in India. Using critical thinking, philosophical knowledge, cultural practices, scientific evidence, and research-based programs to integrate these traditions into personal/professional life. prereq: [5315, 5317] or instr consent

CSPH 5319. Yoga and Ayurveda in India. (4 cr.; Student Option No Audit; Every Spring) Yoga and Ayurveda are interrelated, ancient, holistic Indian traditions that integrate ethics, spirituality, and healing. While studying with expert practitioners at the University of Minnesota and in India, students will examine the claim that the systematic practice of these traditions promotes healing and optimal health. prereq: CSPH 4311 (and instructor approval), CSPH 5317 or CSPH 5318 or instructor consent.

CSPH 5331. Foundations of Shamanism and Shamanic Healing. (2 cr.; S-N or Audit; Periodic Fall) 3-day retreat intensive. Shamanic philosophies, ritual etiquette, Core beliefs common to all shamanic healing practices. Cross-cultural healing beliefs/practices, unique psychology for understanding them, their use with contemporary healing practices and for personal growth. prereq: Jr or sr or grad student or instr consent

CSPH 5332. Global Healing Traditions: Amazonia Plant Spirit Medicine. (2 cr.; Student Option; Periodic Fall) Non-biomedical traditional healing paradigms as practiced in other parts of the world. Focuses on indigenous healing practices in Peru as directed by a local shaman. prereq: [5331, [grad student or jr or sr in health science or practicing health professional]] or instr consent

CSPH 5341. Overview of Indigenous Hawaiian Healing. (2 cr.; Student Option; Every Fall) Traditional Hawaiian healing, ho'olomilomi (massage), la‘au lapa‘au (herbal medicine) and ho‘oponopono (conflict resolution). Hawaiian epistemology, traditions, and cultural values compared with western. The science of traditional ecological knowledge for healing and self-reliance.


CSPH 5401. People, Plants, and Drugs: Introduction to Ethnopharmacology. (3 cr.; Student Option; Every Fall, Spring & Summer) Biologically active substances used in traditional cultures. Ethnopharmacology's past, current, and potential contributions to human knowledge. Concrete examples. prereq: Jr or sr or grad student or instr consent

CSPH 5405. Plants in Human Affairs. (4 cr.; Student Option; Periodic Fall) Twelve-day, intensive course. Introduction to ethnobotany/ethnopharmacology. Lectures, field trips, presentations by local experts. prereq: Jr or sr or grad student or instr consent

CSPH 5421. Botanical Medicines in Integrative Healthcare. (3 cr.; Student Option; Every Fall) Widely-used botanical medicines from biomedical perspective. Alternative therapeutic systems presented according to bodily systems/processes. Evidence for therapeutic use. Botanical characteristics, traditional uses, chemical properties, dosage, hazards/safety issues, quality control. prereq: Jr or sr or grad student or instr consent


CSPH 5431. Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health. (2 cr.; Student Option; Periodic Fall) Principles of nutrition related to metabolic function. Model attempts to reduce chronic disease by looking for underlying causes/triggers and to intervene to restore function and achieve optimal health. Emphasizes importance of nutrition as a component of self-care. prereq: [ Jr or sr or grad student] in Health Sciences or instr consent

CSPH 5503. Aromatherapy Fundamentals. (1 cr.; Student Option; Every Spring & Summer) For health professional students/practicing health professionals. Essential oil therapy and current aromatherapy practices in clinical settings. Key safety/toxicity issues. Critique scientific/historical evidence about the therapeutic qualities of six essential oils in common use by the public and in clinical settings. prereq: Jr or sr or grad student

CSPH 5511. Interdisciplinary Palliative Care: An Experiential Course in a Community Setting. (2 cr.; Student Option; Every Fall & Spring) Multidisciplinary student teams partner with interdisciplinary community hospice teams in delivery of care to patients in a variety of settings. Series of seminars employs self-analysis/case studies. prereq: instr consent

CSPH 5512. Spiritual Aspects of Palliative Care. (2 cr.; Student Option; Every Fall, Spring & Summer) This course examines spiritual care as an essential component of providing palliative care across the life span. Students will explore spiritual assessment tools, spiritual care models, and formulate a spiritual care plan within an interdisciplinary team perspective. prereq: Instructor consent

CSPH 5513. Living Well, Dying Well: Empowering Patient Communication at the End of Life. (2 cr.; Student Option No Audit; Every Fall) Students will learn how to provide compassionate and effective care at the end of life, including appropriate communication with patients, families, and healthcare providers at crucial points of care. Students will also explore their own perspectives about end of life and learn the importance of self-care. The course will help students reframe end-of-life care from a focus on medical death to an emphasis on humane dying through reflection on values, hopes, and plans. Students will learn to support individuals through personal connection and the sharing of narratives and wisdom.

CSPH 5521. Therapeutic Landscapes. (3 cr.; Student Option; Every Spring) Principles of therapeutic design for specific population requirements. Therapeutic landscape design. Incorporates interdisciplinary interaction between horticulture, landscape architecture, and health science departments. prereq: [ Jr or sr or grad student] in [health sciences or therapeutic recreation or horticulture or landscape architecture] or health professional or instr consent

CSPH 5522. Therapeutic Horticulture. (3 cr.; Student Option; Periodic Fall) Central elements of therapeutic horticulture in context of multiple health care settings.
CSPH 5533. Introduction to Energy Healing. (2 cr.; Student Option; Every Fall) Healing techniques that use energetic systems in body to enhance body's ability to heal. Therapeutic touch, healing touch, Reiki, acupuncture, reflexology, magnets, homeopathy. Scientific theories on mechanisms of energetic medicine and ways to measure energy. Students interact with practitioners of energy healing. prereq: Jr or Sr or grad student or instr consent

CSPH 5535. Reiki Healing. (1 cr.; S-N only; Every Fall, Spring & Summer) History, principles, precepts, and practical application of Reiki energy healing. Alternative energy healing modalities, current research findings. Activation of the Reiki energy, hand positions to perform a treatment. Students provide Reiki treatments, discuss findings. prereq: Jr or Sr or grad student or instr consent

CSPH 5536. Advanced Reiki Healing: Level II. (3 cr.; S-N only; Every Spring) Principles/application of Reiki energy healing. Four levels of healing. Emphasizes healing at spiritual level. Activation of Reiki energy. Symbols that allow for energy transfer through space/time. Using second level Reiki energy for both distance healing and standard Reiki treatment. Students provide Reiki treatments, discuss findings. Current literature, research findings. prereq: 5535, instr consent

CSPH 5541. Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind. (2 cr.; Student Option; Every Fall) Experiential training in the cultivation of happiness, emotional health, and healing for multi-disciplinary professions. Ancient/contemporary, eastern/western approaches. How to integrate techniques to transform emotions and mind states. Meditation, integrative approaches. Case examples. prereq: Sr or grad student or instr consent

CSPH 5555. Introduction to Body and Movement-based Therapies. (2 cr.; Student Option; Periodic Fall) Theories/approaches of selected somatic therapies, including dance, movement, and body-based therapies. Historic/theoretical perspectives on use of movement, dance, and somatic re-patterning. Demonstrations of techniques. Application of techniques to specific populations/settings. prereq: Jr or Sr or grad student or instr consent

CSPH 5561. Overview of the Creative Arts in Health and Healing. (2 cr.; Student Option; Every Summer) How creative arts therapies are integrated into health care. Art therapy, poetry therapy, dance/movement therapy, music therapy. Guided experiential exercises, discussions, readings, individual learning interventions, lectures. prereq: Jr or Sr or grad student

CSPH 5601. Music, Health and Healing. (2 cr.; Student Option; Every Fall & Summer) Music therapy, music medicine, music psychotherapy. Techniques/interventions, hypotheses/rationale related to interventions. Related research. prereq: Jr or Sr or grad student or instr consent


CSPH 5631. Healing Imagery I. (2 cr.; Student Option; Every Spring) How imagery and imagery interventions are implemented for healing and to promote health/wellbeing. Experience/create imagery interventions. Instructional strategies include experiential, discussions, readings, lecture, and individual learning interventions. prereq: Jr or Sr or grad student

CSPH 5641. Animals in Health Care: The Healing Dimensions of Human/Animal Relationships. (3 cr.; Student Option; Every Summer) Central elements of animal assisted therapy in multiple health care settings. History, principles, and evidence-based guidelines. Community-based interventions, in-class demonstrations, field trips. prereq: Jr or Sr or grad student

CSPH 5642. Nature Heals: An Introduction to Nature-Based Therapeutics. (3 cr.; Student Option; Every Fall, Spring & Summer) This course will cover the basic theories and approaches of Nature-Based Therapeutics including restorative environments, therapeutic horticulture, animal assisted interactions, therapeutic landscapes, forest bathing, green care farming, facilitated green exercise, wilderness therapy and ecopsychology. The course includes: 1) historic and theoretical perspectives 2) research into specific techniques 3) application of techniques to specific populations and setting

CSPH 5643. Horse as Teacher: Intro to Nature-Based Therapeutics Equine-Assisted Activities & Therapies (EAAT). (3 cr.; Student Option; Every Fall) This course is designed to introduce students to the field of Equine-Assisted Activities and Therapies (EAAT) and to the range of therapeutic and learning opportunities found within equine interactions. Five domains of practice in EAAT are covered and include physical, social, cognitive, psychological and spiritual contexts. The course presents historical and theoretical concepts which helped develop various types of EAATs, and how the growth of EAAT nationally and internationally has continued to mold the profession. Students will learn to describe safety guidelines, best practices as they are currently known, and precautions and contraindications in EAAT sessions. During a three-day face-to-face class, students will engage in hands-on learning with horses and apply course concepts and topics during this intensive. Students will evaluate peer-reviewed literature in EAAT research to identify the strengths and weaknesses of such published material. Students will synthesize reading, lecture and experiential learning to develop an EAAT plan for an assigned target group population. prereq: Jr or Sr or grad or instr consent


CSPH 5702. Fundamentals of Health Coaching II. (4 cr.; A-F or Audit; Every Spring) Basic tenets of health coaching model. Tools for self development, deep listening, and effective communication. Core building blocks for optimal health from a holistic perspective. Identifying benchmarking stages/patterns of change, interfacing with interdisciplinary health care providers, locating resources to assist clients in decision making, and educating clients on self-care practices. prereq: CSPH 5701; admitted to Integrative Health and Wellbeing Coaching MA program; or, Integrative Therapies and Healing Practices Certificate-Health Coaching track; or, instr consent.


CSPH 5704. Business of Health Coaching. (2 cr.; A-F only; Every Fall) Applying health coaching knowledge/skills in service delivery venues or private practice. Starting business. Business models. Student determine structure/venue appropriate for
them. Legal/ethical considerations. prereq: 5101, 5701, 5702, admitted to Integrative Health and Wellbeing Coaching MA; or, Integrative Therapies and Healing Practices Certificate-Health Coaching track; or inst consent.

CSPH 5705. Health Coaching Professional Internship. (2 cr.; S-N only; Every Spring) 120 hours of health coaching practice. Students work with individual clients in acute/longitudinal encounters, provide wellness teaching, design career plan. Prerequisite CSPH 5701, 5702, 5703; admitted to Integrative Health and Wellbeing Coaching MA; or, Integrative Therapies and Healing Practices Certificate-Health Coaching track [CSPH 5101, 5704 recommended]

CSPH 5706. Lifestyle Medicine. (2 cr.; Student Option; Every Fall & Summer) This course provides a foundation in the theory and clinical application of lifestyle medicine. Lifestyle medicine aims to address the behavioral and lifestyle bases of common illnesses through promoting healthy behaviors and reducing harmful behaviors. In this course, we will explore optional nutrition, lifestyle, physical activity, and attitude. We will examine the emerging evidence base of lifestyle medicine and how it relates to health promotion and disease prevention. Participants will be introduced to common laboratory and imaging findings, and how they relate to optimal health. prereq: basic course in Biology or Human Physiology.

CSPH 5707. Coaching People with Clinical Conditions. (2 cr.; Student Option; Every Spring & Summer) This course provides the student with a basic awareness and expanded perception of prevalent clinical conditions, and supports the development of empathy. It equips the student with best practice coaching skills to use with a client managing one or more clinical conditions. And it supports the development of professional communication skills. prereq: CSPH 5701, 5702 and 5706; practicing health professional admitted to one of the following programs: Integrative Health and Wellbeing Coaching Master's, Integrative Therapies and Healing Practices Certificate-Health Coaching track; CSPH 5701; CSPH 5702; or instructor consent. This course provides Health Coaching students the opportunity to advance coaching skills/strategies through individual client practice under the supervision of an experienced Health Coaching instructor. The student health coach will engage in recorded in-person and/or telephone coaching sessions, and receive live feedback from the instructor. The student will assess their own integration of coaching skills through completion of self-skills assessment (level appropriate) that includes self-reflection. A final skills assessment (level appropriate) that will completed utilizing the standardized tool developed for the University of Minnesota Health Coaching program (developed in alignment with guidelines the International Consortium for Health and Wellness Coaching). Prereq: Jr or sr or grad student or instr consent

CSPH 5710. Health and Wellbeing Group Coaching. (2 cr.; Student Option No Audit; Every Fall) The Group Coaching course expands the competencies of the Health Coach from the one-to-one coaching process to a group format. Theories and tools of group coaching will be applied to facilitating a group coaching process in the community. Course progress will include: Foundations of Group Coaching; Developing Group Coaching Skills; Application of Group Coaching Skills to a Community Organization; Expanding Theory and Application of Group Coaching. Prereq admission to Integrative Health & Wellbeing Coaching MA or graduate Certificate in Integrative Therapies and Healing Practices-Health Coaching program or instructor approval; CSPH 5701, 5702, 5706; recommended CSPH 5707; or instructor approval.

CSPH 5711. Optimal Healing Environments. (3 cr.; Student Option; Every Fall) Development/implementation of optimal healing environments. Evidence base supporting structural, architectural, human, and care processes. Emphasizes identifying models of optimal healing environments and leadership strategies that support diffusion of innovation. prereq: Jr or Sr or grad student or inst consent

CSPH 5712. Supervised Health Coaching Skills Advancement. (1-2 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) Prereq admitted to Integrative Health and Wellbeing Coaching Master of Arts, Integrative Therapies and Healing Practices Certificate-Health Coaching Track; CSPH 5701; CSPH 5702; or instructor consent. This course provides Health Coaching students the opportunity to advance coaching skills/strategies through individual client practice under the supervision of an experienced Health Coaching instructor. The student health coach will engage in recorded in-person and/or telephone coaching sessions, and receive live feedback from the instructor. The student will assess their own integration of coaching skills through completion of self-skills assessment (level appropriate) that includes self-reflection. A final skills assessment (level appropriate) will be completed utilizing the standardized tool developed for the University of Minnesota Health Coaching program (developed in alignment with guidelines the International Consortium for Health and Wellness Coaching). Prereq: Jr or Sr or grad student or inst consent

CSPH 5713. Health Coaching for Health Professionals. (2 cr.; A-F only; Every Fall) Prereq enrolled in Doctor of Nursing Practice-Integrative Health and Healing track or other health professional program; or instr consent. This course explores the basic tenets of the four pillars of health coaching model: self-awareness, mindful presence, authentic communication, and safe/sacred space. Students will learn to identify/benchmark stages/patterns of change and to respectfully collaborate with interdisciplinary health care providers and facilitate clients ability to achieve sustainable lifestyle changes. Consistent, nonjudgmental application of a holistic perspective of optimal health and wellbeing in patient encounters will be discussed and demonstrated. Students will have the opportunity to observe and to practice applying tools and practices from motivational interviewing, emotional intelligence, appreciative inquiry and non-violent communication. Students will identify the basic elements of an effective coach/client interchange in order to apply basic, effective coaching techniques. Students will be able to differentiate between health coaching, nurse education, case/disease management, and therapy. The course will discuss the importance of coaching personal development in professional practice so that students may apply tools for self-reflection and personal growth in their own lives and work settings.

CSPH 5805. Wellbeing in the Workplace. (3 cr.; Student Option No Audit; Every Fall & Spring) Work and experiences in the workplace have a profound impact on many dimensions of individual and collective wellbeing, including a sense of purpose and meaning, financial and emotional security, quality of relationships and community, physical and emotional health, and the local and global environments. In this course, students will learn multi-disciplinary perspectives on key challenges in creating workplaces that contribute to greater wellbeing. Students will also reflect on their own personal experiences with wellbeing in their current and past work environments and examine strategies for enhancing wellbeing based on interdisciplinary theory and research. Specific topics include the importance of purpose and meaning at work, challenges in achieving work-life integration, the impact of technology on work expectations, and organizational change. This course is based on a whole-life, integrative model of wellbeing and draws from research and theory across the social, behavioral, and health sciences.

CSPH 5806. Wellbeing and Resiliency for Health Professionals. (1 cr.; Student Option; Every Fall; Spring, Summer) This course will teach health professional students and health professionals self-care strategies that will improve their individual wellbeing and reduce the stress and burnout often experienced in these professions. Improving individual wellbeing will also contribute to greater wellbeing in the teams and systems in which these professionals work.

CSPH 5807. Mindfulness in the Workplace: Pause, Practice, Perform. (2 cr.; Student Option; Every Fall & Spring) An experiential course designed to teach core mindfulness skills while also exploring specific applications to the workplace setting. Explores key mindfulness traits and how they relate to essential workplace skills, such as resilience, task execution, critical analysis, intra/interpersonal growth, and leadership. The course will explore existing workplace programs and how corporate culture can be a barrier or a catalyst for adoption of mindfulness principles. From the perspective of the workplace and academic literature,
students will gain an understanding of how to practically apply evidence-based techniques to help them succeed on the job.

CSPH 5905. Food Matters: Cook Like Your Life Depends On It. (1 cr.; Student Option; Every Fall & Spring)
This course examines the role of food as it bears on the current acute care approach to health and healing, the predominance of chronic disease and the important role that lifestyle (physical activity, stress, sleep, diet) has on all aspects of well-being. For healthcare students and future practitioners, this course will support the development of personal food and cooking skills. This will allow them to serve as models to patients, as well as provide tools, resources and applications to support and guide patients in addressing their own diet and cooking challenges, specifically as they pertain to improving their health outcomes. Provides an in-depth exploration of dietary trends, their risks and benefits in relation to current health concerns such as diabetes, obesity, heart disease, etc. Also examines the impact of the Standard American Diet (SAD?) on these public and personal health problems linked to diet and lifestyle. Analyzes the components of a food system including how production, distribution and consumption of food are interrelated.

CSPH 6000. Integrative Therapies and Healing Practices Topics. (1-4 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer)
Topics-based exploration/research on integrative therapies/healing practices. prereq: Grad student or instr consent

CSPH 7001. The Healer’s Art. (1 cr.; S-N only; Every Spring)
Hidden crisis in medicine. Growing loss of meaning/commitment experienced by physicians nationwide under stresses of today’s health care system. How to stress-proof students to meet challenges of practices. prereq: Medical student

CSPH 8100. Special Topics in Complementary Therapy and Healing Practices. (1-6 cr. [max 12 cr.]; Student Option; Periodic Fall, Spring & Summer)
Critiquing research on complementary therapies (e.g., design, outcome measures). Synthesizing research findings for a therapy. Hypothesizing future directions for research on complementary therapies.

CSPH 8101. Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research. (2 cr.; Student Option; Periodic Fall, Spring & Summer)
Seminar. Students evaluate peer-reviewed literature in complementary/alternative healing practices (CAHP) research. Identifying strengths/weaknesses of published research, synthesizing findings from multiple studies. prereq: Grad student

CSPH 8191. Independent Study in Integrative Therapies and Healing Practices. (1-6 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer)
Individual study with faculty guidance. Students write proposal, including outcome objectives/work plan. Faculty member directs work, evaluates project. prereq: instr consent

CSPH 8701. Integrative Health and Wellbeing Coaching MA Capstone Project. (2 cr.; S-N only; Every Fall & Spring)
Culminating course for the master of arts in integrative health and wellbeing coaching program. Students use coaching data collected during the Advanced Health Coaching practicum, Health Coaching Professional internship, or Group Health Coaching course to write and orally present a research-informed concept analysis and retrospective narrative case report. prereq: Integrative Health and Wellbeing Coaching MA student, CSPH 5701, 5702, 5703, 5704, 5706, 5707, 5709.

Cultural Stdy/Comparative Lit (CSCL)

CSCL 5261. European Intellectual History: The Early Modern Period, Antiquity to 1750. (3 cr.; Student Option; Periodic Fall)
First of a two-semester course. European thought in its historical/cultural context. Emphasizes development of philosophical/scientific thought, its relation to thinking about the individual and the community. Readings from original sources.

CSCL 5282. European Intellectual History: The Modern Period, 1750-Present. (3 cr.; A-F or Audit; Periodic Spring)
Second of a two-semester course. European thought in its historical/cultural context. Emphasizes development of philosophical/scientific thought, its relation to thinking about the individual and the community. Readings are from original sources.

CSCL 5302. Aesthetics and the Valuation of Art. (3 cr.; Student Option; Periodic Fall & Spring)
Society, ideology, and aesthetic value considered in light of recent critical theories of visual art, music, and literature. Meditation of place, social class, gender and ideology on aesthetic judgment in post-Renaissance Western culture.

CSCL 5305. Vision and Visuality: An Intellectual History. (3 cr.; A-F only; Periodic Fall & Spring)
Central role of vision/vitality in modernity. Modern age as scopic regime. Ways that ideas/ideologies of perception have shaped aesthetic experience within social existence.

CSCL 5331. Discourse of the Novel. (3 cr.; Student Option; Periodic Fall)
Comparative study of the novel, 18th century to present. Its relations to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity, and its role in articulating international cultural relations.

CSCL 5401. Origins of Cultural Studies. (3 cr.; Student Option; Periodic Fall & Spring)
Intellectual map of the creation of cultural studies as a unique approach to studying social meanings. Key figures and concepts, including nineteenth- and early twentieth century precursors.

CSCL 5411. Avant-Garde Cinema. (4 cr.; A-F or Audit; Every Fall)
History/theory of avant-garde cinema, from classical period (1920s) to post-WWII. prereq: 1921 or ARTH 1921W or equiv

CSCL 5555. Introduction to Semiotics. (3 cr.; Student Option; Periodic Spring)
Role of music in American/European film from early 20th century silent cinema to near present. Narrative features, shorts, documentary, horror, thriller, science fiction, comedy, cartoon. Film music as social/cultural practice and as part of political economy within culture industry.

CSCL 5833. Marx, Freud, Nietzsche: Intellectual Foundations. (3 cr.; Student Option; Periodic Fall & Spring)
Three thinkers who defined modernity: Marx, Freud, and Nietzsche. Central tenets of their thought/terms associated with their theories. Their careers portrayed against the background of their times; their place in intellectual history.

CSCL 5910. Topics in Cultural Studies and Comparative Literature. (3-4 cr.; max 32 cr.; Student Option; Every Fall, Spring & Summer)
Topics specified in Class Schedule.

CSCL 5944H. Honors Thesis. (3 cr.; A-F only; Every Fall & Spring)
Honors thesis. prereq: Candidate for honors in CSCL, consent of CSCL honors adviser

CSCL 5993. Directed Study. (1-3 cr.; max 9 cr.; Student Option; Every Fall, Spring & Summer)
Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

Curriculum and Instruction (Cl)

CI 5008. Theory and Practice of Arts Teaching. (1-2 cr. [max 3 cr.]; A-F or Audit; Every Fall & Spring)
Designed for students pursuing visual or performing arts education licensure, the course explores: 1) Arts concepts, skills, and processes appropriate for elementary school; 2) methods of teaching arts for social justice; and 3) an overview of children’s production of and responses to visual and performing art.

CI 5049. Digital Media & Technology Integration: Arts Education Theory & Practice. (3 cr.; A-F or Audit; Every Summer)
This course explores issues in the visual and performing arts regarding the current and
potential use of technology and digital media in P-12 arts classrooms. Through readings, discussions, artistic production, academic writing, and collaboration, you will understand the use and integration of technology in P-12 arts classrooms as pedagogical tools; the function of scaffolding students' use of digital media as part of 21st century arts teaching and learning; various technological supports for student learning and artistic production; specific digital media theories, pedagogies, and content knowledge; the use of technology in designing, sharing, and conducting lessons; issues concerning the assessment and exhibition of student works; and practical issues of using technology for teaching in and through the arts.

CI 5050. Issues in Art Education. (1-4 cr. [max 8 cr.]; Student Option; Every Fall & Summer) Issues/trends, current practices, recent research.

CI 5065. Improving Arts Programs in the Schools. (3 cr.; A-F or Audit; Every Fall) This course provides students with an exploration of issues in visual and performing arts instruction, including teaching methods and evaluation, philosophical frameworks of pedagogy, and institutional issues concerning arts programs in middle and high schools; social and cultural structures of schooling, practical issues, and teaching arts.

CI 5069. Curriculum Innovations in Arts Education. (3 cr.; A-F or Audit; Every Fall) This course provides students with an examination of traditions in American schooling related to visual and performing arts education curricula.

CI 5075. The Social, Historical and Cultural Foundations of Arts Education. (3 cr.; A-F or Audit; Periodic Fall) The Social, Historical and Cultural Foundations of Arts Education will examine the arts in public education since the 1800s.

CI 5078. Application of Aesthetic Theory in Education. (2 cr.; A-F or Audit; Every Spring & Summer) The course explores: contemporary theories of arts; psychological and philosophical foundations; an overview of children's production of and responses to visual and performing arts.

CI 5096. Arts Education Practicum. (1-6 cr. ; A-F or Audit; Every Fall) In this course, students complete practicum observations in designated K-12 visual art or performing art, special education, and kindergarten classrooms.

CI 5097. Student Teaching in Arts Education. (8 cr.; S-N or Audit; Every Spring & Summer) Teacher candidates spend 16 weeks student teaching in visual art, dance, or theatre. Eight weeks occur in an elementary setting and eight weeks occur in a secondary setting including, but not limited to, middle school.

CI 5105. Increasing Access and Success in Undergraduate Classrooms. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Fundamentals and best practices for promoting student access, persistence, and retention within classroom. Focuses on traditionally under-represented/served populations.

CI 5106. Multicultural Teaching and Learning in Diverse College Contexts. (3 cr.; A-F only; Every Fall) Theory/pedagogy for culturally responsive teaching from perspectives of teachers/learners in postsecondary settings. Critical multicultural education, universal instructional design, integrated multicultural instructional design.

CI 5111. Introduction to Elementary School Teaching. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Curriculum organization, instruction, management, assessment, professional decision making, prereq: Foundations of ed major or elem ed initial lic.

CI 5116. Action Research in Educational Settings. (3 cr.; A-F or Audit; Every Spring) Action research as method of improving teaching/learning in educational settings. Experience doing research in classrooms. Relative strengths/challenges of different approaches to classroom research. Ethical issues.

CI 5121. Culture Power and Education. (3 cr.; A-F only; Every Fall & Spring) In this course we will explore the manifestations of culture and power in education. We will examine the ways in which culture is a mediating factor in the educational achievement of underrepresented students. We will explicate the relationship between home/community and school cultures; and illuminate the detrimental impact of subtractive schooling practices. We then explore the theories and research that have shown the importance of integrating students' interests, knowledges, and experiences/cultures-for increasing student engagement and achievement. Our examination of culturally relevant pedagogy we will move beyond an understanding of "culture" within education as the "celebration" of ethnic food, songs and customs. Instead, we shift toward a more complex understanding of "culture" that takes into account the influences of ethnic culture, youth culture, and popular culture.

CI 5122. Social Class, Education and Pedagogy. (3 cr.; A-F only; Every Fall & Spring) This course will immerse students in social, psychological, economic, and political aspects of social class and poverty, and the implications for education as a social institution and classroom pedagogy. Students will engage in inquiries around social class in the U.S.; working-class literature for adults and children; labor histories; and economic systems' and will learn to design social class-sensitive teaching practices guided by five principles for social class-sensitive change.

CI 5136. History of the American Curriculum. (3 cr.; Student Option;) Survey of formation of public school subjects and curriculum theory in United States.

Social, political, and economic implications of curriculum theory.


CI 5145. Critical Pedagogy. (3 cr.; A-F or Audit; Every Spring) Examination of critical pedagogy; critique of power relations regarding race, culture, class, gender, and age in various educational settings; consideration of improved practice in education for children, youth, and adults.

CI 5150. Curriculum Topics. (3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Curriculum: Instruction and Assessment. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Current research/issues that cross disciplinary boundaries in curriculum development, instructional practices, and assessment methods. Interrelations among curriculum, instruction, and assessment within framework of constructivist learning theory. Individual classroom practices/theories, prereq: Grad students only.

CI 5156. Popular Culture, Teaching, and Learning. (3 cr.; A-F only; Every Fall) Approaches to the study of popular culture and education. Intersection between everyday life and broader historical contexts. Sporting events, toys, clothing, shopping malls, vampire mania, music festivals, video, and comics are the kinds of popular forms of culture we will engage as we develop teaching/learning strategies, prereq: Grad student or sr in a program that values teaching as a component of the discipline.

CI 5163. Child and Adolescent Development for Teaching and Learning I. (1 cr.; A-F only; Every Fall & Summer) Attending to constant transitions/development in which children and adolescents negotiate their road to adulthood. How to foster learning/ positive development, prereq: Enrolled in teacher initial licensure program.

CI 5164. Child and Adolescent Development for Teaching and Learning II. (2 cr.; A-F only; Every Fall & Spring) Transitions/development in which children/adolescents negotiate road to adulthood. How to foster learning/positive development, prereq: Enrolled in teacher initial licensure program.

CI 5177. Practical Research. (1-3 cr.; A-F or Audit; Every Fall, Spring & Summer) Preparation for identifying a research and development topic, reviewing the existing
knowledge on the topic, planning and carrying out a project, further investigating the topic, and writing a report on the project. prereq: CI MEd student, or CI or EdPA Teacher Leadership MEd student

CI 5186. School-Related Projects. (1-4 cr.; A-F or Audit; Every Fall, Spring & Summer) Research or evaluation project related to teaching, curriculum, or other aspect of schooling. Approved and supervised by faculty advisor. prereq: MEd student

CI 5187. Practicum: Improvement of Teaching in Elementary or Pre-Kindergarten Schools. (2-3 cr.; S-N or Audit; Every Fall, Spring & Summer) Elementary school classroom teaching project designed to improve specific teaching skills. Approved and directed by adviser. prereq: Students in early childhood educ M Ed, or elem educ M Ed, or teaching M Ed

CI 5190. Directed Individual Study in Curriculum and Instruction. (1-6 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Producing/evaluating curriculum materials. Literature review of issues/problems. Assessing curriculum processes. prereq: Grad student, instr consent

CI 5211. Elementary Education Content and Pedagogy I. (4 cr.; A-F only; Every Fall, Spring & Summer) Teacher Candidates will complete eight modules on elementary content/pedagogy instruction across disciplines. Introduce various concepts/practices that will be spiraled in each subject area.

CI 5212. Elementary Education Content and Pedagogy II. (3 cr.; A-F only; Every Fall, Spring & Summer) Teacher Candidates will complete five modules on elementary content/pedagogy instruction across disciplines. Builds on various concepts/practices from introductory course. Introduces content that will be spiraled in each subject area.

CI 5213. Elementary Education Content and Pedagogy III. (3 cr.; A-F only; Every Fall, Spring & Summer) Teacher Candidates will complete six modules on elementary content/pedagogy instruction across disciplines. Builds on various concepts/practices from two previous introductory courses. Introduces content that will be spiraled in each subject area.

CI 5214. Elementary Education Content and Pedagogy IV. (3 cr.; A-F only; Every Fall, Spring & Summer) Teacher Candidates will complete five modules on elementary content/pedagogy instruction across disciplines. Builds on various concepts/practices from previous three courses. Introduces content that will be spiraled in each subject area.

CI 5215. Elementary Education Content and Pedagogy V. (2 cr.; A-F only; Every Fall, Spring & Summer) Teacher Candidates will complete five modules on elementary content/pedagogy instruction across disciplines. Builds on various concepts/practices from introductory courses. Introduces content in each subject area. Serves as conclusion to elementary ed content/pedagogy courses.

CI 5254. Kindergarten Methods. (2 cr.; A-F or Audit; Every Fall, Spring & Summer) Purpose of kindergarten, its place in elementary program. Curriculum appropriate for needs of age group, including children with special needs. Assessment procedures, role of classroom teacher. prereq: Foundations of Education/Elementary Education or M.Ed./ILP Elementary Education

CI 5283. Practicum: Applying Instructional Methods in the Elementary Classroom. (1-3 cr.; max 6 cr.; S-N only; Every Fall & Spring) Field-based practicum in elementary school setting. In-class discussions about application of classroom teaching to school setting. prereq: M.Ed./Elementary education initial licensure student, enrolled in elementary education methods course

CI 5285. Clinical Experience in Elementary School Teaching. (12 cr. max 24 cr.; S-N only; Every Fall, Spring & Summer) Students spend full days in elementary classroom, gradually assuming responsibility for teaching, and prepare portfolio based on criteria given. One seminar per week. prereq: M.Ed./Elementary education initial licensure students

CI 5286. Student Teaching Seminar: Elementary Education. (3 cr.; max 6 cr.; A-F only; Every Fall & Spring) Weekly seminar supplementing student teaching experience. Class discussions, sharing of artifacts from the classroom, reflections, and readings. prereq: M.Ed./Elementary education initial licensure only

CI 5287. Capstone Project: Improvement of Teaching in Elementary and Pre-Kindergarten Schools. (3 cr.; A-F only; Every Fall, Spring & Summer) Elementary school classroom teaching project to improve specific teaching skills. Approved/directed by adviser. prereq: M.Ed./elementary education initial licensure student

CI 5300. Teaching Introductory Computer Concepts and Skills. (1-3 cr.; A-F or Audit; Every Spring) Pedagogical strategies for teaching keyboarding and word processing.

CI 5301. Foundations of Computer Applications for Business and Education. (3 cr.; A-F only; Every Fall, Spring & Summer) Instructional uses of computers/representative business, education, marketing applications. Word processing, databases, spreadsheets, graphic design. Expectations are for demonstrations of skills on apps/understanding of concepts that go beyond basic.

CI 5304. Data Management for Online Integration. (3 cr.; Student Option; Every Spring) Using database software to organize, manage, and display online data, to create content management systems, and to integrate into existing websites.

CI 5305. Integrated Computer Applications in Business and Marketing Education. (3 cr.; Student Option; Every Fall & Spring) Case-based authentic business computing problems requiring integration of two or more application packages. Pedagogical issues of learning/teaching advanced computer applications.

CI 5307. Technology for Teaching and Learning. (1.5 cr.; A-F or Audit; Every Fall, Spring & Summer) Diverse educational technology in K-12 classrooms. Effective use of technology. Computer technologies used to stimulate personal productivity/communication and to enhance teaching/learning processes. prereq: [MEd/initial licensure or CLA music ed major or preteaching major or instr consent], basic computer skills

CI 5321. Foundations of Distance Education. (3 cr.; A-F or Audit; Every Summer) History, philosophies, technologies, and best practices related to distance learning environments. Distance education theories. Issues in distance education.

CI 5323. Online Learning Communities. (3 cr.; A-F or Audit; Every Spring) Students design/research an online learning environment that promotes community. What community is, how it fosters learning in educational learning environments. Theories of distance learning instruction. Community models, technological tools to develop online communities.

CI 5325. Designing and Developing Online Distance Learning. (3 cr.; A-F or Audit; Every Fall) Students research, use, and evaluate technologies for distance learning and design their own learning environments. prereq: 5351 or 5362 recommended

CI 5327. Designing Online Adventure Learning. (3 cr.; A-F or Audit; Every Spring) Bring adventure to your online learning environments: learn to design, develop, and deliver an online program that provides opportunities to explore real-world issues through authentic learning experiences in a collaborative online space. You'll engage learners virtually and in real-time. For more info go to http://www.chasingseals.com then sign up and start exploring.

CI 5330. Special Topics in Learning Technologies. (3 cr. max 9 cr.; A-F or Audit; Every Fall & Summer) Topics related to needs of in-service teachers. Topics, location, credits. Duration flexible.

CI 5331. Introduction to Learning Technologies. (3 cr.; A-F or Audit; Every Fall) An exciting look at the field of learning technologies (LT), examining the numerous opportunities this area of study brings to individuals who decide to pursue a LT degree. Students engage in numerous real-world projects as they come to understand both the
past and future of technology in education, business, and society as a whole.

CI 5336. Planning for Multimedia Design and Development. (3 cr.; A-F or Audit; Every Spring)
Theory, research, practice in instructional design. Generic components of instructional design process. Applying principles to design/development of computer-based instructional materials.

CI 5351. Technology Tools for Educators. (3 cr.; A-F or Audit; Every Fall)
Develop skills in using technology applications to support teaching and learning. Internet applications, presentation software, Web 2.0 technologies, and Web site development.

CI 5361. Teaching and Learning with the Internet. (; 2-3 cr.; Student Option; Every Spring)
Implications/challenges in using Internet-based technologies in classroom. Pedagogical models.

CI 5362. Foundations of Interactive Design for Web-based Learning. (3 cr.; A-F or Audit; Every Fall)
Processes of designing/developing interactive learning media and online applications from ground up. Focused on usability/aesthetics in online learning.

CI 5363. New Media and Interaction Design for Online and Mobile Learning. (3 cr.; A-F or Audit; Every Fall)

CI 5365. Contemporary Software Development Issues and Tools. (3 cr.; A-F or Audit; Every Summer)
Software used in multimedia design/development. Uses of the software, intricacies of interface, relevant programming principles. Introduction to developing multimedia applications. prereq: Familiar with standard computer/Internet operations

CI 5367. Interactive Multimedia Instruction. (3 cr.; A-F or Audit; Every Spring)
Principles of effective computer-based design; tools in multimedia development; contemporary issues and skills used in the design, development, and implementation of interactive multimedia instruction. Use multimedia development tools, create a multimedia portfolio, and investigate the issues surrounding their effective use. prereq: Knowledge of principles and procedures of CBI design and one multimedia authoring system.

CI 5371. Learning Analytics: Theory and Practice. (3 cr.; Student Option; Every Fall)
Learning analytics as a nascent field is broadly defined as the "measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs." This course aims to provide a general, non-technical survey of learning analytics, as well as its application in various educational contexts. In particular, we will discuss foundations of learning analytics, survey pertinent education theories, discuss new forms of assessment, explore popular data mining techniques, review learning analytical tools and case studies, and de-sign analytics for our own interested contexts. Given the breadth of this field, additional support is provided for deep dives in special interest areas. Overall, this course provides a comprehensive, theory-driven overview of learning analytics to orient students to this nascent field and prepare them for advanced research/practice in learning analytics.

CI 5390. Learning Technologies Field Experiences. (; 2 cr.; S-N only; Every Fall & Spring)
Field-based experience for students enrolled in computers, keyboarding, and related technology applications methods classes. Apply learning from University courses to the K-12 school setting. In-class discussions about the application of classroom learning to the school setting. prereq: Students in teachers of computers/keyboarding/related technology applications additional licensure program

CI 5402. Introduction to Special Collections. (; 3 cr.; A-F or Audit; Periodic Fall)
Uses Children's Literature Research Collection as research material. Study of manuscripts, original art, and letters. prereq: Children's lit course

CI 5403. Writing For and By Children. (3 cr.; A-F only; Every Fall)

CI 5404. Multicultural Literature for Children and Adolescents. (; 3 cr.; A-F or Audit; Spring Odd Year)
Course explores multicultural literature for children and adolescents as a site where difference can be emphasized and appreciated rather than downplayed and muted. We study award-winning works of fiction and arrive at a definition of multicultural literature for the modern classroom.

CI 5405. Middle School Language Arts Methods. (; 2 cr.; A-F only; Fall Odd Year)
Introduction to the unique needs of middle school students in the language arts classroom. Language arts content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school language arts classroom. prereq: Elem ed licensure student

CI 5410. Special Topics in the Teaching of Literacy. (; 1-3 cr. [max 9 cr.]; Student Option; Every Fall & Summer)
Topics related specifically to the needs of in-service teachers. Topics, location, credits, and duration will be highly flexible.

CI 5413. Foundations of Reading. (3 cr.; A-F or Audit; Periodic Spring)
Reading processes, development of readers. Assessment and tutoring of individual children in reading and other literacy practices. prereq:

CI 3610 and concurrent registration with CI 5414

CI 5414. Practicum: Working With Developing Readers. (2 cr.; S-N only; Every Fall & Spring)
Field-based practicum. Students apply learning from their University course to working with developing readers. Instructor provides specific assignment. prereq: CI 3610 and concurrent registration with CI 5413 required; elementary education foundations major

CI 5417. Elementary literacy instruction for ESL Students. (; 3 cr.; A-F or Audit; Fall Odd Year)
Teaching reading/writing in elementary grades to students from diverse languages. Second-language literacy development. Phonemic awareness, phonics, fluency, vocabulary, comprehension. Ways to connect students? background knowledge to literacy curriculum. prereq: Bachelor's degree completed

CI 5419. The American Middle School. (; 3 cr.; Student Option; Every Fall & Summer)
Focus on the uniqueness of the early adolescent and appropriate learning situations. For educators working with middle-level students.

CI 5422. Teaching Writing in Schools. (; 3 cr.; A-F or Audit; Periodic Fall & Spring)

CI 5425. Reading Instruction in the Elementary Grades. (; 3 cr.; A-F only; Every Fall & Spring)
Curricular/methodological issues in teaching of reading. Reading/orthographic processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, and teaching diverse students. prereq: [Elementary or early childhood] licensure student

CI 5426. Language Arts Instruction in the Elementary Grades. (; 3 cr.; A-F only; Every Fall & Spring)
Curricular/methodological issues of language arts. Oral language development, response to literature, writing processes, authentic assessment strategies. Teaching diverse students. prereq: Elementary or early childhood licensure student

CI 5431. Introduction to Instructional Leadership in K-12 Reading. (; 3 cr.; A-F or Audit; Every Summer)
K-12 curriculum in reading, major theories/research that motivate curriculum. Major instructional principles, alignments needed, resources available, prereq: Minnesota license valid for classroom teaching in pre-kindergarten, [adult basic education or grades kindergarten through 6 or 1 through 6 or 5 through 8 or 9 through 12 or kindergarten through 12]

CI 5432. Instructional Leadership in Reading in Kindergarten and the Elementary Grades. (; 3 cr.; A-F or Audit; Every Fall)
Research-based reading instruction for elementary grades. How to help other teachers
improve practice. Characteristics of effective schools within context of improving students. reading achievement. prereq: 5431

CI 5433. Instructional Leadership in Reading for the Middle and Secondary Grades. (3 cr ; A-F or Audit; Every Spring) Curriculum/instruction for middle/secondary school students. prereq: 5432

CI 5434. Professional Development and Evolving Practice in K-12 Reading. (3 cr ; A-F or Audit; Every Summer) Developing e-portfolio to assess competence in standards for teaching K-12 reading. Evolving teaching practices. Applications of current technologies. prereq: 5433

CI 5435. Instructional Leadership in Preventing Reading Difficulties. (3 cr ; A-F or Audit; Every Fall) Research-based reading interventions for struggling readers. How to help other teachers improve their practice. Theory/research behind preventing reading. prereq: 5435.


CI 5442. Literature for Adolescents. (3 cr ; A-F or Audit; Periodic Fall & Spring) Characteristics of literature written for adolescents; rationale for using adolescent literature; adolescents' reading interests and attitudes; analysis of quality and appeal; individualized reading programs; methods of promoting reading; multicultural literature; developing teaching activities.

CI 5451. Teaching Reading in Middle and Secondary Grades. (3 cr ; A-F or Audit; Every Fall) Methods of accommodating to students' abilities and facilitating reading in regular content classes.

CI 5452. Reading in the Content Areas for Initial Licensure Candidates. (1-2 cr ; A-F only; Periodic Fall & Spring) Web-based course. Fostering students' reading related to learning from text. prereq: Concurrent enrollment in licensure area methods course(s), enrolled in Initial Licensure Program. Internet access, basic understanding of [computer use, Web browsers, email, word processing software]


CI 5463. Minnesota Writing Project Annual Invitational Summer Institute. (3 cr ; A-F only; Every Summer) Workshop. Participants reflect on their own literacy processes, participate in a writing group, discuss current reading texts, and demonstrate best practices in classroom. prereq: Licensed teacher or administrator or [space available, faculty letter of recommendation]

CI 5464. The Politics of Literacy and Race in Schools. (3 cr ; A-F or Audit; Every Fall) Literacy and race in schools examined, especially how power plays out, and what are the possibilities for creating radical democratic forms of life. Reactions of language, literacy, whiteness, and racial identities are explored. Topics include educators' talk and silence about race, Ebonics, and youth's racial identities in global times.

CI 5465. Writing and Social Justice: A Minnesota Writing Project Open Institute. (3 cr ; Student Option; Every Summer) This course focuses on practices within literacy instruction as related to the current educational landscape and a theme of social justice. In this course, participants will focus on three areas: writing, teaching, and learning. Participants will reflect on their own writing processes as they write, share, and participate in a community of writers. Writing groups will meet several times during the course. Participants will also consider the theory and practice of writing instruction that helps students achieve their potential as writers and change agents. In addition, participants will investigate a literacy issue relevant to the course theme, social justice, and will present it as a research project or lesson. This course is offered for practicing teachers at all levels and across disciplines.

CI 5471. Clinical Experience in Teaching Secondary English. (3 cr ; A-F only; Every Fall) Initial licensure candidates in English Education will observe the teaching and learning experience in a school and classroom context; implement approaches, assessments, and philosophies learned about in corresponding methods courses; reflect upon the complexities of classroom life in a seminar format; and co-plan and co-teach a five-day unit. prereq: Must register same semester as CI 5441 and CI 5451.

CI 5472. Teaching Critical Media Analysis in Schools. (3 cr ; A-F or Audit; Every Fall & Spring) “Critical” media literacy means that we focus on, among other things, analyzing the intersection between media and issues of identity -- like gender, race, and sexuality. We also focus on how to teach critical media analysis to students and others.

CI 5474. New Literacies Frameworks and Instruction: Digital Texts and Digital Reading. (3 cr ; A-F only; Every Fall) Read digital texts against backdrop of traditional print-based notions of reading, literacy, school curricula/instruction. Assists education professionals in making school/district-wide decisions based on sound research on digital reading/new literacies.

CI 5475. Teaching Digital Writing. (3 cr ; A-F or Audit; Every Fall) Blogs, wikis, online discussion. Database searches. Integration of images, audio, video, text. Digital note-taking, mapping, storytelling. Online discussions, collaborative writing. Audio production. Formatting/design techniques. Online evaluation. E-portfolios.


CI 5483. Critical Literacy, Storytelling, and Creative Drama. (3 cr ; Student Option; Every Summer) This course examines how storytelling and creative drama can be used as tools to help develop students? critical literacy and to assist them in becoming more fluent readers and writers. Storytelling is a unique blend of performance, literature, and folklore. It engages personal and cultural identities and promotes creative thinking. Critical literacy is the ability to analyze the presentation of information and identify how it influences listeners and readers. Writing, performing, and analyzing narratives are, therefore, powerful means for developing critical literacy. In other words, critical literacy is the focus; theater and storytelling are the vehicles. Key topics to be covered include: 1) A historical background on fairy and folk tales, legends, fables, myths, and the different oral traditions; 2) Tools for developing a critical view of diverse tales; 3) Practical instruction on how to use storytelling and story genres in the classroom to develop critical literacy; 4) Assessing storytelling work in the classroom. Students will meet in the first week at the University to learn tools of the Neighborhood Bridges program and in the second week practice and observe each other’s teaching with local school classrooms. In the past we have worked with 4th graders and 6th graders, though we will also discuss how course content applies to high school students.

CI 5484. Improving Secondary English Language Arts Instruction: Seminar for Early Career Teachers Part I. (1.5 cr ; A-F only; Every Fall) This online course is designed for MEd students in Curriculum and Instruction who...
have recently earned the Communication Arts and Literature (English Language Arts) teaching license. The purpose of this course sequence is for secondary English Language Arts (ELA) teachers to examine their practice in a collaborative community and to improve teacher effectiveness through ongoing feedback from the instructor and other participants. The course will provide support through small group discussions and peer and instructor response. Key topics to be covered include: 1) frameworks for understanding teacher growth in ELA contexts; 2) developing an ELA classroom ecology; and 3) supporting and assessing student learning in the ELA Common Core Standards. This 1.5-credit course was designed in a sequence with CI 5485: Improving Secondary English Language Arts Instruction: Seminar for Early Career Teachers Part II, which is also 1.5 credits and offered in the following spring. prereq: Recently received Communication Arts and Literature (i.e., English Language Arts) teaching license.

CI 5485. Improving Secondary English Language Arts Instruction in the First Three Years: Part II. (1.5 cr.; A-F only; Every Spring)
This course is designed for MEd students in Curriculum and Instruction who have recently earned the Communication Arts and Literature (English Language Arts) teaching license. The purpose of this course sequence is for secondary English Language Arts (ELA) teachers in their first three years to examine their practice in a collaborative community and to improve teacher effectiveness through ongoing feedback from the instructor and other participants. The course will provide support through small group discussions and peer and instructor response. This 1.5-credit course was designed in a sequence with CI 5484: Improving English Language Arts Instruction in the First Three Years: Part I, which is also 1.5 credits and taken in the previous fall. This second course in the sequence will focus on teacher-driven professional inquiry that participants began developing during the fall course. prereq: Successful completion of CI 5484.

CI 5493. Minnesota Writing Project Directed Studies. (1-3 cr.; A-F only; Every Summer)
Directed study for teachers involved in MWP. Capstone course for those enrolled in the Certificate in Teaching Writing and Critical Literacy. Teachers investigate current theory and practice of literacy instruction. Ongoing cohort for those enrolled in the Certificate. prereq: Teaching license, [CI 5483 or enrolled in the Certificate for Teaching Writing and Critical Literacy] or instructor permission.

CI 5496. Directed Experiences in Teaching English. (4-8 cr.; S-N or Audit; Every Fall & Spring)
Student teaching/clinical experience for English Education (Comm Arts & Lit) initial licensure and middle level endorsement students. Credits vary depending on length of field experience and should be determined with your academic adviser. prereq: MEd/initial licensure students in English ed only

CI 5502. Science Instruction in the Elementary Grades. (3 cr.; A-F or Audit; Every Fall & Spring)
Methods/materials for teaching science/health at elementary school level. prereq: Early Childhood or Elementary Education ILP.

CI 5511. Introduction to Secondary Science: Laboratory-based Instruction. (4 cr.; A-F only; Every Fall, Spring & Summer)
Inquiry about teaching/learning, observing/analyzing instruction, reflecting on own/each other’s science teaching. How to use various instructional techniques/methods.

CI 5512. Secondary Science Methods: Understanding the Nature of Science. (3 cr.; A-F only; Every Fall, Spring & Summer)
Inquiry about teaching/learning, observing/analyzing instruction, reflecting on own/each other’s science teaching. How to use various instructional techniques/methods.

CI 5513. Secondary Science Methods: Equity in Science Teaching. (3 cr.; A-F only; Every Fall, Spring & Summer)
Inquiry about teaching/learning, observing/analyzing instruction, reflecting on own/each other’s science teaching. How to use various instructional techniques/reflect upon teaching. Develops understanding of research-based instructional methods in secondary science classrooms.

CI 5514. Secondary Science Methods: The Science Learning Environment. (2 cr.; A-F only; Every Fall, Spring & Summer)
Inquiry about teaching/learning, observing/analyzing instruction, reflecting on science teaching. How to use various instructional techniques/reflect upon teaching. Develops understanding of equitable science teaching practices/safe student-centered classroom culture.

CI 5515. Secondary Science Methods: Developing Adaptive Expertise. (3 cr.; A-F only; Every Fall, Spring & Summer)
Inquiry about teaching/learning, observing/analyzing instruction, reflecting on science teaching. How to use various instructional techniques/reflect upon professional growth using evidence from teaching. Identify goals/instruction plans for professional practice.

CI 5530. Secondary Science Methods I. (3 cr.; A-F only; Every Summer)
Lab-based science teaching in secondary school setting. Research-based teaching strategies are modeled that address national/state-level standards. How to use various inquiry-based instructional techniques/methods.

CI 5531. Secondary Science Methods II. (3 cr.; A-F or Audit; Every Fall)
Methods of planning/teaching science to middle school students. prereq: Initial licensure student in science ed and CI 5530 Secondary Science Methods I

CI 5532. Secondary Science Methods III. (3 cr.; A-F or Audit; Every Spring)
Methods of planning/teaching science for secondary school students. prereq: Admission to initial licensure program in science and CI 5531 Secondary Science Methods II

CI 5533. Current Developments in Science Teaching. (3 cr.; A-F or Audit; Every Summer)
Using curriculum standards to design science courses. prereq: MEd, initial licensure, grad student, or instr consent

CI 5534. Studies in Science Education. (3 cr.; A-F or Audit; Every Fall)
Improvement of science teaching through the application of research findings. prereq: M.Ed., init lic, or instr consent

CI 5535. Foundations of Science Education. (3 cr.; A-F or Audit; Every Spring)
Analysis of present science teaching practices in light of historical and philosophical foundations of science education. prereq: M.Ed., grad student, or instr consent

CI 5536. Equity, Policy, and Assessment in Science Education. (3 cr.; A-F only; Every Fall)
Nature of equity, diversity, and policy matters that influence schools/teachers involved in science teaching and scientific literacy. Classroom presentations, discussions, readings in current research. prereq: Med, or grad student, or instr consent

CI 5537. Principles of Environmental Education. (3 cr.; A-F or Audit; Every Fall)
Critical review of Environmental Education, its history, theories, curricula, teaching methods, and assessment practices. Development of an exemplary unit plan for teaching environmental studies. prereq: Undergrad in NRES or M.Ed. or grad student in education or instr consent

CI 5538. Action Research in Science Education. (3 cr.; A-F only; Every Spring)
This course is designed to accomplish several main goals for those enrolled: (1) articulate their own understanding of what it means for there to be equity in science education and how their personal interpretation aligns with existing frameworks for viewing equity; (2) become familiar with interactions between equity and educational policies, including standardized testing, school organization, and teacher preparation in Minnesota; (3) design and conduct an investigation around a classroom dilemma pertaining to an issue of equity.

CI 5540. Special Topics: Science Education. (1-4 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer)
Detailed examination and practice of the teaching of one area of science (e.g. geology, health, physical science) or one method of instruction (e.g. laboratories, demonstrations, Internet, simulations).

CI 5541. Teaching History and Nature of Science. (3 cr.; A-F or Audit; Every Fall)
Understanding nature of science (NOS). Integrate/reflect on NOS in secondary science classroom. Historical cases/integrating NOS with science content/scientific inquiry. prereq:
CI 5551. Reflecting on Science Classroom Practices I. (1.5 cr.; A-F only; Every Fall) Students reflect on their instruction and student learning during first years of teaching. Monthly meetings, observations, online discussion. Classroom management, planning, inquiry-based teaching, assessment, equity in the classroom.

CI 5552. Reflecting on Science Classroom Practices II. (1.5 cr.; A-F only; Every Spring) Students reflect on their instruction and student learning during first years of teaching. Monthly meetings, observations, online discussion. Classroom management, planning, inquiry-based teaching, assessment, equity in the classroom.

CI 5596. Clinical Experience in Middle School Science. (4 cr.; A-F or Audit; Every Fall) Supervised clinical experience in middle school science teaching.

CI 5597. Clinical Experience in Secondary School Science Teaching. (4-8 cr.; S-N or Audit; Every Spring) Supervised clinical experience in secondary school science teaching, prereq: initial licensure or instr consent

CI 5608. CARLA Summer Institute Seminar. (1-4 cr. [max 16 cr.]; Student Option No Audit; Every Summer) The Center for Advanced Research on Language Acquisition (CARLA) offers a series of intensive summer institutes to provide timely professional development for foreign language and ESL educators throughout the country. The special topics offered under CI 5608 are designed to provide language teachers with the latest research-based information and best practices skill development as the field of language instruction evolves. Each institute is highly interactive and includes discussion, theory-building, hands-on activities, and plenty of networking opportunities with colleagues from around the world.


CI 5612. ESL Methods for Multilingual Development. (3 cr.; A-F only; Every Fall, Spring & Summer) Introduction to methods of developing reading, writing, speaking, listening skills among English learners in K-12. Reflect on beliefs/ideas, cultivate orientation towards reflective teaching/life-long learning.

CI 5613. Testing and Assessment for English Learners. (3 cr.; A-F only; Every Fall, Spring & Summer) Develop awareness/familiarity with policies, procedures, practices in use in attempting to determine academic readiness of students learning English as secondary language in American public schools.

CI 5614. Curriculum and Materials Development for English Learners. (3 cr.; A-F only; Every Fall, Spring & Summer) Explore role ESL teachers play in curriculum/materials development. Historical overview of curriculum development in second language education, factors that influence curriculum development, range of models for curriculum development tailored to English learners.

CI 5615. Academic English for English Learners: Planning, Assessment, Instruction. (2 cr.; A-F only; Every Fall, Spring & Summer) Prepares ESL teacher candidates to develop academic English skills of English learners of various proficiencies through bilingual teaching strategies. Prepares students to offer leadership with colleagues from content areas to integrate language/content. Includes focused study of advanced-level syntactic structures/completion of edTPA.

CI 5616. Academic Language and English Learners I. (1 cr.; A-F only; Every Summer) Working with English learners and other linguistically diverse students across content areas to develop academic language proficiency. Prereq: Enrolled in teacher initial licensure program

CI 5617. Academic Language and English Learners II. (1 cr.; A-F only; Every Spring) Working with English learners and other linguistically diverse students across all content areas to develop academic language proficiency. Prereq: Enrolled in teacher initial licensure program

CI 5619. Teaching World Languages and Cultures in Elementary Settings. (3 cr.; Student Option; Every Summer) Methods/materials for elementary world language instruction; development of oral communication/literacy in world languages; world language program design; global awareness/cross-cultural experience; children's language; children's literature, games, and songs; planning/development of units and lessons.

CI 5620. Introduction to Second Language Acquisition for Language Teachers. (3 cr. [max 6 cr.]; Student Option; Every Summer) Current research and theory in the area of second language acquisition (SLA). Topics include the similarities and differences across first and second language acquisition; the role of individual differences in language learning (including age, first language, aptitude among others). Implications for sociolinguistic diversity in the United States.

CI 5621. Culture as the Core in the Second Language Classroom. (2 cr.; Student Option No Audit; Every Summer) How language teachers foster development of intercultural communicative competence through a pedagogical approach that addresses the nature of culture and culture learning, and the interrelatedness of language and culture learning.

CI 5622. Growing Learner Language: A Hands-On Approach to Developing the Language Learners Produce. (2 cr.; Student Option No Audit; Every Summer) The focus of this institute is on the growth and development of the language learners produce, and how that growth may be enhanced by ongoing pedagogical innovation. This institute uses the problem-solving framework of Exploratory Practice to promote a culture of instructor initiative that promotes and responds to learner language development in the classroom. Participants begin with a brief review of theories of second language acquisition, and then work together to reflect on videos of learner language as it is produced by different kinds of learners. Institute participants work with instructors to identify specific features in these learners' language. Participants then apply those insights to their own classrooms by learning how to set up engaging, puzzle-solving activities that stimulate growth in learner language. Finally, participants learn how to design pre- and post-course measures that demonstrate the impact of their innovations in instruction on the growth of specific features and dimensions of learner language in their own classrooms.

CI 5623. Improving Language Learning: A Practical Course in Styles- and Strategies-based Instruction. (2 cr.; Student Option No Audit; Every Summer) Learner-focused approach to teaching that helps students understand and make the most of their own learning styles/strategies. Participants create materials/lessons and explore ways to incorporate strategies into their own language curricula.

CI 5624. Content-based Language Instruction and Curriculum Development. (2 cr.; Student Option No Audit; Every Summer) Intensive professional development to help foreign language teachers learn to implement the CBI curricular approach in the language classroom. Introduces all phases of CBI curricular development and provides resources necessary to ensure successful implementation.

CI 5625. Developing Assessments for the Second Language Classroom. (2 cr.; Student Option No Audit; Every Summer) Assessment fundamentals and various topics, including assessment frameworks, performance assessment models, national standards, effective evaluation, and authentic materials. Participants use backward design to develop rating criteria and rubrics, and a standards-based performance assessment unit.

CI 5626. Developing Learners' Sociocultural Competence. (2 cr.; Student Option No Audit; Every Summer) Overview of how to incorporate a pragmatics component into second/foreign language curriculum to enhance learners' sociocultural competence. Includes approaches to teaching/evaluating pragmatics.

CI 5627. Creativity in the Second Language Classroom. (2 cr.; Student Option; Every Summer)
Career Language Teachers Part 1. (1.5 cr.; A-F only; Fall Odd Year)
This course provides recently licensed practicing teachers an opportunity to continue to develop their skills as reflective practitioners within the context of World Languages and ESL with a focus on their own teaching practices and student learning. Participants engage in online discussions, read, reflect, and create professional growth plans.

CI 5637. Problems of Practice in Second Language Education: Seminar for Early Career Language Teachers Part 2. (1.5 cr.; A-F only; Spring Even Year)
In this course, recently licensed practicing teachers continue to develop their skills as reflective practitioners within the context of World Languages and ESL with a focus on their own teaching practices and student learning. Participants engage in online discussions, read, reflect, and implement and report on professional growth plans. Prerequisite: Completion of CI 5636 or instructor consent.

CI 5641. Language, Culture, and Education. (3 cr.; A-F or Audit; Periodic Spring & Summer)
Applies current sociolinguistic and discourse theory/research to study of relationships between language and culture in educational settings: language curriculum and instruction; classroom language use; borders between school and home/community language use; and educational policies on literacy/second-language instruction.

CI 5642. Assessing English Learners. (3 cr.; A-F or Audit; Spring Odd Year)
Current practices concerning language and academic content assessment of English learners (ELs) at the school site, state, and national level; factors affecting academic learning needs of ELs/where assessment fits into that picture.

CI 5644. Practicum in Language Teaching: ESL and World Languages. (1-6 cr.; S-N only; Every Spring)
Practical, hands-on training in teaching of English as a Second Language. Applying theoretical/practical material studied in prior course work. Discuss readings/research articles on SLA, applying theoretical/practical principles to specific critical classroom incidents.

CI 5654. Teaching English Learners in the Elementary Classroom. (3 cr.; A-F only; Every Fall, Spring & Summer)
Benefits/challenges of working with English learners (ELs). Linguistically/culturally diverse students. Instructional practices/strategies for teaching ELs in elementary classrooms. Language learning/bilingualism. Cultural differences. Prereq: Early Childhood or Elementary Education ILP

CI 5646. English Grammar for ESL Teachers. (3 cr.; Student Option; Every Fall)
English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching grammar in ESL contexts. Prereq: LING 5001 or instr consent

CI 5648. Advanced Practices in Teaching Academic Language. (3 cr.; A-F only; Every Spring)
Prepares K-12 teachers for second language proficiency. Read/discuss current research. Implement innovative teaching practices. Prereq: Grad student, instr consent

CI 5649. Language Analysis for ESL Teaching in Higher Ed. (4 cr.; Student Option No Audit; Every Spring)
Overview of complex aspects of English grammar not covered in 5646. Academic uses of passives, indirect objects, conditionals, relative clauses, complementation, reported speech, deixis/reference, articles, prepositions, phrasal verbs, pragmatics. Prereq: 5646

CI 5651. Foundations of Second Languages and Cultures Education. (3 cr.; A-F or Audit; Every Fall)
Historical overview of second language teaching/learning in U.S. introduction to second language acquisition. Second language instructional concepts across elementary, secondary/university options for foreign language, bilingual education, immersion language programs, and English as a second language programs. Theoretical frameworks for language instruction are tied to practice.

CI 5653. Methods in Teaching English as a Second Language (ESL) in Higher Education. (3 cr.; Student Option No Audit; Every Fall & Spring)
Theory/practice teaching academic English as second or foreign language in contexts of higher education. History of field/varied methods in language teaching. Current best practices in teaching academic English pronunciation, listening, speaking, reading, writing skills. Prereq: An intro to linguistics course

CI 5655. Teaching Literacy in Second Language Classrooms. (3 cr.; Student Option No Audit; Every Fall)
Reading comprehension/composing processes in a second language; relationship between first and second literacy development; relationship between reading and writing; relationship of culture to reading comprehension and writing; politics of literacy; assessment of second language literacy; using technology to enhance literacy instruction.

CI 5656. Teaching Speaking and Listening in Second Language Classrooms. (3 cr.; A-F or Audit; Spring Even Year)
Theories/methods in teaching language as communication in oral/aural modes; planning student interaction; classroom organization for oral language learning/acquisition; using technology to enhance interaction; assessment of listening comprehension and oral communication.

CI 5658. Foreign Language Testing and Assessment. (3 cr.; A-F or Audit; Spring Odd Year)
For world language/EFL teachers. Aligning foreign language classroom instruction/
CI 5560. Special Topics in the Teaching of Second Languages and Cultures. (1-4 cr.; max 12 cr.; Student Option: Every Spring & Summer) Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Second Language Curriculum Design. (3 cr.; A-F or Audit; Every Spring) Historical overview of curriculum development in second language education; contexts that influence curriculum development; models for curriculum development in second language settings; politics of curricular reform; national/state standards and implications for curriculum development; effects of technology on second language curriculum.

CI 5670. Foundations of Dual Language and Immersion Education. (3 cr.; Student Option: Every Fall) Research foundations and program principles for dual language/immersion. Second language acquisition; critical features of program design/implementation; benefits/challenges of dual language/immersion; program assessment; advocacy. Theory/research for dual language/immersion tied to practical application. prereq: Enrollment in certificate program in dual language/immersion educ or instr consent

CI 5671. Curriculum Development and Assessment in Dual Language/Immersion Classrooms. (3 cr.; Student Option: Fall Odd Year) Content-based language instruction and curriculum development for dual language, bilingual, and immersion contexts; balancing content/language goals/objectives in curriculum and instruction; integration of language, literacy content, and culture in curriculum; standards-based instruction; backwards design; assessment that aligns with content-based curriculum and instruction. prereq: instr consent

CI 5672. Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms. (3 cr.; Student Option: Every Spring) Counterbalancing content with integrated focus on language and literacy development for dual language, bilingual, and immersion classrooms. Materials development; proactive/reactive instructional techniques; noticing and awareness-raising strategies; structuring student language production; differentiating for content, ability, and language. prereq: instr consent

CI 5673. Immersion 101: An Introduction to Immersion Teaching. (2 cr.; Student Option No Audit; Every Summer) Research-based introduction to issues for teachers, administrators, and district personnel in K-12 immersion education. One-way (foreign language), two-way (bilingual), and indigenous programs. Principles/practices that inform language-attentive curriculum development/instruction.

CI 5676. Biliteracy Development in Dual Language/Immersion Classrooms. (3 cr.; Student Option: Spring Odd Year) This course aims to provide dual language, bilingual and language immersion educators with an understanding of the complex phenomena of literacy and biliteracy and with a range of instructional strategies for fostering literacy and biliteracy development in dual language/immersion classrooms.

CI 5683. Directed Study in Second Language Education. (1-4 cr.; Student Option: Every Fall, Spring & Summer) Individual or group work on curricular, instructional, or assessment problems. prereq: instr consent

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2-6 cr.; Student Option: Every Fall, Spring & Summer) Teaching and learning experiences in Second Languages and Cultures at the elementary-school level. Requires students to work in a public school setting. prereq: 5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates

CI 5697. Practicum: ESL in the Elementary School. (2-6 cr.; Student Option: Every Fall, Spring & Summer) Teaching/learning experiences in an English as a Second Language setting at elementary school level. Requires students to work in a public school setting. prereq: Adviser approval

CI 5698. Student Teaching in Second Languages and Cultures. (2-6 cr. [max 14 cr.]; Student Option: Every Fall, Spring & Summer) Student teaching in Second Languages and Cultures at the secondary level for teachers already licensed in another field. Requires students to work in a public school setting. prereq: Adviser approval; credits cannot be counted on a graduate degree program

CI 5699. Clinical Experiences in Second Languages. (3-12 cr. [max 16 cr.]; A-F or Audit; Every Fall & Spring) Teaching and learning experiences in elementary and secondary second language instructional settings. Includes a seminar held concurrently to support the student teaching experience. prereq: SLC initial licensure program only

CI 5701. Oral Expression and Questionings in the Elementary Grades. (3 cr.; A-F only; Every Fall & Spring) Content/organization of elementary social studies programs. Programs of understanding. Improving learning situation. prereq: Early Childhood or Elementary Education ILP

CI 5702. Social Studies Instruction in the Elementary Grades. (3 cr.; A-F only; Every Fall & Spring) Content/organization of elementary social studies programs. Programs of understanding. Improving learning situation. prereq: Early Childhood or Elementary Education ILP

CI 5744. Seminar: Reflecting on Professional Development in Social Studies Education. (3 cr.; A-F only; Every Fall) Reflecting on teaching experience, examining social/cultural context of teaching/learning, developing a professional identity. Refining teaching and teacher research skills. prereq: Secondary social studies initial licensure student

CI 5745. Engaging Youth With Social Studies Texts. (3 cr.; A-F only; Every Spring) Ways to engage students (grades 5-12) in social studies (textbooks, literature, speeches, editorials, political cartoons, tables, graphs, maps, film.). Developing middle/high school students' disciplinary literacy.

CI 5746. Global and Multicultural Education in the Secondary Classroom. (3 cr.; A-F only; Every Spring) Issues, classroom practices, and controversies surrounding global/multicultural perspective-taking in social studies education. Strategies for helping secondary social studies students develop global/multicultural worldviews.

CI 5747. Global and Environmental Education: Content and Practice. (3 cr.; A-F or Audit; Every Spring) Preparates educators for leadership responsibilities in the area of global environmental education. Focus on the knowledge and process skills necessary to carry out a leadership role in the curriculum.

CI 5762. Developing Civic Discourse in the Social Studies. (3 cr.; A-F or Audit; Periodic Spring & Summer) Philosophies, strategies, and research on developing civic discourse in secondary social studies classroom. Selecting issues. Democratic classroom climate. Relating to social/cultural contexts.

CI 5768. Clinical Experiences in Teaching Social Studies. (1-8 cr. [max 16 cr.]; S-N or Audit; Every Fall & Spring)
Student teaching experiences for students preparing to become secondary social studies teachers. Teacher candidates work closely with social studies teachers in grades 5-12 to plan and implement engaging and meaningful learning experiences for middle and high school students. prereq: ME/initial licensure student

CI 5811. Introduction to Teaching Secondary Mathematics. (4 cr.; A-F only; Every Fall, Spring & Summer) Introduction to teaching mathematics. Fundamental mathematical ideas/different ways children think about these ideas.

CI 5812. Teaching Algebra. (3 cr.; A-F only; Every Fall, Spring & Summer) Uses algebra as vehicle to discuss student learning trajectories, ways to measure students understanding, make instructional decisions to help students grow.

CI 5813. Teaching Geometry. (3 cr.; A-F only; Every Fall, Spring & Summer) Geometric/measurement ideas as vehicle to model ways to engage/manage students in more effective ways.

CI 5814. Teaching and Learning Mathematics. (3 cr.; A-F only; Every Fall, Spring & Summer) Topics require more sophisticated understanding of teaching based on first year experience/reflect deeper on teaching.

CI 5815. Leadership in Mathematics Education. (2 cr.; A-F only; Every Fall, Spring & Summer) Preparing to give back to profession as you grow in role as teacher leader.

CI 5822. Mathematics Instruction in the Elementary Grades. (; 3 cr.; A-F or Audit; Every Fall & Spring) Principles of learning mathematics in elementary grades. Objectives, content, philosophy, instructional materials, methods of instruction/evaluation, prereq: Early Childhood or Elementary Education ILP

CI 5890. Clinical Experiences for K-12 Teaching. (1-4 cr.; A-F only; Every Fall, Spring & Summer) Practical teaching/learning experiences in school setting. Includes co-teaching during student teaching and coaching/assessment by a university supervisor.

CI 5891. Introduction to Equity-Based Pedagogy. (1 cr.; A-F only; Every Fall, Spring & Summer) Introduces aspects of inequities in U.S. society/school. Examines how social class/poverty permeated education as social institution/classroom pedagogy. Covers five principles for social class-sensitive change/intersections between social class/other markers of difference.

CI 5892. Enacting Equity-Based Pedagogy. (2 cr.; A-F only; Every Fall, Spring & Summer) Extended study of inequities. Examines working-class literature for adults/children. Labor histories, economic systems, hierarchies of class, race, gender, sexuality, language in schools/communities.

CI 5983. Equity-Based Pedagogy/Advocacy. (1 cr.; A-F only; Every Fall, Spring & Summer) Extends study of inequities in society. Five principles for social class-sensitive change. Intersections between social class/other markers of difference such as race, gender, sexuality, language.

CI 5984. Planning Design and Management. (1 cr.; A-F only; Every Fall, Spring & Summer) Foundational understanding of being teacher, developing culturally responsive classroom, designing learning experiences. Conceptualization of teacher nationally/locally, language in classroom. Foundational concepts/tools used when facilitating learning.

CI 5985. Academic Language and English Learners in the Content Areas. (1 cr.; A-F only; Every Fall, Spring & Summer) Prepares teacher candidates to work effectively with English learners/other linguistically diverse students across all content areas. Develop students' academic language proficiency as needed for school success.

CI 5986. Foundations of Special Education. (1 cr.; A-F only; Every Fall, Spring & Summer) Skills to promote learning/success for all students, including those at risk for school failure/with special needs. Introduces research/issues emphasizing collaborative problem solving approach that facilitates effective family-professional partnerships/educational programming for individuals with disabilities.

CI 5987. Child and Adolescent Development for Teaching, Learning, and Assessment. (1 cr.; A-F only; Every Fall, Spring & Summer) Cognitive, social, emotional development of childhood/adolescence. Ecological influences in development. Theories of learning/cognition, cognitive/social development, motivation, individual/group differences, testing/assessment, teaching methodologies, pragmatic issues.

CI 5988. Clinical Experience: Improvement of Teaching. (2 cr.; A-F only; Every Fall, Spring & Summer) Capstone project. Link theory/practice, integrate coursework with experiences in classroom.

CI 5993. Directed Study in Family, Youth, and Community. (; 1-3 cr. [max 9 cr.]; A-F only; Every Fall, Spring & Summer) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member. prereq: instr consent

CI 8075. Seminar: Art Education. (; 2 cr.; A-F or Audit; Periodic Fall & Spring) Reports, evaluation of problems, and review of recent literature. prereq: Educ grad student or instr consent

CI 8079. Research in Art Education. (; 3 cr.; A-F or Audit; Periodic Fall) Current research agenda. Helps students identify research questions and choose appropriate methodologies. prereq: Educ grad student or instr consent

CI 8085. Narrative Inquiry in Education. (3 cr.; Student Option; Spring Even Year) Through readings and activities focused on published studies and articles, students explore theory/application of two narrative research forms, narrative analysis— in which stories of informants are collected and analyzed, and narrative construction—in which researchers compose qualitative data collected in research settings into the form of stories.

CI 8095. Problems: Art Education. (; 1-12 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance; may include advanced studio practice and educational issues requiring a research methodology. prereq: Grad art educ major or instr consent

CI 8111. Representations of Knowledge in Curriculum and Culture. (; 1-3 cr.; Student Option; Periodic Fall) Overview of research and theory on sociology of knowledge and education. Conceptions of knowledge in curriculum; connections between cultural conditions and curriculum design and implementation; influence of national political agendas, population, the mass media, and textbooks on curriculum in diverse educational settings. prereq: CI grad student or instr consent

CI 8115. Curriculum and Achievement Outcomes in a Diverse Society. (; 3 cr.; A-F or Audit; Periodic Fall) Analysis of American public school experiences for students of African-American, Hispanic, Asian, and American Indian background; social, political, regional, and educational variables that influence student outcomes; perspectives concerning ethnic student achievement; factors influencing school achievement, and prospects for change. prereq: Doctoral student

CI 8121. Curriculum Change: Perspectives, Processes, and Participants. (; 3 cr.; Student Option; Periodic Fall) Examination of curriculum within educational organizations; educational organization as mediator and transmitter of societal/cultural perspectives; implications of organizational context for curriculum change, change processes, and change participants. prereq: CI grad student or instr consent

CI 8127. Curriculum Theory and Research: Alternative Paradigms and Research Methods. (; 3 cr.; Student Option; Periodic Fall) Traditions of inquiry, exemplary studies, and associated research methods; survey and assessment of topics and methods as applied to curriculum questions; and relationships between theory and research. prereq: GI grad student or instr consent

CI 8131. Curriculum and Instruction Core: Critical Examination of Curriculum in Context. (; 3 cr.; A-F or Audit; Periodic Fall & Spring)
CI 8132. Curriculum and Instruction Core: Teaching Theory and Research. (3 cr.; A-F or Audit; Every Fall & Spring)
Overview of research on teaching: historical perspective, modern research/findings, implications for practice/research. prereq: CI PhD or MA student or inst consent

CI 8133. Research Methods in Curriculum and Instruction. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Survey of educational research methods, comparison of underlying assumptions/procedures. prereq: CI PhD or MA student or inst consent

CI 8134. Foundations of Research in Curriculum and Instruction I. (3 cr.; A-F or Audit; Every Spring)
This Foundations of Research course is the first of a two-course sequence required for PhD students in Curriculum and Instruction. The course is designed to ground students in qualitative and quantitative paradigms and epistemology and prepare students for specialized methodology courses that focus on specific research approaches in education.

CI 8135. Foundations of Research in Curriculum and Instruction II. (3 cr.; A-F or Audit; Every Spring)
This Foundations of Research course is the second of a two-course sequence required for PhD students in Curriculum and Instruction. The course is designed to ground students in qualitative and quantitative paradigms and epistemology and prepare students for specialized methodology courses that focus on specific research approaches in education.

CI 8145. Using Mixed Methods in Educational Research. (3 cr.; A-F or Audit; Every Fall & Spring)
Conceptual issues surrounding design/use of mixed methods in addressing problems/research questions in education. Critique of select mixed design exemplars published in respected research publications/practical application of analyses of data using mixed inquiry methods. prereq: [8133, 8148, OLPD 8812] or equiv. [CI PhD student or inst consent], additional quantitative/qualitative methodology courses recommended

CI 8146. Critical Ethnography in Education. (3 cr.; A-F or Audit; Spring Odd Year)
Theoretical/methodological foundations. Possibilities and problems for understanding inequality/disparities in education. Research design, data collection, analysis, writing. prereq: MA or PhD student or Inst consent

CI 8147. Critical Discourse Analysis in Educational Research. (3 cr.; A-F or Audit; Fall Odd Year)
Students apply CDA methods to analysis of written, visual, and spoken texts in social settings such as schools, families, and communities. prereq: [MA or PhD] student

CI 8148. Conducting Qualitative Studies in Educational Contexts. (3 cr.; Student Option; Every Spring)
Qualitative research methods. Ethnography, sociolinguistics, symbolic interactionism. Observation, prereq: CI 8133 and [CI or OLPD PhD student]

CI 8149. Qualitative Research: Coding, Analysis, Interpretation, and Writing. (3 cr.; A-F or Audit; Periodic Fall)
How to code/analyze field notes. Individual/group interviews, multimedia using NUDIST NVivo software. Students interpret analyzed material and complete an article length document that includes a related research/methodology. prereq: [8133, 8148, grad student, completion of a qualitative research study] or inst consent

CI 8150. Research Topics in Curriculum & Instruction. (3 cr. max 9 cr.); A-F only; Periodic Spring & Summer)
Special topics, current research trends in curriculum and instruction. Research review, subject integration, curriculum contexts, development, implementation, data collection, analysis, evaluation.

CI 8151. Paradigms and Practices in Teacher Preparation. (3 cr.; A-F or Audit; Fall Even Year)

CI 8152. Teacher Learning and Professional Development. (3 cr.; A-F or Audit; Fall Odd Year)
Theoretical/empirical work on teacher learning, professional communities, teacher inquiry, perspectives on outcomes of professional development, and policy recommendations for supporting teacher learning. Research methodologies. prereq: Grad student

CI 8153. Research Approaches to Classroom Discourse. (3 cr.; A-F or Audit; Fall Even Year)
This course introduces students to major traditions in analysis of classroom discourse, anthropological linguistics, conversational analysis, sociocultural, critical discourse and multimodal discourse analysis and their use in conjunction with other qualitative approaches to classroom research. Analysis of genre, gesture, and verbal performance are also addressed.

CI 8154. Culturally Relevant Pedagogy. (3 cr.; A-F or Audit; Fall Even Year)

CI 8155. Immigrant Families and U.S. Schools. (3 cr.; A-F or Audit; Fall Odd Year)

CI 8156. Asian American Education. (3 cr.; A-F or Audit; Spring Even Year)

CI 8159. Culture and Teaching Colloquium. (3 cr. max 6 cr.); A-F or Audit; Every Fall)
Doctoral seminar. Interdisciplinary perspectives on theme central to cultural study of teaching. Theme varies year to year.

CI 8161. Research Experience I: Study Design and Planning. (3 cr.; Student Option No Audit; Every Fall)
Students identify research topic, conduct literature review, refine research questions, design study, obtain IRB approval as needed, and begin data collection. Readings, seminar discussions, peer critique of work. prereq: [8134, 8135, 6-12 cr. of research methodology, CI PhD student] or inst consent

CI 8162. Research Experience II: Data Analysis and Manuscript Preparation. (3 cr.; Student Option No Audit; Every Spring)
Students complete data collection/analysis, prepare research manuscript. Seminar discussions, critical examination of their own and peers? work. prereq: 8161

CI 8165. Queer and Feminist Theories: Collective Memory Research Methods. (3 cr.; A-F only; Spring Even Year)
Seminar for advanced graduate students to work with queer and feminist theories in what is broadly constructed as educational research. We consider post-modern theoretical work that recognizes the "rational" and the mind/body dichotomy as constructions which reproduce existing structures. Collective memory writing is explored as a research method.

CI 8181. Seminar in Teaching in Colleges of Education. (3 cr.; Student Option; Periodic Fall)
Goals, instructional strategies, evaluation procedures, and professional considerations. prereq: CI PhD student or inst consent

CI 8195. Problems: Improvement of Instruction. (1-6 cr.; Student Option; Every Fall & Summer)
Independent research in curriculum and instruction. prereq: inst consent

CI 8196. Practicum in Teaching in Colleges of Education. (1 cr.; S-N only; Periodic Fall & Spring)
Practicum experience for graduate students to learn how to teach a college level course through a supervised, mentored experience. Supervised teaching occurs in an education course at the University or other institution.

CI 8197. Problems: Curriculum Studies. (1-4 cr.; max 8 cr.); A-F or Audit; Every Fall)
Directs students to completing Plan B paper for M.A. degree. prereq: MA student

CI 8198. Problems: Teacher Education. (1-6 cr. max 12 cr.; Student Option; Every Spring)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
CI 8594. Conducting Research in Science Education. (3 cr.; Student Option; Periodic Fall) Application of research methodology to a specific science education issue. prerequisite: science education course

CI 8595. Problems: Science Education. (3 cr.; maximum 6 cr.; Student Option; Every Fall & Spring) Independent research. prerequisite: science education course

CI 8545. Indigenous Language Revitalization and Activist Research Methods. (3 cr.; A-F only; Fall Even Year) This course is a hands-on look at activist research methods situated in the context of Indigenous Language Revitalization. That is, what happens when a community problem is the organizing force in research? Students will be expected to both engage in language learning, research, designing a research project, and connecting this to critical thinking as applied to culture, language, and Indigenous language revitalization.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1-3 cr.; maximum 6 cr.; Student Option; Periodic Fall & Summer) Research topics vary. prerequisite: science education course

CI 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; maximum 12 cr.; No Grade Associated; Every Fall, Spring & Summer) TBD prerequisite: Doctoral student who has not passed preliminary oral; no required consent for 1st/2nd registrations, up to 12 combined cr; department consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

CI 8671. Sociolinguistic Research Approaches to Education. (3 cr. [maximum 6 cr.]; A-F only; Spring Odd Year) This course provides students with an overview of current research approaches, theories, and methods in linguistic anthropology and sociolinguistics with a focus on educational contexts and linguistic diversity. Course activities include reviewing and critiquing current research and theory in the field and working on small projects.

CI 8689. Language and Education Policy. (3 cr. [maximum 6 cr.]; A-F or Audit; Every Spring) Students will gain a solid understanding of language policy theory, language policy research methods, and key empirical findings. They will acquire skills to critically analyze and evaluate language policy, and gain experience and academic practice in doing so.

CI 8691. Readings in Second Languages and Cultures Education. (1-3 cr.; Student Option; Every Fall & Spring) Independent reading. prerequisite: science education course.

CI 8695. Problems: Second Languages and Cultures Education. (1-6 cr. [maximum 12 cr.]; Student Option; Every Fall & Spring) Independent research. prerequisite: science education course


CI 8742. Seminar: Research in Social Studies Education. (3 cr.; A-F or Audit; Every Spring) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications. prerequisite: science education course

CI 8777. Thesis Credits: Master's. (1-18 cr. [maximum 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD

CI 8795. Problems: Social Studies Education. (1-6 cr. [maximum 12 cr.]; Student Option; Every Fall, Spring & Summer) Independent research. prerequisite: science education course

CI 8796. Research Internship in Social Studies Education. (1-6 cr.; A-F or Audit; Every Fall, Spring & Summer) Internship with social studies education faculty member; experience in collecting and analyzing data; drafting and presenting reports; writing for publication. prerequisite: science education course

CI 8888. Thesis Credits: Doctoral. (1-24 cr.; maximum 100 cr.; No Grade Associated; Every Fall, Spring & Summer) Thesis credits: Doctoral prerequisite; maximum 18 cr per semester or summer; 24 cr required

CI 8900. Family, Youth, and Community Colloquium. (1-4 cr.; maximum 8 cr.; No Grade Associated; Every Fall, Spring & Summer) Theories, practices, pedagogies, epistemologies, and public policies not dealt with in regular courses. Content varies by offering. prerequisite: MA or PhD student

CI 8913. Interpretive Research. (3 cr.; maximum 6 cr.; A-F only; Every Fall) Hermeneutic, ethnmethodological, and phenomenological research methodologies. Ethics, evaluation, and usefulness of interpretive research. Practice in conducting interpretive research.

CI 8914. Critical Science Research. (3 cr.; A-F only; Every Spring) Origins, influences, characteristics, and central concepts. Distinction between critical science and other action research. Requisite skills/knowledge for conducting critical science research, using that knowledge in a project.

CI 8994. Directed Research in Family, Youth, and Community. (1-6 cr.; A-F only; Every Fall, Spring & Summer) TBD prerequisite: science education course.

Dakota (DAKO)

DAKO 5126. Advanced Dakota Language I. (3 cr.; maximum 12 cr.; A-F or Audit; Every Fall) Focuses on immersion method.

DAKO 5129. Advanced Dakota Language II. (3 cr.; maximum 12 cr.; A-F or Audit; Every Spring) Focuses on immersion method.

DAKO 5226. Dakota Mastery I. (3 cr.; maximum 6 cr.; Student Option; Every Fall) This content-based Dakota language class will focus on Dakota culture and history. Students will learn through both oral and written texts. Both traditional and contemporary stories will be discussed and utilized to give students a better view of Dakota ontology and epistemology. The effects of colonization and the need for decolonization will be also be discussed through the lens of Dakota stories and culture.

Dance (DNCE)

DNCE 5010. Modern/Contemporary Dance Technique 7. (2 cr. [maximum 4 cr.]; Student Option; Every Fall) Seventh course in ten-section sequence of modern dance technique. Continuation of technical development. Performance range/style. Students study with various guest artists. prerequisite: department consent, audition

DNCE 5020. Modern/Contemporary Dance Technique 8. (2 cr. [maximum 4 cr.]; Student Option; Every Spring) Eighth course in ten-section sequence of modern dance technique. Performance range/style. Students study with various guest artists. prerequisite: 5010, department consent, audition

DNCE 5030. Modern/Contemporary Dance Technique 9. (2 cr. [maximum 6 cr.]; A-F or Audit; Every Fall) Ninth course in ten-section sequence of modern dance technique. It focuses on pre-professional technique training for students prepared for that level of technical achievement and readying themselves for a potential career as contemporary dance professionals. All Dance Program Modern Dance Technique courses examine the practical application and understanding of principles of space, time, and energy focusing on alignment, weight, momentum, power for the body’s core, joint and skeletal articulation, clarity of focus and intent, flexibility, strength, stamina and energy flow and lines through the use of breath appropriate to the technical level of the course. The course also explores a range of performance strategies that students may encounter for future performance experiences within the dance program and beyond.

DNCE 5040. Modern/Contemporary Dance Technique 10. (2 cr. [maximum 6 cr.]; Student Option; Every Spring) Tenth course in ten-section sequence of modern dance technique. It focuses on pre-
professional technique training for students prepared for that level of technical achievement and readying themselves for a potential career as contemporary dance professionals. All dance program modern dance technique courses examine the practical application and understanding of principles of space, time, and energy focusing on alignment, weight, momentum, power for the body's core, joint and skeletal articulation, clarity of focus and intent, flexibility, strength, stamina and energy flow and lines through the use of breath appropriate to the technical level of the course. The course also explores a range of performance strategies that students may encounter for future performance experiences within the dance program and beyond.

DNCE 5110. Ballet Technique 7. (3 cr. [max 2 cr.]; Student Option; Every Fall) Continuation of ballet technique. Musically, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet. prereq: dept consent, audition

DNCE 5120. Ballet Technique 8. (3 cr. [max 2 cr.]; Student Option; Every Spring) Continuation of 5110. Musicality, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet. prereq: 5110, dept consent, audition

DNCE 5334. Introduction to Dance/Movement Therapy. (2 cr.; Student Option; Every Spring) Historical/theoretical perspectives on use of movement/dance in relationship to psychology/healing. D/MT pioneers/techniques. Applications of D/MT with various populations/settings. Experiential course. prereq: dept consent

DNCE 5443. Theorizing Dancing Bodies. (3 cr.; Student Option; Every Fall) Major developments in Western philosophic thought on dance and dance theory, from its beginnings to present. prereq: instr consent

DNCE 5454. (Re)Writing the Dancing Body. (3 cr.; Student Option; Every Spring) Modes of writing found in dance studies. Oral histories, historical documentation, performance reviews, performance ethnographies, scholarly essays. Discussion/critique of existent modes of writing. Writing/rewriting practice. prereq: Grad student


DNCE 5495. Dance and Global Tourism. (3 cr.; Student Option No Audit; Every Fall) Politics of dance/performance for tourism industry. Ways in which dancing body produces ideas of nation-state. How this reflects stereotypes of female identity in global context. prereq: Grad student

DNCE 5500. Topics in Dance. (1-3 cr. [max 30 cr.]; Student Option; Periodic Fall, Spring & Summer) Topics specified in Class Schedule.

DNCE 5601. Dance Composition 5. (1-2 cr.; Student Option; Every Spring) Final part of six-semester sequence in dance composition. Exploration of movement through independently scheduled rehearsals. Choreographic concepts. Tools in dance creation, development/refinement of movement, structure of groups choreography. prereq: 4601, 4602, dept consent

DNCE 5700. Performance. (1 cr. [max 4 cr.]; Student Option; Every Fall & Spring) Technique, improvisation, choreography, music, design, and technical production as they relate to dance performance. prereq: concurrent registration is required (or allowed) in technique course, dept consent

DNCE 5858. Dance Pedagogy. (3-4 cr.; Student Option; Every Fall) Teaching dance provides the foundational pedagogy and methods for artful and responsible teaching and learning in dance. Students will examine key dance education theories and quality teaching practices, and then apply the theories by developing and teaching dance lessons. The course introduces tools that assist in the planning, teaching, assessing, and sharing of dance experiences with children, adolescent, and adult learners in a variety of settings. Specific learning opportunities include: readings, investigation and discussion of dance pedagogy; the creation of lesson plans; teaching labs (in-class and off-site supervised practice teaching); and clinical observations where students can observe the theory in practice.

DNCE 5993. Directed Studies. (1-4 cr. [max 10 cr.]; Student Option; Every Fall & Spring) Guided individual study. Prereq-instr consent, dept consent, college consent.

Data Science (DSCI)

DSCI 5994. Directed Research. (1-3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) Directed Research

DSCI 8760. Data Science M.S. Plan B Project. (3 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) Project arranged between student and faculty.

DSCI 8970. Data Science M.S. Colloquium. (1 cr.; S-N or Audit; Every Fall) Recent developments in Data Science and related disciplines. Students must attend 13 of the 15 lectures.

DSCI 8991. Independent Study. (1-3 cr. [max 6 cr.]; Student Option; Every Fall) Independent study with professor. prereq: instr consent

Dental Hygiene (DH)

DH 5201. Management Internship. (5 cr. [max 4 cr.]; S-N only; Every Fall, Spring & Summer) Supervised experience in oral health care industry. Experience in corporations, health care management organizations, long-term care facilities, publishing firms, or professional organizations. An internship is required (minimum 14 weeks). prereq: Dental hygiene grad student

DH 5203. Capstone Project. (3 cr.; S-N only; Every Fall, Spring & Summer) Formulation of extensive business plan/project related to area of interest based on coursework taken or internship experience. prereq: Dental hygiene grad student

DH 5401. Research Methods in Health Sciences. (3 cr.; A-F only; Every Summer) Developing skills in scientific method. Analyzing research findings. Types of research, problem selection, hypothesis writing, research planning/design, data collection/measuring techniques, analysis/interpretation of data. Ethics. prereq: Dental hygiene grad student

DH 5403. The Discipline of Dental Hygiene. (2 cr.; A-F only; Every Summer) Dental hygiene practice grounded in science and guided by research evidence. Etiology, prevention, and treatment of dental caries, periodontal diseases, oral cancer, and other conditions. Advances in technology. prereq: Dental hygiene grad student

DH 5405. Curriculum and Course Development. (2 cr. [max 4 cr.]; A-F only; Every Fall) Curriculum/course development/management, competency-based education/outcomes assessment. Role of accreditation in dental hygiene education. Students develop competency-based dental hygiene curriculum/course. prereq: Dental Hygiene grad student

DH 5407. Instructional Strategies for Effective Teaching. (2 cr.; A-F only; Every Fall) Application of principles of learning. Learning/teaching styles, student-centered teaching, instructional strategies. Microteaching selected strategies. prereq: Dental hygiene grad student

DH 5409. Dental Hygiene Clinic Administration. (2 cr.; A-F only; Every Spring) Theory/practice of dental hygiene preclinical/clinical instruction. Administration of clinic. Developing protocols, calibrating faculty, monitoring student progress. Central Regional Dental Testing Service exam, clinic evaluation mechanisms, quality assurance. prereq: Dental hygiene grad student

### Dental Therapy (DT)

**DT 5000. Dental Therapy Capstone Project.** (2 cr.; S-N only; Every Spring) In-depth, independent, project-based research topic from interests in oral health. Intensive, active-learning initiative requiring significant effort in planning/implementation. Final written product/oral presentation mandatory, demands extensive systematic investigation/research.


**DT 5140. Preventive Pediatric Dental Clinic.** (1 cr.; A-F only; Every Fall) Oral health promotion of pediatric patients. Brushing techniques, fluoride application, dietary analysis/counseling. Students interact with parents of pediatric patients.

**DT 5141. Clinical Pediatric Dentistry III.** (2 cr.; A-F only; Every Fall, Spring & Summer) Early childhood development, dental care for children. Prereq: Must be in the dental therapy program, passed basic foundation competencies.

**DT 5162. Principles of Exodontia and Minor Oral Surgery.** (1 cr.; A-F only; Every Fall & Spring) Develop knowledge/skill for exodontia/minor oral surgery.

**DT 5241. Oral Radiology Clinic II.** (1 cr.; A-F only; Every Fall) Clinical instruction in oral radiography. Intraoral/extraoral radiographic procedures, evaluations. Prereq: Must be in dental therapy masters program.

**DT 5220. Comprehensive Care Clinic.** (1-5 cr. [max 10 cr.]; S-N only; Every Spring) Assessment, treatment, and management of patients. Concepts/principles of evidence-based dentistry as applied to clinical practice.

**DT 5321. Treatment Planning for the Dental Therapist.** (1 cr.; S-N only; Every Fall, Spring & Summer) Formal lecture presentations regarding fundamentals of assessment/treatment planning of dental cases. Prepare student to understand University of Minnesota School of Dentistry protocol in development of optimal, alternative, emergency treatment plans.

**DT 5360. Outreach Experiences I.** (1 cr.; S-N only; Every Fall) Students work in clinics outside of U of M with underserved patients.

**DT 5361. Outreach Experiences II.** (2 cr.; S-N only; Every Fall, Spring & Summer) Experiences that reinforce principles of delivering dental health care/services to patients, including underserved patient populations, in contemporary off-site clinical settings.

**DT 5410. Applied Dental Biomaterials.** (1 cr.; A-F only; Every Summer) Application of scientific principles to selection/ utilization of dental materials. Prereq: 2nd yr DT student.

**DT 5429. Introduction to Psychomotor Skill Development.** (1 cr.; S-N only; Every Fall) Virtual reality based training for psychomotor skills required in prosthodontic/operative courses. Eye-hand/mirror skills, ergonomics used while preparing teeth for restoration. Prereq: In dental therapy program.

**DT 5430. Oral Anatomy.** (2 cr.; A-F only; Every Fall) Morphological characteristics of human dentition, associated contiguous structures. Foundational knowledge applied to situations encountered in general dental clinical practice. Prereq: Accepted into dental therapy masters program.

**DT 5431. Oral Anatomy Laboratory.** (3 cr.; A-F only; Every Fall) Manual dexterity skills, anatomy of human dentition. Prereq: Accepted into masters in dental therapy program.

**DT 5432. Operative Dentistry I.** (1 cr. [max 2 cr.]; A-F only; Every Fall, Spring & Summer) How to treat dental caries. Therapeutic treatment of underlying pathology. Surgical treatment of early caries lesion.

**DT 5433. Operative Dentistry I Pre-Clinic Laboratory.** (2 cr.; A-F only; Every Fall, Spring & Summer) How to treat dental caries. Therapeutic treatment of underlying pathology. Surgical treatment of early caries lesion. Hands-on projects working with models simulating teeth and surrounding structures. Prereq: 2nd yr masters in dental therapy student.

**DT 5434. Operative Dentistry II Lecture.** (1 cr.; A-F only; Every Fall, Spring & Summer) How to surgically manage more advanced caries lesions. Transition from pre-clinic lab to clinic setting. Prereq: Enrolled in master’s in dental therapy program.

**DT 5435. Operative Dentistry II for the Dental Therapist, Lab.** (1 cr.; A-F only; Every Fall, Spring & Summer) More advanced caries lesions: diagnosis, structural preparation, decay removal and restoration.

**DT 5443. Operative Clinic III.** (4 cr.; A-F only; Every Fall, Spring & Summer) How to place restorations. Students place single-tooth restorations on patients.

**DT 5460. Essentials of Clinical Care I For the Dental Therapist.** (10 cr. [max 12 cr.]; S-N only; Every Fall) Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, pediatric care, and health promotion. Limited care may be given on rotations to oral surgery clinics.

**DT 5471. Prosthodontic Topics for Dental Therapy.** (2 cr.; A-F only; Every Summer) Lectures, lab projects of selected prosthodontic techniques to enable the dental therapist to provide/cement quality pre-fabricated metal or resin provisional crowns and other prosthodontic procedures in the scope of DT practice.

**DT 5960. Essentials of Clinical Care II for the Dental Therapist.** (5-10 cr. [max 20 cr.]; S-N only; Every Summer) Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, pediatric care, and health promotion. Limited care may be given on rotations to oral surgery clinics.

**DT 6164. Principles of Exodontia and Minor Oral Surgery for the ADT student.** (1 cr. [max 2 cr.]; A-F only; Every Fall, Spring & Summer) This course develops knowledge and skill in the advanced dental therapy (ADT) student in exodontia and minor oral surgery.

**DT 6321. Treatment Planning.** (2 cr.; A-F only; Every Fall) Fundamentals of assessment/dental treatment planning using University of Minnesota School of Dentistry protocol in developing optimal, alternative, emergency treatment plans. Case-
based treatment planning/small group seminars utilized.

**DT 6340. Advanced Dental Therapy Prep Clinic.** (10 cr.; A-F only; Every Fall) Preparation for licensed dental therapists to be eligible for advanced dental therapy certification. Course has four requirements: completion of designated clinic hours, self-assessment records, faculty assessment records, final interview that can be completed with patients from student's place of employment.

**DT 6341. Advanced Dental Therapy Prep Lecture.** (2 cr.; A-F only; Every Fall) Preparation for licensed dental therapists to become eligible for advanced dental therapy certification. Topics range from essential basic sciences to specific clinical procedures. prereq: Must be a licensed dental therapist who was originally trained at the University of Minnesota, School of Dentistry.

### Dentistry (DENT)

**DENT 6113. Oral Radiology Clinic III.** (1-2 cr.; A-F or Audit; Every Fall, Spring & Summer) This course consists of radiographing dental school patients, radiographic interpretations, panoramic and extraoral technique seminars and quality assurance procedures.

**DENT 6225. Advanced Oral and Maxillofacial Surgery Elective.** (1-5 cr.; S-N or Audit; Every Fall) Diagnosis/treatment of dentoalveolar pathology. 25-125 contact hours.

**DENT 6230. Oral and Maxillofacial Surgery Externship Elective.** (0 cr.; S-N or Audit; Periodic Fall & Spring) Students gain additional surgical experiences and determine if career in oral/maxillofacial surgery is desirable. prereq: Interview with externship dir, letter stating student registered in good standing at ADA-accredited dental school; experience in dentoalveolar surgery procedures preferred.

**DENT 6231. Hospital Dentistry Clinic Rotation.** (0 cr.; S-N or Audit; Every Fall) Managing hospitalized patients, operating room protocol, patient admission and discharge, and ambulatory patients.

**DENT 6232. Hospital Dentistry Clinic Rotation.** (1 cr.; S-N or Audit; Every Fall & Spring) Managing hospitalized patients, operating room protocol, admission/discharge of patients, ambulatory patients.

**DENT 6319. Surgical and Clinical Oral and Maxillofacial Pathology.** (1-10 cr.; S-N or Audit; Periodic Fall & Spring) This elective involves spending time with Division of Oral and Maxillofacial Pathology faculty while they diagnose surgical pathology cases and see clinical oral pathology referral patients.

**DENT 6470. Health Ecology Elective.** (1-10 cr.; Student Option; Every Fall & Spring) Highly motivated students earn academic credit for activities in special-interest areas.

**DENT 6480. Advanced General Dentistry Elective.** (1-10 cr.; Student Option; Every Fall, Spring & Summer) Block rotations of 2 to 10 weeks in selected special clinics and programs such as prisons, regional treatment centers, and migrant worker health care programs.

**DENT 6490. Health Ecology: Independent Study.** (1-10 cr.; Student Option; Every Fall & Spring) Arranged with any Health Ecology faculty member.

**DENT 6591. Pediatric Dentistry Independent Study.** (2 cr.; Student Option; S-N or Audit; Every Fall & Spring) Students may be assigned independent projects or additional clinical experiences in pediatric dentistry.

**DENT 6713. Endodontics: Independent Study.** (1 cr.; A-F or Audit; Every Fall & Summer) Has three phases: case presentations, literature review, laboratory. prereq: Completion of 3rd yr of dental school, dept consent

**DENT 6715. Advanced Endodontic Elective.** (0 cr.; S-N only; Every Fall) Current data relevant to methods/materials in endodontic dentistry.

**DENT 6931. Application of Occlusal Appliances.** (1 cr.; S-N only; Every Fall & Spring) Focuses on fabrication, application, and adjustment of occlusal appliances. Clinical, lab, and practice issues.

**DENT 7000. Dental Clinic.** (1-6 cr.; Student Option; Periodic Fall, Spring & Summer) Focuses on fabrication, application, and adjustment of occlusal appliances. Clinical, lab, and practice issues.

**DENT 7021. Contemporary Diagnosis and Management of Orofacial Pain.** (1 cr.; A-F only; Every Spring) Pain mechanisms, pathways, and assessment of orofacial pain. Pharmacology of pain and strategies for effective pre- and post-operative pain management.

**DENT 7031. Advanced Seminar in Clinical Geriatric Dentistry.** (1-2 cr.; S-N or Audit; Every Fall) Oral health problems in elderly, clinical implications of biological aging changes, geriatric medical concerns, medical risk assessment, medication issues, ethical/legal concerns, dental management of patients in long-term care settings. prereq: [Advanced or grad] student in [dentistry or other AHC discipline]

**DENT 7032. Field Experience: Administration in a Multidisciplinary Health Center.** (1-3 cr.; Student Option; Every Spring & Summer) Administrative and management issues in a multidisciplinary health care environment. Student placement with faculty approval and oversight at the Amherst H. Wilder Senior Health Clinic or other sites. Project emphasis on strategic planning, organizational structure, budgeting and financial management, personnel management, communications, quality assurance activities, or other topics.

**DENT 7033. Teaching and Evaluation in Dentistry.** (3 cr.; A-F or Audit; Every Spring) Application of educational and psychological principles to professional dental education. Design and implementation of curricular components based on principles of learning and instruction. Review of evaluation and measurement theories and practices in the context of student performance and assessment. Survey of program evaluation methods. prereq: Dent or OBio grad student or instr consent


**DENT 7061. Special Oral Pathology I.** (1 cr.; S-N or Audit; Every Fall & Spring) Review of clinical, radiographic, and treatment aspects of oral disease and oral manifestations of systemic disease. Prereq: [Resident or grad student] in discipline other than oral pathology

**DENT 7062. Special Oral Pathology II.** (1 cr.; S-N only; Every Spring) Review of the clinical, radiographic, and treatment aspects of oral disease and oral manifestations of systemic disease. Preq: 7061, resident [or grad student] in discipline other than oral pathology.

**DENT 7071. General Practice Residency Dental Clinic.** (13 cr.; max 78 cr.; S-N only; Every Fall, Spring & Summer) Clinical course for residents of the General Practice Residency Program.

**DENT 7082. Carniofacial Growth and Development.** (2 cr.; A-F only; Every Fall) This course is structured as a combination of two-hour lectures, seminars, and distance learning meeting once a week. The overall objectives of this course are to present essential concepts necessary to understand growth and development as it pertains to orthodontic diagnosis and treatment planning.

**DENT 7101. Management Philosophy for Dental Practices.** (1 cr.; A-F only; Every Fall & Spring) Seminar on philosophy and techniques used in the administration and management of offices.
for dental specialists. prereq: Dentistry grad student

DENT 7102. Conscious Sedation. (2 cr.; A-F only; Every Fall)
Oroal, inhalation, and intravenous sedation for dental patients. Topics include patient selection and physical risk assessment; selection and administration of sedative agents; and prevention, recognition, and management of medical emergencies. prereq: Dentistry grad student

DENT 7111. Current Literature Review in Dentistry. (2 cr.; A-F only; Every Fall & Spring)
Current literature in dentistry and related disciplines. Formal setting for students to meet and review current literature that is of significance to all. prereq: Grad student in [dentistry or oral biology] or instr consent

DENT 7112. Treatment Planning Seminar. (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring)
Multidisciplinary format for discussion of complex dental patients. Evaluating, diagnosing, and developing a comprehensive treatment plan for complex dental patients.

DENT 7121. Psychological Issues in Medical and Dental Patient Management. (1 cr.; Student Option; Every Fall & Spring)
Psychological issues in medical and dental evaluation and treatment, psychopathology, stress, and illness.

DENT 7123. Temporomandibular Disorders and Orofacial Pain. (1 cr.; A-F or Audit; Every Fall)
Basic didactic information needed to recognize/manage patients with temporomandibular disorders. Overview of scope/complexity of clinical practice of TMD/Orofacial Pain management.

DENT 7220. Prosthetically-Driven Implant Surgery and Treatment Planning. (1 cr.; A-F only; Every Fall)
Patient selection. Treatment planning for implant therapy. Indications/contra-indications of various types of implants. Treatment planning, implant surgery, bone grafting procedures. prereq: Prosthodontics resident

DENT 7411. Dental Biomaterials in Prosthodontics. (1 cr.; A-F only; Summer Odd Year)

DENT 7991. Independent Study. (1-4 cr.; max 8 cr.; Student Option No Audit; Every Fall, Spring & Summer)
Individualized study under supervision of graduate faculty member in MS-Dentistry Program. Focus determined by faculty and student. prereq: Enrolled in an advanced dental education program

DENT 7993. Curricular Practical Training Elective. (1 cr. [max 4 cr.]; S-N only; Every Fall, Spring & Summer)
This course is an elective internship or employment to gain practical work experience, advance professional skills and explore career interests.

DENT 8031. Topics and Problems in Dental Education. (1-3 cr.; Student Option; Every Spring & Summer)
Independent study in student learning, instructional development, curriculum planning, student testing and evaluation, and academic administration, where these areas and their interfaces are applied directly to professional dental education. Provides opportunity for applying and extending concepts learned in Dent 7033.

DENT 8061. Clinical Topics in TMD. (2 cr.; A-F only; Every Fall)
Structured as a combination of 2-hour lectures and seminars meeting once a week. The overall objectives are to present essential concepts necessary to the diagnosis and management of temporomandibular disorders (TMD), as well as background on how TMD can affect patient care for the orthodontist. It should be noted the course is not designed to meet the needs of a person providing specialty care for TMD and orofacial pain. The students will learn evidence-based approaches to diagnose and provide and predictable and efficient treatment for patients with mild TMD conditions. Critical review of classic and current TMD and orodental literature is an important component of this course. Hands-on clinical experience will consist of two clinical sessions.

DENT 8090. Evidence-based Clinical Pediatric Dentistry. (2 cr.; A-F or Audit; Every Fall, Spring & Summer)
Selected pediatric dentistry topics. In-depth literature review, seminar discussion.

DENT 8091. Interdisciplinary Care of the Cleft Palate Patient. (1 cr.; S-N or Audit; Every Summer)
Comprehensive surgical, dental, and speech and hearing evaluation and management of patients with cleft lip and palate.

DENT 8100. Topics in Advanced Periodontology: Literature Review. (2 cr.; Student Option; Every Fall, Spring & Summer)
State-of-the-art information on a variety of topics concerning risk factors and therapeutic modalities for periodontal disease.

DENT 8101. Dental Implantology: A Multidisciplinary Approach. (2 cr.; Student Option; Every Fall & Summer)
Dental implant therapy from perspective of several dental disciplines.

DENT 8120. Advanced Principles and Techniques of Orofacial Pain Disorders. (2 cr. [max 3 cr.]; A-F or Audit; Every Spring)
Interdisciplinary study of theory, principles, epidemiology, mechanisms associated with TMJ/craniofacial pain disorders. Basis for scientific understanding of diagnostic management strategies. prereq: Participation in TMJ, orofacial pain advanced education program

DENT 8121. Current Literature in TMD and Orofacial Pain. (1 cr.; A-F or Audit; Every Fall, Spring & Summer)
Review of current literature/how it relates to past literature. Theories on pain, philosophies of management.

DENT 8123. Advanced Topics in Orofacial Pain. (2 cr.; A-F or Audit; Every Spring)
Review of cutting edge research and clinical findings regarding etiology and treatment of acute and chronic orofacial pain conditions and related disorders. prereq: Grad student in dentistry or other health sciences grad student or instr consent

DENT 8200. Dental Clinic for Oncology Fellows. (13 cr.; S-N only; Every Fall, Spring & Summer)
Train oral/maxillofacial surgeons in principals/practice of head/neck oncology. Treatment of benign/malignant disease including salivary gland tumors. Training will emphasize multidisciplinary care of head/neck oncology patient.

DENT 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master’s student, adviser and DGS consent

DENT 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

Dermatology (DERM)

DERM 7182. Dermatology Preceptorship. (4 cr.; H-N only; Every Fall, Spring & Summer)
This elective is useful to the student planning a career in a primary care specialty or dermatology.

DERM 7183. Advanced Dermatology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Students will gain further experience in all aspects of dermatology. This course is appropriate for medical students interested in pursuing a career in Dermatology.

DERM 7185. Research in Dermatology. (3-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)
An introduction to research in dermatology. The student pursues a research project through clinical or laboratory research. The specific project is individually formulated by the student and faculty. As time permits during this course, the student is invited to attend research and teaching conferences conducted by the Department of Dermatology.

DERM 7910. Dermatology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Dermatology medical residency.

DERM 7920. Medicine/Dermatology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Medicine/dermatology medical residency.

DERM 7930. Dermatology Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

Design (DES)

DES 5160. Topics in Design. (1-4 cr.; max 24 cr.; A-F only; Every Fall, Spring & Summer)
Topics in design

DES 5165. Design and Globalization. (3 cr.; A-F or Audit; Every Fall)
The course explores how culture, identity, and difference are defined and produced and the role that design plays in the production of difference, inequality, and marginalization. prereq: Grad student

DES 5168. Evidence-Based Design. (3 cr.; A-F or Audit; Every Fall)
Origins of evidence-based design/possible benefits and detractors. Students learn various components as a process/ explore methods of integrating process via application to a design project in their area of expertise. Process, impact, influence, and anticipated outcomes are documented/ analyzed as compared to a typical design process approach. prereq: CDes grad student or instr consent

DES 5170. Topics in Design. (3 cr.; max 24 cr.; A-F or Audit; Periodic Fall)
In-depth investigation of single specific topic, announced in advance.

DES 5185. Human Factors in Design. (3 cr.; A-F or Audit; Periodic Fall)
Theories/methods that influence the assessment of physical, social, and psychological human factors. Development of user needs with application to designed products that interact with human body. prereq: Grad student or sr or instr consent

DES 5188. Anthropometrics, Sizing & Fit. (4 cr.; A-F only; Periodic Fall & Spring)
Comprehensive attention to ergonomics and anthropometric variance across populations is crucial to the advancement of wearable products and apparel. This course will examine the relationship between body size, body shape, product design, sizing systems, and fit. Students will examine existing sizing systems and develop new sizing systems using anthropometric data, body scan technology, and Op/TeX 3D patternmaking software. A special focus will be given to examining innovative tools that encourage the merging of anthropometrics and design throughout the design process. This class is suitable for students across a variety of disciplines.

DES 5193. Directed Study in Design. (1-6 cr.; max 36 cr.; A-F only; Every Fall, Spring & Summer)
Directed Study in Design prereq: dept consent

DES 5196. Field Study: National/International. (1-10 cr.; A-F or Audit; Every Fall, Spring & Summer)
Faculty-directed field study in a national or international setting.

DES 8102. Quantitative Research Methods. (3 cr.; A-F only; Fall Even Year)
Quantitative research methods for issues related to humans, their behaviors, and everyday living in the designed environment.

DES 8103. Qualitative and Mixed Methods Research. (3 cr.; A-F or Audit; Fall Odd Year)
A scientific approach to qualitative research. Methods/strategies combined to explore complex research questions.

DES 8112. Design Theory. (3 cr.; A-F or Audit; Spring Even Year)

DES 8113. Teaching and Assessment. (2 cr.; A-F or Audit; Fall Odd Year)

DES 8114. Design Studio. (4 cr.; A-F or Audit; Fall Even Year)
Advanced problem analysis, design solution. prereq: Design grad student or instr consent

DES 8115. Grant Writing. (2 cr.; A-F or Audit; Fall Even Year)
Interdisciplinary course.

DES 8151. Product Development: Theory and Practice. (3 cr.; A-F only; Spring Odd Year)
Product development theories/methods as applied in many design fields. Emphasizes retail setting. Seminar format discussion, case studies, observation/critique of hands-on industry product development project.

DES 8164. Innovation Theory and Analysis. (3 cr.; A-F or Audit; Spring Odd Year)
Theories and factors that influence adoption and diffusion of designed products. Methodologies used in analysis of diffusion process.

DES 8166. Material Culture and Design. (3 cr.; A-F or Audit; Periodic Spring)
Research approaches to material culture study using artifacts from Goldstein Museum of Design. prereq: [DHA or DES] grad student or instr consent

DES 8167. Aesthetics of Design. (3 cr.; A-F or Audit; Periodic Spring)
How we perceive, analyze, value, and evaluate design outcomes/results.

DES 8170. Topics in Design. (1-3 cr.; max 6 cr.; A-F or Audit; Every Fall & Spring)
In-depth investigation of topic announced in advance.

DES 8181. Research Ethics. (1 cr.; S-N or Audit; Every Spring)
Overview of ethical concerns/questions in conducting/disseminating research. Mentoring relationships, use of human subjects, data handling, plagiarism, authorship, publishing, research funding, social responsibility of researchers, code of conduct. prereq: Grad student

DSSC 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

DSSC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

DSSC 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

DSSC 8777. Thesis Credits: Master’s. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

DSSC 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change. (3 cr.; S-N or Audit; Every Fall)
Approaches practiced by physical, biological, social science, and humanities scholars. “Ways of knowing” in different cultures/groups. Issues/methodological challenges facing interdisciplinary/international studies. Taught by faculty from biological, social sciences, and humanities. prereq: Grad DSSC minor or instr consent

DSSC 8112. Scholarship and Public Responsibility. (1-24 cr.; max 2 cr.; S-N only; Every Spring)
Seminar. Concerns/themes relevant to public engagement in academic work. Diverse practices of reading, writing, and pedagogy. Privileged locations of knowledge. Practices of collaborative work. prereq: Grad DSSC minor or instr consent

DSSC 8211. Doctoral Research Workshop in Development Studies and Social Change. (3 cr.; S-N or Audit; Every Fall)
Interdisciplinary workshop to assist doctoral students in writing successful research and grant proposals to support their dissertation research on themes related to global social change. Enables students to develop interdisciplinary peer review and feedback skills and consider ethical and practical issues global
south research, prereq: Grad DSSC minor or instr consent

DSSC 8310. Topics in Development Studies and Social Change. (1.3 cr. [max 9 cr.]; S-N only; Every Fall & Spring) Seven-week to full semester seminar. Topical issues in development and social change.

Doctor of Dental Surgery (DDS)

DDS 6111. Periodontology I Lecture. (1.5 cr.; A-F only; Every Summer) Periodontal anatomy, physiology/etiology of periodontal diseases. Clinical, histopathological, and pathogenesis of gingivitis and periodontitis. Role of genetics, tobacco use, and systemic disorders.

DDS 6112. Periodontology II: Technique. (2 cr.; A-F or Audit; Every Fall) Presurgical procedures in periodontics. Clinical skills to examine, diagnose, prevent, and treat periodontal diseases. Prereq-In DDS program.

DDS 6113. Periodontology III Lecture. (1.5 cr.; A-F only; Every Spring) Clinical procedures associated with surgical phase of periodontal therapy, including implants. Evaluation of periodontal treatment, maintenance phase, relationship between periodontics and other disciplines in dentistry. Clinical research. Integrating periodontics into general practice.


DDS 6121. Periodontology Clinic. (2 cr.; A-F or Audit; Every Spring) Nonsurgical and surgical treatment of periodontal diseases, evaluation of periodontal therapy, implementation of maintenance programs.

DDS 6122. Periodontology Clinic DDS3. (2 cr.; A-F only; Every Spring) Nonsurgical and surgical treatment of periodontal diseases, evaluation of periodontal therapy, and implementation of maintenance programs.

DDS 6124. Periodontology Clinic D4. (2 cr. [max 4 cr.; A-F only; Every Spring) This course is designed to enable the dental student to gain expertise, knowledge and confidence in the clinical skills needed to examine, diagnose and treat the periodontal patient. Students are expected to complete 3-4 competencies and a Patient Case presentation.

DDS 6130. Introduction to Clinical Dentistry. (2.2 cr. [max 20 cr.; S-N only; Every Summer) Methods/procedures consistent with preclinical teaching in traditional predoctoral program. Prereq: Enrolled in PASS

DDS 6131. Pediatric Dentistry Pre-Clinic. (1.7 cr.; A-F or Audit; Every Spring & Summer) Physical, emotional, dental, and language development. Diagnosis, prevention, and management of oral diseases in children.

DDS 6141. Pediatric Dentistry Clinic. (3.6 cr.; A-F only; Every Fall, Spring & Summer) Preventive/clinical topics/techniques. Diagnosis, treatment planning, and clinical treatment of pediatric patients. Prereq-3rd yr DDS student.

DDS 6151. Pain and Anxiety Control. (1.2 cr.; A-F or Audit; Every Spring & Summer) Didactic/clinical aspects of pain/anxiety control as pertains to dentistry. Emphasizes use of local anesthetics, conscious sedation (nitrous oxide inhalation). Acute/chronic pain mechanisms, neuropathic pain, issues pertaining to narcotic/other drug abuse.

DDS 6152. Oral and Maxillofacial Surgery I. (1.1 cr.; A-F only; Every Fall) Introduction to concepts of oral/maxillofacial surgery. Emphasizes fundamental skills of oral surgery that apply to practice of general dentistry.

DDS 6153. Oral and Maxillofacial Surgery II. (1.2 cr.; A-F only; Every Spring) Fundamental clinical/diagnostic skills that apply to practice of general dentistry. Surgical procedures, complications, facial fractures, congenital abnormalities. Prereq-Oral Surgery I.

DDS 6161. Oral & Maxillofacial Surgery Clinic Rotation. (2.5 cr.; S-N or Audit; Every Spring) Oral Surgery Clinic experience.

DDS 6171. Orthodontics I. (2.7 cr.; A-F only; Every Fall) Supervision, guidance, and correction of growing or mature dentofacial structures. Growth/development of craniofacial structures. Diagnostic methods, biology of tooth movement and biomechanics. Clinical diagnosis, treatment planning.

DDS 6172. Orthodontics II. (1.5 cr.; A-F only; Every Spring) Lectures examine clinical management of specific orthodontic problems; and principles and procedures in preventative, interceptive, and corrective orthodontics examined through case analysis and treatment planning. Lab covers practical applications of developing occlusion analysis; and fundamentals of orthodontic appliances.

DDS 6181. Orthodontic Clinic Rotation. (1 cr.; S-N or Audit; Every Fall & Spring) Diagnosis, treatment timing, and treatment objectives; skills required to perform orthodontic procedures.

DDS 6211. Introduction to Oral Biology. (0.6 cr.; S-N only; Every Spring) Biology of the mouth. Broad overview of current information on the following topics: plaque microbiology, bone growth and remodeling, oral diseases, bad breath, and amalgam fillings. Prereq-1st yr [DDS or DT student].

DDS 6212. Topics in Dental Biochemistry. (1.1 cr.; A-F only; Every Spring) Biological, chemical, and biochemical phenomena in oral cavity and their interrelationships. Biological/chemical basis of dental caries. How saliva, dental plaque, and plaque fluid interact with and impact caries process. Metabolic handling, antacaries mechanisms of fluoride. prereq: 1st yr [DDS or DT student]


DDS 6214. General Histology. (3.7 cr.; A-F or Audit; Every Fall) Structure/function of cells, tissues, and organs. Prereq-Accepted into DDS program.


DDS 6231. Physical Evaluation I. (2.9 cr.; A-F only; Every Spring) Concepts of diagnosis and patient evaluation for physical examination in various adult clinical programs in School of Dentistry. Prereq: 1st yr [DDS or DT student]

DDS 6232. Physical Evaluation II. (2.2 cr.; A-F or Audit; Every Fall) Lecture and case-based series designed to review physical evaluation of common medical/systemic problems of patient management and care based on principles of medical management, thorough evaluation, and recognition of the medically compromised patient. Includes acute management of medical emergencies in dental practice.


DDS 6234. Radiographic Interpretation. (2 cr.; A-F only; Every Fall) Dental record keeping. Documentation/analysis of medical/clinical findings. Patient's rights, informed consent. Radiographic interpretation of deviations from normal. Prereq-In DDS program.

DDS 6235. Oral Radiography Preclinical Lab I. (0.9 cr.; S-N only; Every Fall) Preclinical demonstration-participation phases in radiographic technique, using mounted human skulls. Prereq-In DDS program.

Application of clinical knowledge, skills, and the principles of care to the comprehensive assessment, diagnosis, treatment planning, and management of patients.

**DDS 6313. Comprehensive Care Clinic II.** (1 cr. [max 3 cr.]; S-N only; Every Fall, Spring & Summer)

Patient management skills. Diagnosis, treatment planning, delivery of comprehensive care, efficient use of clinic time. Prereq-6050.

**DDS 6314. Treatment Planning and Introduction to Patient Care.** (4.1 cr. or S-N; Every Fall & Spring)


**DDS 6315. Clinical Geriatric Dentistry Rotation.** (0 cr. or S-N only; Every Fall)

The purpose of this rotation is to complement and reinforce information provided in didactic course DDS 6338 Geriatrics and Special Needs Patient Care to enable upper level students to interact with older adults with complex dental, medical and psycho-social concerns during routine dental appointments.

**DDS 6322. Treatment Planning Clinic II.** (1 cr. or A-F or Audit; Every Spring)

Devise initial plan from established database; make case presentation; develop final treatment plan, informed consent and appointment plan; and make financial arrangements. Prereq: Patient Management II Resource Workbook

**DDS 6325. Dental Professional Development I.** (1 cr.; S-N only; Every Fall & Spring)

First of a series that prepares the student in professionalism and practice management. Uses self-assessment and strategic planning to lead students to identify personal and professional aspirations. Four sequential levels of learning creating progressively higher levels of competence using a blended-learning format including online education, simulations and self-directed learning.

**DDS 6326. Dental Professional Development II.** (1 cr.; S-N only; Every Summer)

Focuses on Career Planning, Personal Strategic Planning, Personal Finance and Debt Management. Students apply principles and tools learned to their future professional practice and career.

**DDS 6327. Dental Professional Development III.** (2 cr.; S-N only; Every Spring)

This course focuses on preparing the student in professionalism, critical thinking, problem solving and practice management. It uses a blended-learning format that includes online education, simulations and self-directed learning. It lays the groundwork for students to develop day-to-day leadership skills needed to operate a successful dental practice.

**DDS 6328. Dental Professional Development IV.** (1 cr.; S-N only; Every Summer)

Fourth and final course sequence in Dental Professional Development. Focuses on completing business plans and refining personal and professional strategic plans applying skills learned in the previous three courses.

**DDS 6331. Dental Public Health I.** (1.9 cr.; S-N only; Every Fall)


**DDS 6332. Dental Public Health II.** (1 cr.; S-N only; Every Spring)

Aspects/principles of prevention, risk assessment, screening, dietary analysis, Models of health education, health promotion. How dental profession influences public. Student groups research/present materials about oral health topic.

**DDS 6333. Professional Problem Solving.** (0.8 cr.; S-N only; Every Spring)

Forum for discussion of clinical dental cases in context of ethics/professionalism. Five workshops based on ADA principles of ethics and code of professional conduct. Prereq-DDS 3rd yr.

**DDS 6335. Professional Problem Solving.** (0.3 cr.; S-N only; Every Fall)

Forum for discussion of clinical dental cases in context of ethics/professionalism. Given over fall/spring semester of 4th year. Three workshops on dental cases/ethics.

**DDS 6336. Dental Practice Management.** (2 cr.; S-N only; Every Spring)

Skills in planning, organizing, leading, and controlling the clinical, business, and human aspects of dental practice.

**DDS 6337. Current Legal Issues for the New Dentist.** (2.1 cr.; S-N only; Every Fall)

Legal issues: regulation of the profession, associateships, purchasing a dental practice, starting a practice, dental risk management, contract law considerations. Prereq-In DDS program.

**DDS 6338. Special Issues in Oral Health Care: Geriatric, Hospital, and Special Needs Patient Dentistry.** (1.7 cr.; A-F only; Every Summer)

Delivering optimal oral health care to older adults and patients with special needs. Clinical management of patients with social, psychological, physiological, and dental characteristics. Dentistry in hospital setting. Prereq-4th yr DDS program student.

**DDS 6339. Emergency Preparedness.** (0.8 cr. [max 1.6 cr.]; S-N only; Every Spring)

Emergency preparedness for the dental office with emphasis on teamwork skills. Online module, lectures, and participation in simulated realistic disaster scenarios with interprofessional teams. Prereq-Must be enrolled in a School of Dentistry program.

**DDS 6340. Medical Emergencies and Patient Safety in the Dental Clinical Environment.** (0.5 cr.; S-N only; Every Spring)

Hands-on/didactic training in recognizing/managing medical emergencies. Patient safety/
reduction of risks for accidental patient injury in dental clinical environment.

**DDS 6360. Introduction to Outreach Experiences.** (0.5 cr.; S-N only; Every Spring) Provide dental care to underserved populations in various clinical settings throughout Minnesota.

**DDS 6361. Outreach Experiences I.** (2 cr.; S-N only; Every Fall, Spring & Summer) Dental care/involvement in community health promotion/service events to under-served populations throughout Minnesota.

**DDS 6362. Outreach Experiences II.** (2 cr.; S-N only; Every Fall) Provide dental care/involvement in community health promotion/service events to underserved populations in various clinical settings throughout Minnesota. Prereq: Doctor of Dental Surgery Program.

**DDS 6363. Outreach Experiences III.** (2 cr.; S-N only; Every Spring) Dental care/involvement in community health promotion/service events to under-served populations throughout Minnesota.

**DDS 6411. Applied Dental Biomaterials.** (2 cr.; A-F only; Every Spring) Prosthodontics, operative dentistry. Students apply scientific principles to selection/utilization of biomaterials, and evaluate a recent research publication. Prereq: In DDS program.

**DDS 6431. Oral Anatomy I.** (2 cr. [max 4 cr.]; A-F or Audit; Every Fall) Morphological characteristics of human dentition and associated contiguous structures. Foundational knowledge applied to situations in general clinical practice. Lectures, lab. Prereq: 1st yr DDS student.


**DDS 6433. Introduction to Psychomotor Skill Development I and II.** (0.7 cr. [max 1.4 cr.]; S-N only; Every Fall) Virtual-reality-based training for psychomotor skills. Mirror skills, proper ergonomics. Preparation of intra-coronal activity. Prereq: 1st yr DDS student.

**DDS 6434. Operative Dentistry I.** (1.7 cr.; A-F only; Every Fall & Summer) Restorative of small caries lesions, cervical abrasion lesions, and attrition defects. Practical aspects of caries risk assessment, lesion identification, and comprehensive caries management. Emphasizes indications for surgical intervention, principles of restoration design, and rationale for various design features. Prereq: Dental Anatomy, Biomaterials.

**DDS 6435. Operative Dentistry I Laboratory.** (2.3 cr.; A-F or Audit; Every Fall & Summer) Restoration of small caries lesions, cervical abrasion lesions, and attrition defects in clinical simulation setting. Emphasizes designing/ executing retentive/resistant restorations, conserving tooth structure, and operating in clinically relevant orientations. Self-evaluation techniques, discriminatory skills. Prereq: Dental Anatomy, Biomaterials.

**DDS 6436. Operative Dentistry II.** (2.1 cr.; A-F only; Every Fall) Diagnosis, treatment planning, and treatment of moderate to severe phase of dental caries. Use of dental amalgam, cast gold, composite resin, and cast porcelain. Aesthetic modifications to teeth. Prereq: In DDS program.

**DDS 6437. Operative Dentistry II Lab.** (2.9 cr.; A-F only; Every Fall) Exercises in treatment of moderate to severe phase of dental caries utilizing dental amalgam, cast gold, composite resin, and cast porcelain. Aesthetic modifications to teeth. Prereq: In DDS program.


**DDS 6439. Operative Dentistry IV.** (1.4 cr.; A-F only; Every Fall) Contemporary aspects of operative Dentistry. Students, working in groups, answer clinical questions. Evidence-based approach. Prereq: 3rd yr DDS student.

**DDS 6441. Operative Dentistry Clinic II.** (4 cr.; A-F only; Every Fall & Spring) Students, under direction of instructor, place single tooth restorations on patients, perform dental exams, and prepare treatment plans for patients with consultation from Operative Dentistry Division faculty. Prereq: Operative Dentistry I, II, III, Operative Dentistry I, II Lab.

**DDS 6442. Operative Dentistry Clinic V.** (7.5 cr.; A-F only; Every Spring) Clinical application of operative dentistry diagnosis, treatment planning, clinical judgment, and technical skills. Prereq: Operative Dentistry I, II, III, Operative Dentistry I and II Lab.

**DDS 6451. Introduction to Endodontics Lecture and Laboratory.** (3.7 cr.; A-F or Audit; Every Summer) Study of morphology, physiology, and pathology of the human dental pulp and periradicular tissues.

**DDS 6461. Endodontic Clinic D3.** (2 cr.; S-N only; Every Fall & Spring) Clinical practice for endodontics.

**DDS 6462. Endodontic Clinic.** (2 cr.; A-F or Audit; Every Spring) Clinical practice for endodontics.

**DDS 6471. Preclinical Prosthodontics Single Crown Restoration Lecture II.** (1.5 cr. [max 3 cr.]; A-F or Audit; Every Spring) Provides fundamental knowledge/procedural skills necessary for managing simulated patient cases that require full crown restoration.

**DDS 6472. Preclinical Prosthodontics Single Crown Restoration Technique Laboratory II.** (3.3 cr. [max 6.6 cr.]; A-F or Audit; Every Spring & Summer) Lab techniques, fundamentals of tooth preparation.

**DDS 6473. Preclinical Prosthodontic Technique Lecture III.** (1.5 cr.; A-F or Audit; Every Fall & Summer) Fixed, removable, occlusion topics.

**DDS 6474. Preclinical Prosthodontics Technique Laboratory III.** (2.1 cr.; A-F or Audit; Every Fall & Summer) Fixed, removable, occlusion topics.

**DDS 6475. Preclinical Prosthodontics Techniques Lecture IV.** (1.8 cr.; A-F only; Every Fall) Theory/practice in complete denture construction. Diagnosis, treatment planning/sequencing for edentulous patient. Instruments, terminology, principles, technical/clinical procedures. Prereq: DDS program.

**DDS 6476. Preclinical Prosthodontic Technique Laboratory IV, Complete Dentures.** (2.3 cr.; A-F only; Every Fall) Technical/clinical laboratory procedures used for fabrication/replacement of teeth with complete dentures. Prereq: DDS program.

**DDS 6477. Preclinical Prosthodontics Technique Lecture V, Removable Partial Dentures.** (2.5 cr.; A-F only; Every Spring) Principles/philosophies of removable partial denture prosthodontics. Design/fabrication of removable prosthesis to replace teeth for partially edentulous patient. Lecture format, plus an interactive seminar.

**DDS 6478. Preclinical Prosthodontics Technique Laboratory V, Partial Dentures.** (2.2 cr.; A-F only; Every Spring & Summer) Technical/clinical laboratory procedures used for fabrication/replacement of teeth with partial dentures.

**DDS 6479. Clinical Occlusion.** (1 cr. [max 2 cr.]; A-F or Audit; Every Spring) Clinical variation in occlusion encountered in a typical clinical setting. Guidelines to manage this variation. Prereq: Enrolled in dentistry program.

**DDS 6481. Fixed Prosthodontics Clinic II.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Summer) Diagnosis, design, construction of fixed prosthetic cases.

**DDS 6482. Removable Prosthodontics Clinic II.** (1 cr. [max 2 cr.]; S-N only; Every Fall, Spring & Summer) Clinical practice in partial and complete removable denture prosthodontics for DDS third-year students.

**DDS 6483. Fixed Prosthodontics Clinic IV.** (7.5 cr.; A-F only; Every Spring) Diagnosis, design, construction of fixed prosthodontic cases.

**DDS 6484. Removable Prosthodontics Clinic IV.** (4 cr.; A-F only; Every Spring) Clinic practice in complete/partial removable denture prosthodontics.

**DDS 6485. Preclinical Removable Prosthodontics Lectures for PASS.** (2.5 cr.; A-F only; Every Spring) Principles and philosophies of removable partial denture prosthodontics. Design and
fabrication of removable prosthesis to replace teeth for partially edentulous patient. Lecture and interactive seminar.

**DDS 6486. Removable Prosthodontics Laboratory for PASS.** (2.2 cr.; A-F only; Every Spring)
Technical and clinical laboratory procedures used for fabrication/replacement of teeth with partial dentures.

**DDS 6487. Fixed Prosthodontics for PASS (Program for Advanced Standing Students).** (3 cr.; A-F only; Every Summer)
Pre-clinical didactic and laboratory course designed to provide students with the knowledge and procedural skills necessary for managing simulated patient cases requiring full crown restoration.

**DDS 6491. Preclinical Prosthodontics Technique Lecture VI.** (1.9 cr.; A-F only; Every Summer)

**DDS 6492. Preclinical Prosthodontics Techniques Laboratory VI.** (1 cr.; A-F only; Every Summer)

**DDS 6493. Prosthodontics I.** (1.1 cr. [max 2.2 cr.]; A-F only; Every Spring)
Links preclinical clinical areas. Treatment planning for abutments, retainers, and pontics. Design principles for porcelain fused to metal restorations, pontic designs, occlusion. Prerequisite: Fundamentals of prosthodontics shape/color, aesthetics of anterior prosthodontics.

**DDS 6494. Global and Integrated Competency Assessment Course.** (1 cr.; S-N only; Every Spring)
Global/integrated assessment of didactic/clinical competency for 4th year DDS students. Results of assessment shall be used to establish/maintain standards/competency of University of Minnesota, School of Dentistry.

**DDS 6495. Oral & Maxillofacial Surgery Honors Elective Course.** (1 cr.; S-N only; Every Fall, Spring & Summer)
This course provides Doctor of Dental Surgery students the opportunity to participate in a week-long externship experience in the Oral & Maxillofacial clinic at the University of MN, School of Dentistry. Students will be shadowing the OMS Residents as they care for patients. This includes evaluation and management of a surgical patient, pre- & post-operative care, and treatment planning.

**DDS 6496. Predoctoral Prosthodontics Honors Course.** (1 cr.; S-N only; Every Fall & Spring)
Clinical, laboratory, and seminar based course for senior dental honors students. Theory and practice in complete denture construction and implant restoration.

**DDS 6511. Foundations of Interprofessionalism, Communication, and Collaboration.** (1 cr.; S-N only; Every Fall)
First of three phases of Center for Interprofessional Education's health curriculum. Online work, face-to-face sessions. Professional identity, integrity. Relationships between professionals and those they serve. Social networking, tools for self/peer assessment.

**DDS 6570. Mission of Mercy Volunteer Elective Experience.** (0 cr.; S-N only; Every Fall)
Short term volunteer experience to learn public health aspects of oral health. Must be approved by School of Dentistry. Must have faculty supervision.

**DDS 6571. Special Smiles Volunteer Elective Experience.** (0 cr.; S-N only; Every Summer)
Short term volunteer experience with Special Smiles event. Public health initiatives of oral health. Must be approved by School of Dentistry. Must have faculty supervision.

**DDS 6572. Team Smiles Volunteer Elective Experience.** (0 cr.; S-N only; Every Summer)
Short term volunteer experience for Team Smiles event. Students experience public health initiative in oral health. Must be approved by School of Dentistry. Must have faculty supervision.

**DDS 6588. Common Hope: Short-term Clinical Experience in Guatemala Elective.** (0 cr.; S-N only; Every Spring)
Students spend up to two weeks working with Common Hope in Guatemala providing oral health care in cities of Antiqua/San Rafael. Clinical care given under direct supervision of School of Dentistry faculty licensed dentist.

**DDS 6601. Phillips Neighborhood Elective Volunteer Experience.** (0 cr.; No Grade Associated; Every Fall, Spring & Summer)
Opportunity to observe/assist in provision of health care services to populations diverse in age, ethnicity, social environment. Experience unique clinical settings.

**DDS 6602. Harbor Lights Elective Volunteer Experience.** (0 cr.; No Grade Associated; Every Fall & Spring)
Short term volunteer experience to learn about particular aspect of oral health. Must be approved by School of Dentistry/have faculty supervision. Prereq: Must be in DDS program.

**DDS 6603. Elective Regional Volunteer Experience.** (0 cr.; S-N only; Every Fall, Spring & Summer)
Short term volunteer experience to learn particular aspect of oral health. Must be approved by School of Dentistry. Must have faculty supervision.

**DDS 6604. Elective Regional Volunteer Experience.** (0 cr.; S-N only; Every Fall, Spring & Summer)
Short term volunteer experience to learn particular aspect of oral health. Must be approved by School of Dentistry. Must have faculty supervision.

**DDS 6605. Advanced Practice Management Elective.** (0-2 cr.; S-N only; Every Spring)
Fundamentals of business management related to maintaining dental practice. Components include economics, planning practice philosophy, operational decisions, financial decisions, financial analysis, business taxation, evaluation.

**DDS 6606. Rural Dentistry Scholars Elective.** (0-1 cr.; S-N only; Every Fall, Spring & Summer)
The Rural Dentistry Scholars Elective course (RDS) is for second and third year DDS students and Dental Therapy students selected to participate in the MN Collaborative Rural Oral Health Project (MN-CROHP) to address the rural dental workforce issues. Students spend 3.5 weeks in a rural dental practice in selected counties in MN under the mentorship of a rural dentist. During the same period they participate in community activities for oral health promotion and disease prevention instruction during community events and in K-12 schools and network with other health care providers in the community. Through a grant, students receive stipend and receive reimbursement for housing and travel costs.

**DDS 6607. Interprofessional Leadership and Facilitation Elective.** (1 cr.; S-N only; Every Fall)
Instruction on Kotter's 8-Step Process for leading change. Attend facilitator training associated with AHC course Foundations of Interprofessional Communication/Collaboration. Facilitate six small group sessions of first-year students within AHC. Prereq: Four-year DDS student.

**DDS 6608. Elective Externship I.** (1-5 cr.; S-N only; Every Fall, Spring & Summer)
Short-term externship to become familiar with a particular aspect of oral health or participate in international exchange program.

**DDS 6609. Elective Externship II.** (1-5 cr.; [max 10 cr.]; S-N only; Every Fall, Spring & Summer)
Short-term externship to become familiar with a particular aspect of oral health or participate in international exchange program.

**DDS 6610. Elective Externship III.** (1-5 cr.; S-N only; Every Fall, Spring & Summer)
Short-term externship to become familiar with a particular aspect of oral health or participate in international exchange program.

**DDS 6611. Study Abroad Externship.** (1-10 cr.; [max 25 cr.]; S-N only; Every Fall, Spring & Summer)
Short-term externship to become familiar with a particular aspect of oral health or participate in international exchange program.

**DDS 6612. Union Gospel Mission Volunteer Outreach Opportunity.** (0 cr.; S-N only; Every Fall, Spring & Summer)
Volunteer at Union Gospel Mission in St. Paul, Minnesota under guidance of School of Dentistry faculty.

**DDS 6613. Endodontic Topics for the General Dentist.** (0 cr.; S-N only; Every Fall & Spring)
Presentations on scientific/biologic basis for root canal therapy.
DDS 6614. Predoctoral Periodontal Honors. 
(2 cr.; A-F only; Every Spring) 
Surgical periodontics. Lab exercises, gingivectomy, modified Widman flap, apically positioned flap with osseous recontouring, free gingival graft procedures. Surgically placed dental implants in aplastic maxible. Students assist senior periop residents in surgery, perform surgery on their own patient.

DDS 6615. Oral and Maxillofacial Pathology Independent Study. 
(1 cr.; max 2 cr.; S-N or Audit; Every Fall & Spring) 
Independent projects in oral and maxillofacial pathology designed by student and faculty. This elective covers primarily retrospective surgical pathology studies although active laboratory research may be possible.

DDS 6616. Advanced Simulation Clinic Elective I. 
(0.5 cr.; S-N only; Every Fall, Spring & Summer) 
Operative dental procedures. Psychomotor skills for performing basic operative preparations according to specifications of DentSim software. Prereq-DDS program.

DDS 6617. Advanced Simulation Clinic Elective II. 
(0.5 cr.; S-N only; Every Fall, Spring & Summer) 
Additional operative dental procedures. Psychomotor skills for performing basic operative preparations according to specifications of DentSim software. Prereq-DDS program.

DDS 6619. Moderate Sedation Techniques. 
(0 cr.; S-N only; Every Fall) 
Planning/administration of moderate sedation via parenteral access (intraovenous).

DDS 6621. Introduction to CAD/CAM Restorations. 
(2 cr.; S-N only; Every Fall, Spring & Summer) 
CAD/CAM in restorative dentistry. Emphasizes clinical aspects. Students deliver CAD/CAM restorations to patients.

DDS 6622. EBD: Advanced Dental Materials for Esthetic & Digital Applications. 
(1 cr.; S-N only; Every Fall, Spring & Summer) 

DDS 6623. Oral Disease Clinic Elective. 
(0 cr.; S-N only; Every Fall, Spring & Summer) 
Students experience clinical oral pathology diseases not normally seen during dental clinic rotations. Students observe operator protocol, management, and referrals.

DDS 6624. Disaster 101 Elective. 
(1 cr.; S-N only; Every Fall & Spring) 
Disaster preparedness. Timeliness/quality of response. Students participate in simulated disaster scenarios in interprofessional teams. Prereq-In DDS program.

DDS 6625. Pediatric Dentistry Honors Elective. 
(0.5 cr.; A-F only; Every Fall, Spring & Summer) 
Didactic discussions/clinical sessions with pediatric patients requiring advanced dental treatment and/or advanced behavioral management skills.

DDS 6626. Orofacial Pain Clinic Elective. 
(1 cr.; max 2 cr.; S-N only; Every Fall, Spring & Summer) 
Two days of observation in the Orofacial Pain Clinic while residents and faculty evaluate and manage patients with orofacial pain conditions. Students will gain working knowledge of patient interviewing skills, musculoskeletal exam of the head and jaw, jaw range of motion and function. They will also gain knowledge of how to prescribe and deliver dental appliances.

DDS 6627. Oral Pathology Clinical Pathologic Correlation. 
(1 cr.; max 4 cr.; S-N only; Every Fall & Spring) 
This oral pathology elective has two parts. Every week one clinical oral path case will be uploaded in the course website for students to review. Students will meet as a group once a month for discussion of the four cases. One student will introduce one case involving discussion of the history, clinical presentation, establishing a clinical differential diagnosis, discuss of next steps in diagnosis and treatment planning.

DDS 6630. Dental Research Training. 
(2-6 cr.; S-N or Audit; Every Summer) 
Research project, written report.

DDS 6631. DDS/PhD Research Elective I. 
(2 cr.; max 6 cr.; S-N only; Every Fall, Spring & Summer) 
Integrate research education with dental education. Attend labs one-half day per week, MNCrest seminar monthly, and oral biology student seminar weekly. Additional research time/credits may be permitted with approval of associate dean for academic affairs. Prereq: Students must be part of the MinnCrest program.

DDS 6632. DDS/PhD Research Elective II. 
(2 cr.; max 6 cr.; S-N only; Every Fall, Spring & Summer) 
Integrate research education with dental education. Attend lab one-half day per week, MNCrest seminar monthly, and oral biology student seminar weekly. Additional research time/credits may be permitted with approval of associate dean for academic affairs. Prereq: Students must be part of the MinnCrest Program.

DDS 6640. Curricular Practical Training Elective. 
(1 cr.; max 4 cr.; S-N only; Every Fall, Spring & Summer) 
This course is an elective internship or employment to gain practical work experience, advance professional skills and explore career interests.

DDS 6900. Dental Clinic. 
(1-15 cr.; S-N or Audit; Every Fall, Spring & Summer) 
Elective clinical course for students and adult special students who want additional clinical training in comprehensive dental care.

DDS 6901. Essentials of Clinical Care DDS2. 
(0 cr.; S-N only; Every Fall, Spring & Summer) 
This course will introduce sophomore doctor of dental surgery students to the clinical care of patients. Students will assist in care provision in multiple care environments under the direction and supervision of experienced clinical faculty. This course will encompass clinical training over two semesters and a final grade is given at the end of the last semester. This course will also allow students to volunteer to assist at the Union Gospel Mission Dental Clinic in St. Paul. Prereq: Must be enrolled in the Doctor of Dental Surgery Program.

DDS 6911. Essentials of Clinical Care: D3. 
(0-18 cr.; max 72 cr.; S-N only; Every Fall, Spring & Summer) 
Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, prosthodontics/ endodontics, and health promotion. Limited care may be given on rotations to oral surgery/ endodontics clinics. Prereq-DDS 3rd yr.

DDS 6918. Evidence Based Dentistry. 
(2 cr.; A-F only; Every Fall & Spring) 
Background knowledge and skills to integrate the best research evidence with clinical expertise and patient preferences in making clinical decisions. Principles of evidence-based dentistry are discussed as well as their clinical application. Prereq-Must be in DDS program.

DDS 6921. Essentials of Clinical Care: D4. 
(0-18 cr.; max 54 cr.; S-N only; Every Fall, Spring & Summer) 
Students provide comprehensive care under direction of clinical faculty. May include periodontics, operative, prosthodontics/ endodontics, and health promotion. Limited care may be given on rotations to oral surgery and endodontics clinics. Prereq-DDS 4th yr.

DDS 6931. Dental Clinic. 
(1-15 cr.; S-N only; Every Fall, Spring & Summer) 
Elective clinical course. Clinical training in comprehensive dental care.

DDTS 7103. Biochemistry & Cell Biology for Dental Students. 
(4 cr.; max 8 cr.; A-F only; Every Fall) 
This course covers four main classes of biomolecules (nucleic acids, proteins, carbohydrates, and lipids) and how they interact at the cellular and organismal levels. Dental students will learn about the building blocks that comprise these biomolecules and how they are produced and degraded as part of normal cellular growth processes. These basic biochemical concepts will then be transferred to cellular processes including enzyme kinetics, roles of salivary enzymes in health and disease, metabolic pathways, and regulation of cellular processes such as cell cycle progression and the blood-clotting cascade. Upon completion of the course, students will be able to explain the role of these biomolecules in health and disease, with an emphasis on oral health, as well as being capable of diagnosing diseases based on biochemical characterization of patient samples.
DTCH 5993. Directed Studies. (1-4 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

Early Modern Studies (EMS)

EMS 5500. Topics in Early Modern Studies. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) Selected topics in early modern studies from various disciplinary perspectives/world regions. prereq: Grad student

EMS 8100. Workshop in Early Modern Studies. (1-3 cr. [S-N only; Every Fall & Spring) Lectures and workshops offered by various centers, departments, institutes, and libraries across disciplines on Twin Cities campus. Online reports and discussion. prereq: instr consent

EMS 8250. Seminar in Early Modern Studies. (3 cr. [max 6 cr.]; Student Option; Every Spring) Current research and debates in early modern studies. Theoretical approaches to major questions shaping seminar's subject matter.

EMS 8500. Topics in Early Modern Studies. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) Selected topics in early modern studies from various disciplinary perspectives and world regions. prereq: Grad student

EMS 8993. Directed Study. (1-6 cr.; A-F or Audit; Every Fall, Spring & Summer) Students work on tutorial basis. Guided individual reading or study. prereq: Grad student

Earth Sciences (ESCI)

ESCI 5093. Directed Studies in Earth Sciences. (1-4 cr. [max 16 cr.]; Student Option; Every Fall & Spring) Independent, directed study in earth sciences arranged by student/faculty member.

ESCI 5102. Climate Change and Human History. (3 cr.; Student Option; Spring Even Year) Causes of long-/short-term climate change. Frequency/magnitude of past climate changes, their geologic records. Relationship of past climate changes to development of agrarian societies and to shifts in power among kingdoms/city-states. Emphasizes last 10,000 years. prereq: 1001 or equiv or instr consent

ESCI 5201. Time-Series Analysis of Geological Phenomena. (3 cr.; A-F or Audit; Periodic Fall) Time-series analysis of linear and nonlinear geologic and geophysical phenomena. Examples drawn from ice age cycles, earthquakes, climatic fluctuations, volcanic eruptions, atmospheric phenomena, thermal convection and other time-dependent natural phenomena. Modern concepts of nonlinear dynamics and complexity theory applied to geological phenomena. prereq: Math 2263 or instr consent

ESCI 5203. Mineral and Rock Physics. (3 cr.; Student Option; Periodic Spring) Physical properties of minerals and rocks as related to the composition and dynamics of the Earth's crust, mantle, and core. prereq: 2201, Phys 1302


ESCI 5302. Isotope Geology. (3 cr.; A-F or Audit; Every Fall) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radiometric dating, deanothermometry, and tracer techniques in geologic processes. prereq: 3303W or instr consent

ESCI 5351. Geochemical Modeling of Aquifer Systems. (3 cr.; Student Option; Spring Odd Year) Using mass transfer reaction path models to assess chemical evolution of natural fluids, hydrothermal alteration processes, and formation of hydrothermal ore deposits. prereq: 4401

ESCI 5353. Electron Microprobe Theory and Practice. (3 cr.; Student Option; Periodic Fall) Characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions. prereq: [One yr chem, one yr physics] or instr consent


ESCI 5502. Advanced Structural Geology. (3 cr.; Student Option; Periodic Fall) Analysis of structures and fabric of deformed rocks. Determination of states of stress and strain in rocks and of evolution of these with time. Deformation mechanisms. Extensive reading in journal literature. Field trips. prereq: 4501 or instr consent

ESCI 5503. Advanced Petrology. (3 cr.; Student Option; Fall Odd Year) Quantitative approach to modern igneous/metamorphic petrology. Emphasizes thermodynamics of minerals/melts and with applications to phase diagrams, thermobarometry, melting relationships, and energetics of petrologic mass transfer. prereq: 2302, CHEM 1061, CHEM 1065, [MATH 1372 or MATH 1272 or MATH 1572]

ESCI 5504W. Neotectonics. (WI; 3 cr.; Student Option; Fall Even Year) Integration of multidisciplinary elements of geology, geodesy, geodynamics, seismotectonics, tectonophysics to examine recent/active tectonics of Earth’s lithosphere. Extensional, compressional, wrench-tectonic regimes with global case studies incorporating mantle to surface processes. prereq: [2201, 4501] or instr consent

ESCI 5501W. Advanced Sedimentology. (WI; 4 cr.; Student Option; Fall Odd Year) Principles/processes of sedimentary geology. Interactions among lithosphere, biosphere, atmosphere, hydrosphere. Detrital/carbonate facies of modern/ancient systems, coastal processes, geobiology, tectonics, paleoclimate, structural diagenesis, paleosols, volcanic sedimentation. prereq: 4602 or instr consent

ESCI 5705. Limnogeology and Paleoenvironment. (3 cr.; Student Option; Periodic Fall) Within-lake, hydrogeologic, and landscape (geological/biological) processes that lead to formation of various proxy records of paleoenvironment. Systems approach to physical, geochemical, biogeochemical, and biotic proxies. Basic principles, case studies. Emphasizes how proxy records relate to paleoclimate. prereq: instr consent

ESCI 5805. Standards and Practices for Professional Geoscientists. (3 cr.; Student Option; Every Spring) This course is meant to provide students with a clear understanding of the standards and practices regularly used by Geoscience professionals in industry and agency. The course builds on the foundational knowledge offered through the core curriculum of the Earth Sciences undergraduate major, and fills a critical gap in showing how this knowledge is translated into common standards and practices, regulations, funding mechanisms, and even professional expectations within a variety of geoscience disciplines. In short, this course aims to smooth a student's transition from University to an entry-level position from which they can build a successful and sustainable career. This course is targeted for both upper level undergraduates and graduate students. Aspects of the course include: Detailed discussion of regional stratigraphy, bedrock and glacial geology and how they relate to various industrial applications and environmental issues. Examination of state and federal environmental regulations,
as well as the phases of environmental impact statements. Survey of fundamental investigation techniques (GeoProbe drilling, hollow-stem auger drilling, well installation, analytical testing, soil, groundwater, air). Introduction to environmental clean-up grants and their management. Assessment of topics covered in the National Association of State Boards of Geology (ASBOG) Fundamentals of Geology (FG) exam. This exam is a required step on the way to becoming a registered geologist. The exam is offered in mid-March, and the expectation is that students participating in the class will take it. Coordination and completion of the 40 hour HAZWOPER training through UMN. Invited lectures from select representatives of various subsfields and professional organizations (groundwater & contaminant hydrogeology, mining & geophysical exploration, environmental engineering, petroleum) to give students a jumpstart in their professional networking.

**ESCI 5971. Field Hydrogeology.** (2 cr. ; Student Option; Every Summer) Aquifer, vadoze zone, and surface water hydrology field techniques. Shallow soil boring and sampling. Well installation. Single/multiple well aquifer testing. Ground water sampling for chemical analysis. Weather data collection, hydrogeologic mapping, water balance calculation. prereq: instr consent

**ESCI 5980. Seminar: Current Topics in Earth Sciences.** (1-4 cr. [max 12 cr. ] ; S-N or Audit; Periodic Fall & Spring) Topics in earth sciences investigated in a seminar format.

**ESCI 8001. Introductory Graduate Seminar.** (2 cr. ; S-N or Audit; Every Fall) Graduate level survey of important research, concepts, and methods in the earth sciences; familiarization with program faculty/facilities and basics of science writing and proposal craft. prereq: Grad student status in earth sci

**ESCI 8203. Environmental Geophysics.** (3 cr. ; Student Option; Every Fall) Seismic exploration (reflection/refraction). Potential techniques (gravity/magnetics), electrical techniques of geophysical exploration. prereq: Phys 1301 or equivalent

**ESCI 8204. Geomagnetism and Paleomagnetism.** (3 cr. ; Student Option; Spring Even Year) Present geomagnetic field at Earth's surface, secular variation, geomagnetic field reversals. Physical/chemical basis of paleomagnetism. Origin of natural remanent magnetization, mineralogy of magnetic minerals, magnetic polarity stratigraphy, apparent polar wander, environmental magnetism. prereq: 2201, Phys 1302, [Math 1272 or instr consent]

**ESCI 8243. Principles of Rock Magnetism.** (1-3 cr. ; Student Option; Periodic Fall) Remanent magnetizations, their classification and origins. Fundamentals of fine particle magnetism; magnetic minerals; separation of multicomponent magnetizations; effects of chemical change on magnetization; magnetic proxies of climatic and environmental change; biomagnetism. prereq: 4204 or instr consent

**ESCI 8333. FTE: Master's.** (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

**ESCI 8353. Phase Equilibrium in Mineral Systems.** (3 cr. ; Student Option; Periodic Fall) Principles of homogeneous and heterogeneous equilibria and their application to problems in petrology. Emphasis on derivations from first principles and formulation of algebraic and graphical methods essential to multicomponent systems. prereq: 4301, Chem 3551, Math 2243

**ESCI 8354. Igneous Petrology.** (3 cr. ; Student Option; Periodic Fall) Igneous rocks and processes, emphasizing geochemistry of melts and minerals. Content varies with instructor and student interest. prereq: 4301 or instr consent

**ESCI 8355. Metamorphic Petrology.** (3 cr. ; Student Option; Periodic Fall) Metamorphic processes; relation of theory and observation to current problems. Relation of fundamental concepts and techniques to progressive development of mineral assemblages. Term paper required. prereq: 8353

**ESCI 8401. Aqueous Environmental Geochemistry.** (3 cr. ; Student Option; Periodic Spring) General principles of solution chemistry applied to geology. Solution-mineral equilibria. Redox processes in natural waters. Geochemistry of hydrothermal fluids. Environmental geochemistry. prereq: Chem 5501 or instr consent

**ESCI 8402. Biogeochemical Cycles in the Ocean.** (3 cr. ; Student Option; Fall Even Year) Marine biogeochemistry/chemical oceanography. Processes controlling chemical composition of oceans past/present. Cycles of major/minor constituents, including carbon, nitrogen, phosphorus, silicon, oxygen/their isotopes. Role of cycles in climate system. prereq: [Chem 1021, Chem 1022] or instr consent

**ESCI 8444. FTE: Doctoral.** (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (no description) prereq: Doctoral student, adviser and DGS consent

**ESCI 8501. Structural Geology.** (4 cr. ; Student Option; Every Fall) Fundamental concepts related to deformation of Earth's crust. Processes associated with deformation, faulting, folding, fabric development. Lab/recitation include solving problems, conducting physical-numerical experiments. Term Paper. Field trips. prereq: 2301 or instr consent

**ESCI 8502. Tectonic Styles.** (3 cr. ; Student Option; Spring Odd Year) Origin/nature of major types of tectonic disturbances affecting crust/lithosphere, including analysis of form/development of individual structural components/relationship to plate tectonics. Changes over geologic time in nature of orogenic processes. prereq: 4501 or 8501 or instr consent

**ESCI 8511. Mechanics of Sediment Transport.** (3 cr. ; A-F or Audit; Every Fall) Particle motion in fluids. Criteria for incipient motion. Formulations for bedload and suspended load. Bedform mechanics, hydraulic resistance relations. Channel stability, aggradation/degradation, alluvial stream morphology.

**ESCI 8601. Introduction to Stream Restoration.** (3 cr. ; A-F or Audit; Every Fall) Background material essential for participating in a stream restoration project. How to assimilate geologic, hydrologic, and ecological data at the watershed and reach scales to plan a restoration project and evaluate/critique existing stream restoration projects. prereq: Grad student in CE or ESCI or EEB or WRS or FW or BAE or FR or HORT or ENR or LA or SRSE or instr consent

**ESCI 8602. Stream Restoration Practice.** (2 cr. ; S-N only; Every Summer) Field experience, group design project. Students provide a stream restoration context for each other's elective coursework, complete critical assessments of stream restoration projects, and design a stream restoration site. prereq: 8601 or CE 8601

**ESCI 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. ; max 12 cr. ; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**ESCI 8712. Transport Phenomena and Analytical Geohydrology.** (3-4 cr. ; Student Option; Every Fall) Microscopic flow parameters, momentum, mass and energy transport through porous media. Geologic factors in aquifer performance, equations for groundwater flow, and analysis of pump tests. prereq: 5701 or CE 3502 or instr consent

**ESCI 8718. Numerical Methods in Hydrogeology.** (4 cr. ; A-F or Audit; Periodic Fall) Introduction to finite difference and finite element methods in hydrogeology. Students develop one- and two-dimensional models of diffusion and advection-dispersion equations. prereq: 5701, CSci 1107 or instr consent

**ESCI 8777. Thesis Credits: Master’s.** (1-18 cr. ; max 50 cr. ; No Grade Associated; Every Fall, Spring & Summer) (no description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**ESCI 8801. Geomicrobiology.** (3 cr. ; Student Option; Every Spring)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

Geosphere/biosphere interactions over temporal/spatial scales. Global biogeochemical cycling, microbe-metal interactions, microbial paleobiology, environmental geomicrobiology, life detection, habitability of planets. prereq: One semester college level biology

**ESCI 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (no description) prereq: Max 18 cr per semester or summer; 24 cr required

**ESCI 8970. Seminar: Current Topics in Earth Sciences.** (1-4 cr. [max 32 cr.]; Student Option; Periodic Fall & Spring) Seminar course. Individual topics will be determined and added per semester. prereq: instr consent

**ESCI 8980. Seminar: Current Topics in Earth Sciences.** (1-4 cr. [max 30 cr.]; Student Option; Every Fall, Spring & Spring) Selected seminar topics. prereq: instr consent

**ESCI 8994. Research in Earth Sciences.** (1-4 cr. [max 30 cr.]; S-N or Audit; Every Fall & Spring) Independent research under faculty supervision. prereq: instr consent

**Ecology, Evolution, and Behav (EEB)**

**EEB 5042. Quantitative Genetics.** (3 cr.; A-F only; Every Fall) Fundamentals of quantitative genetics. Genetic/environmental influences on expression of quantitative traits. Approaches to characterizing genetic basis of trait variation. Processes that lead to change in quantitative traits. Applied/evolutionary aspects of quantitative genetic variation. prereq: [BIOL 4003 or GCD 3022] or instr consent; a course in statistics is recommended

**EEB 5053. Ecology: Theory and Concepts.** (4 cr.; Student Option; Fall Odd Year) Classical and modern mathematical theories of population growth, interspecific interactions, ecosystem dynamics and functioning, with emphasis on underlying assumptions and on effects of added biological reality on robustness of predictions, stability, interspecific interactions, ecosystem structure and functioning. prereq: Biol 3407 or instr consent

**EEB 5068. Plant Physiological Ecology.** (3 cr.; Student Option No Audit; Spring Even Year) Plant function, its plasticity/diversity in ecological context. Impact of environmental stresses on major physiological processes of plants, including photosynthesis, respiration, water uptake/transport, and nutrient uptake/assimilation. Lab, field trip to Cedar Creek. prereq: BIOL 2022 or BIOL 3002 or BIOL 3407 or BIOL 3408W or instr consent

**EEB 5221. Molecular Evolution.** (3 cr.; A-F or Audit; Periodic Fall) Molecular basis of evolutionary change. Selection, neutral evolutionary processes at molecular level. Evolution from gene to genome level: protein structure/function, multigene families, organelle genomes, genome organization. Lectures, current literature, workshops. prereq: ([BIOL 4003 or GCD 3022], grad student) or instr consent

**EEB 5322. Evolution and Animal Cognition.** (3 cr.; Student Option; Periodic Fall) Animal cognitive abilities. Learning, perception, memory, navigation, and communication from evolutionary/comparative perspective. Cognitive abilities as adaptations that solve specific environmental problems. Empirical methods for assessing cognitive abilities. Emphasizes parsimonious interpretations of data. Controversial topics such as animal intelligence, animal language and whether non-human animals have a "theory of mind." prereq: Biol 3411 or Psy 3061 or instr consent

**EEB 5327. Behavioral Ecology.** (3 cr.; Student Option; Spring Even Year) Evolutionary principles applied to aggressive competition, mate choice, cooperation, and parental investment. Optimization models used to examine foraging strategies, predator/prey interactions, and territoriality. Evolution of sex, sexual selection, dispersal. Evolutionary game theory. prereq: Biol 3411 or instr consent

**EEB 5371. Principles of Systematics.** (3 cr.; Student Option; Spring Odd Year) Theoretical/practical procedures of biological systematics. Phylogeny reconstruction. Computer-assisted analyses, morphological and molecular approaches, species concepts/speciation, comparative methods, classification, historical biogeography, nomenclature, use/value of museums. prereq: Grad student or instr consent

**EEB 5407. Ecology.** (3 cr.; Student Option; Every Fall) Principles of ecology from populations to ecosystems. Applications to human populations, disease, exotic organisms, habitat fragmentation, biodiversity and global dynamics of the earth. prereq: [Math 1142, 1241, 1271 or equivalent]

**EEB 5409. Evolution.** (3 cr.; Student Option; Every Fall & Spring) Diversity of forms in fossil record and in presently existing biology. Genetic mechanisms of evolution, including natural selection, sexual selection, genetic drift. Examples of ongoing evolution in wild/domesticated populations and in disease-causing organisms. Lab. prereq: One semester college biology

**EEB 5534. Biodiversity Sci: The origins, maintenance, consequences, detection and assessment of biodiversity.** (ENV; 3 cr.; A-F only; Every Fall) Biodiversity science is a rapidly expanding field of inquiry with increasing digital resources and global monitoring capabilities precisely at the moment in history that scientists recognize as the Sixth Extinction. In other words, we are currently facing a biodiversity crisis with threats to the Earth's biota not seen since the dinosaurs perished 65 million years ago. "Biodiversity" was coined by W.G. Rosen and E.O. Wilson in the 1980s to describe the variation in all of life on Earth. The term is now widely used in both the scientific and popular literature and is at the center of scientific enquiry, conservation efforts, large-scale collaborative pursuits of technological advances to allow monitoring from space, and global assessments that interface with international policy. Biodiversity requires integration across multiple disciplines from evolution, to ecology, remote sensing, conservation biology, economics and the social sciences, including the environmental policy. Biodiversity science is thus inherently interdisciplinary. As a consequence, rarely does a single course provide students the opportunity to focus on this critical topic from multiple perspectives and dimensions. This new course seeks to provide students intensive study of biodiversity from six perspectives: 1) the origins of biodiversity, including the processes of speciation and extinction over macroevolutionary timescales and those involved in generating biological variation at microevolutionary scales; 2) the ecological problem of species coexistence, given the nature of competitive interactions and biological filters with a focus on the interactions of individual species and major threats to biodiversity; 3) the consequences of biodiversity and biodiversity loss for ecosystem functions, focusing on ecosystem scale processes; 4) the services or benefits to humans attributed to biodiversity, including cultural benefits of biodiversity; here we discuss both practical and ethical arguments for sustaining biodiversity; 5) methods of detecting biodiversity including classic field biodiversity observations and taxonomic collections and emerging remote sensing methods that harness hyperspectral data and satellite imagery; and 6) scientific assessments of biodiversity that communicate the science of biodiversity to policymakers, particularly the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). The IPBES involves scientists from around the world and integrates indigenous and local knowledge (ILK). The United Nations and governments around the globe are sponsoring the IPBES, building on earlier assessments such as a prominent one in the UK. Several guest lecturers from across the University will participate in discussions and aid in development of computer labs (including Sharon Jansa (CBS), Keith Barker (CBS), Joe Knight (CFANS), and others).

**EEB 5601. Limnology.** (3 cr.; Student Option; Every Fall) Advanced introduction to description/analysis of interaction of physical, chemical, and biological factors that control functioning of life in lakes and other freshwater aquatic environments. prereq: Grad student or instr consent

**EEB 5605. Limnology Laboratory.** (2 cr.; A-F or Audit; Every Fall) Field/lab methods to obtain information on environmental conditions in aquatic environments and measure abundance of aquatic organisms, especially plankton. Field/lab instruments, sampling devices, microscopy,
Evolution and Behavior. Prepare students for members representing fields of Ecology, Evolution, and Behavior. prereq: Grad student in Ecology, Evolution, and Behavior Semester. (1 cr. : S-N only; All Fall & Spring)

Distributed Graduate Seminar. (1-6 cr. ; S-N only; Every Fall, Spring & Summer) Faculty members will conduct lab tours in their research of EEB graduate faculty, their postdocs and current graduate students. Faculty members will conduct lab tours in their laboratory and/or inform students about their research. This seminar will be organized by the DGS or a faculty member designated by the DGS.

EEB 8151. EEB Lab Tours. (1 cr. : S-N only; Every Spring) The goal of the Laboratory Tour seminar is to acquaint incoming graduate students with the research of EEB graduate faculty, their postdocs and current graduate students. Faculty members will conduct lab tours in their laboratory and/or inform students about their research. This seminar will be organized by the DGS or a faculty member designated by the DGS.

EEB 8200. Sustainability Science Distributed Graduate Seminar. (3 cr. ; Student Option; Every Spring) Theories of sustainability science. Interactions between human/environmental systems. Improving present/future generations. Presentations/papers. Contemporary research from earth systems science, resource economics, institutional analysis, ecology, geography, development studies, health sciences, engineering.

EEB 8201. Graduate Foundations in Ecology, Evolution and Behavior Semester 1. (4 cr. ; A-F only; All Fall) Foundational knowledge in ecology, evolution, behavior, prereq: Grad student in Ecology, Evolution and Behavior.

EEB 8202. Graduate Foundations in Ecology, Evolution and Behavior - Semester 2. (4 cr. ; A-F only; All Spring) Foundational knowledge in ecology, evolution, behavior. Second semester of two-semester sequence. prereq: 8601, EEB grad student.

EEB 8301. Prelim Proposal Writing Seminar. (1 cr. : S-N only; All Fall) Learn about structure/format of research proposal under guidance of three faculty members representing fields of Ecology, Evolution/Behavior. Prepare students for writing written preliminary exam. prereq: EEB grad student.

EEB 8302. EEB Written Prelim Workshop. (1 cr. : S-N only; All Spring) Provide time for students to meet/discuss issues associated with writing written preliminary exam. Workshop sections of written preliminary exam with peers. Exam should be reviewed informally by committee/revised by student before final submission. prereq: EEB grad student.

EEB 8303. Prelim Proposal Writing Seminar. (1 cr. : No Grade Associated; All Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent.

EEB 8360. Behavioral Biology Seminar. (1 cr. : max 5 cr.; S-N or Audit; All Fall & Spring) Research topics in selected areas. prereq: instr consent.

EEB 8444. FTE: Doctoral. (1 cr. : No Grade Associated; All Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent.

EEB 8500. NSF GRF Graduate Research Fellowship Proposal Writing Seminar. (1 cr. : max 2 cr.; S-N only; All Fall) Prepare EEB students to submit a competitive fellowship proposal to an external organization (e.g., NSF Graduate Research Fellowship program). In addition to announced meeting time, students meet once a week in small groups to discuss proposals/provide each other with feedback. prereq: EEB grad student only.

EEB 8601. Introduction to Stream Restoration. (3 cr. ; Student Option; Fall Even Year) Science/policy behind stream restoration. How to evaluating/ critiquing a stream restoration project. Assimilate geomorphic, hydrologic, and ecological data at watershed and reach scales to plan a restoration project. Developing a monitoring/assessment program for an existing or future restoration project. prereq: Grad student in [CE or GEO or EEB or WRS or FW or BAE or FR or HORT or ENV or LA or SRSE] or instr consent.

EEB 8602. Stream Restoration Practice. (2 cr. ; S-N only; Fall Odd Year) Field experience, group design project. Students provide a stream restoration context for each other's elective coursework, complete critical assessments of stream restoration projects, and design a stream restoration site. prereq: CE 8601 or GEO 8601.

EEB 8641. Spatial Ecology. (3 cr. ; Student Option; Periodic Fall & Spring) Introduction to spatial ecology. Role of space in population dynamics and interspecific interaction. Single species/multispecies models. Deterministic/stochastic theory. Modeling, effects of implicit/explicit space on competition, pattern formation, stability, diversity, and invasion. Reading/discussion of recent literature. prereq: [3407, 2 sem calculus] or instr consent.

EEB 8666. Doctoral Pre-Thesis Credits. (1-6 cr. : max 12 cr.; No Grade Associated; All Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

EEB 8777. Thesis Credits: Master's. (1-18 cr. ; max 50 cr.; No Grade Associated; All Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or semester; 10 cr total required [Plan A only].

EEB 8888. Thesis Credit: Doctoral. (1-24 cr. ; max 100 cr.; No Grade Associated; All Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or semester; 24 cr required.

EEB 8980. Seminar on Current Topics. (1-3 cr. ; max 30 cr.; S-N only; All Fall & Spring) Current research in ecology, evolution, behavior. prereq: EEB grad student.

EEB 8990. Graduate Seminar. (1-3 cr. ; Student Option; All Fall & Spring) Research topics in selected areas. prereq: instr consent.

EEB 8991. Independent Study: Ecology, Evolution, and Behavior. (1-10 cr.; Student Option; All Fall & Spring) Individual research on a specialized topic. prereq: instr consent.

EEB 8994. Directed Research. (1-5 cr. ; max 10 cr.; S-N or Audit; All Fall & Spring) TBD prereq: instr consent.

Economics (ECON)

ECON 5109. Game Theory for Engineers. (3 cr.; A-F only; All Spring) Introduction to game theory. Utility theory, noncooperative/cooperative games, bargaining theory. Games in normal/extensional form. Nash equilibria/refinements. prereq: [Math 2283, 2373, 2374, 3283] or Math 4606, [M.S./Ph.D. student in engineering or comp sci or info tech or operations mgmt] or instr consent.

ECON 5890. Economics of the Health-Care System. (3 cr.; A-F or Audit; All Fall) Economic analysis of U.S. health-care sector. Emphasizes problems of pricing, production, distribution. Health-care services as one factor contributing to nation's health. prereq: 3101 or instr consent.

ECON 8003. Microeconomic Analysis. (2 cr.; Student Option; All Spring) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4163. prereq: 8002.

ECON 8004. Microeconomic Analysis. (2 cr.; Student Option; All Spring) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics:
externalities, economics of information and uncertainty, and game theory. This seven-week course meets with 4164. prereq: 8003

ECON 8101. Microeconomic Theory. (2 cr.; Student Option; Every Fall)
Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course. prereq: 5151 or equiv, Math 2243 or equiv, concurrent registration is required (or allowed) in Math 5615 or concurrent registration in Math 8601, grad econ major or instr consent

ECON 8102. Microeconomic Theory. (2 cr.; Student Option; Every Fall)
Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course. prereq: 8101, concurrent registration is required (or allowed) in Math 5615 or concurrent registration is required (or allowed) in Math 8601, grad econ major or instr consent

ECON 8103. Microeconomic Theory. (2 cr.; Student Option; Every Spring)
Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course. prereq: 8102, concurrent registration is required (or allowed) in Math 5616 or concurrent registration is required (or allowed) in Math 8602 or comparable abstract math course, grad econ major or instr consent

ECON 8104. Microeconomic Theory. (2 cr.; Student Option; Every Spring)
Decision problems faced by the household and firm; theories of choice under conditions of certainty and uncertainty. Partial equilibrium analysis of competition and monopoly. General equilibrium analysis. Welfare economics: economic efficiency of alternative market structures, social welfare functions. Dynamics: stability of markets, capital theory. Seven-week course. prereq: 8103, concurrent registration is required (or allowed) in Math 5616 or concurrent registration is required (or allowed) in Math 8602 or comparable abstract math course, grad econ major or instr consent

ECON 8105. Macroeconomic Theory. (2 cr.; Student Option; Every Fall)
Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4165. prereq: 5152 or equiv, Math 2243, Math 2263 or equiv or instr consent

ECON 8106. Macroeconomic Theory. (2 cr.; Student Option; Every Fall)
Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4166. prereq: 8105

ECON 8107. Macroeconomic Theory. (2 cr.; Student Option; Every Spring)
Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4167. prereq: 8106

ECON 8108. Macroeconomic Theory. (2 cr.; Student Option; Every Spring)
Dynamic general equilibrium models: solving for paths of interest rates, consumption, investment, prices. Models with uncertainty, search, matching, indivisibilities, private information. Implications for measurement and data reporting. Overlapping generations and dynasty models. Variational and recursive methods. This seven-week course meets with 4168. prereq: 8107

ECON 8111. Introduction to Mathematical Economics. (2 cr.; Student Option; Every Fall & Spring)
Use of mathematical models in economic theory. prereq: Math 2243 or equiv, concurrent registration is required (or allowed) in Econ 8101, concurrent registration is required (or allowed) in Math 5615 or equiv or instr consent; Math 4242 recommended

ECON 8112. Introduction to Mathematical Economics. (2 cr.; Student Option; Periodic Fall)
Use of mathematical models in economic theory. Standard techniques, prereq: 8111, concurrent registration is required (or allowed) in 8102, concurrent registration is required (or allowed) in Math 5615 or equivalent abstract math course

ECON 8113. Introduction to Mathematical Economics. (2 cr.; Student Option; Periodic Fall)
Use of mathematical models in economic theory. May include special topics. prereq: 8112, Math 5616 or comparable abstract math course, concurrent registration is required (or allowed) in 8103

ECON 8117. Noncooperative Game Theory. (2 cr.; Student Option; Every Fall)
Solution concepts for noncooperative games in normal form, including Nash and perfect equilibrium and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form applications including bargaining and auctions. Seven-week course. prereq: Math 5616 or equiv or instr consent

ECON 8118. Noncooperative Game Theory. (2 cr.; Student Option; Every Fall & Spring)
Solution concepts for noncooperative games in normal form, including Nash and perfect equilibrium and stable sets of equilibria. Extensive form games of perfect and incomplete information, sequential equilibrium, and consequences of stability for extensive form applications including bargaining and auctions. Seven-week course. prereq: 8104, Math 5616 or equiv or instr consent

ECON 8119. Cooperative Game Theory. (2 cr.; Student Option; Every Spring)
Basics of cooperative game theory, emphasizing concepts used in economics. Games with and without transferable utility; the core, the value, and other solution concepts. Recent results, including potentials, reduced games, consistency, and noncooperative implementation of cooperative solution concepts. Seven-week course. prereq: 8104, Math 5616 or equiv or instr consent

ECON 8181. Advanced Topics in Microeconomics. (2 cr.; max 4 cr.; Student Option; Every Fall)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8104 or instr consent

ECON 8182. Advanced Topics in Microeconomics. (2 cr.; max 4 cr.; Student Option; Every Spring)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8104 or instr consent

ECON 8185. Advanced Topics in Macroeconomics. (2 cr.; max 4 cr.; Student Option; Every Fall & Spring)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8104 or instr consent

ECON 8186. Advanced Topics in Macroeconomics. (2 cr.; max 4 cr.; Student Option; Periodic Spring)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8104 or instr consent

ECON 8191. Workshop in Mathematical Economics. (1-3 cr.; max 10 cr.; Student Option; Every Fall)
Students conduct research and present papers under faculty supervision. prereq: 8104 or instr consent

ECON 8192. Workshop in Mathematical Economics. (1-3 cr.; max 10 cr.; Student Option; Every Spring)
Students work on research and present papers under faculty supervision. prereq: 8104 or instr consent

ECON 8201. Econometric Analysis. (2 cr.; Student Option; Every Fall)
Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models. prereq: [[3010 or equiv]. [Math 1272 or equiv], Stat 5102] or instructor consent

ECON 8203. Econometric Analysis. (2 cr.; Student Option; Every Spring)
Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models. prereq: 8202

ECON 8204. Econometric Analysis. (2 cr.; Student Option; Every Spring)
Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models. prereq: 8202

ECON 8205. Applied Econometrics. (2 cr.; Student Option; Every Fall)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course. prereq: Math 4242 or equiv, concurrent registration is required (or allowed) in Econ 8101, concurrent registration is required (or allowed) in Econ 8105, concurrent registration is required (or allowed) in Stat 5101 or instr consent

ECON 8206. Applied Econometrics. (2 cr.; Student Option; Every Fall)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course. prereq: 8205, concurrent registration is required (or allowed) in 8102, concurrent registration is required (or allowed) in 8106, concurrent registration is required (or allowed) in 8107, concurrent registration is required (or allowed) in Stat 5101 or instr consent

ECON 8207. Applied Econometrics. (2 cr.; Student Option; Every Spring)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course. prereq: 8206, concurrent registration is required (or allowed) in 8103, concurrent registration is required (or allowed) in 8107, concurrent registration is required (or allowed) in Stat 5102 or instr consent

ECON 8208. Applied Econometrics. (2 cr.; Student Option; Periodic Spring)
Application in research, including classical and Bayesian approaches; formulation, comparison, and use of models and hypotheses; inference and prediction in structural models; simulation methods. Seven-week course. prereq: 8207, concurrent registration is required (or allowed) in 8104, concurrent registration is required (or allowed) in Stat 5102 or instr consent

ECON 8211. Econometrics. (2 cr.; Student Option; Every Fall)
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course. prereq: 5151, 5152, Math 4242 or equiv, Stat 5102 or instr consent

ECON 8212. Econometrics. (2 cr.; Student Option; Every Fall)
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course. prereq: 8211

ECON 8213. Econometrics. (2 cr.; Student Option; Periodic Fall)
Linear regression; general linear hypotheses; Gauss Markov Theorem, generalized least squares and their applications. Decision-theoretic choice among estimators. Simultaneous equations models; identification and estimation. Asymptotic distribution theory. Applications, including multivariate time series models and/or limited dependent variables models. Seven-week course. prereq: 8213 or instr consent

ECON 8281. Advanced Topics in Econometrics. (2 cr. [max 4 cr.]; Student Option; Periodic Fall & Spring)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8103 or instr consent; offered when feasible

ECON 8282. Advanced Topics in Econometrics. (2 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
Workshop in Econometrics prereq: 8103 or instr consent

ECON 8311. Economic Growth and Development. (2 cr.; Student Option; Every Fall)
Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course. prereq: 8311 or instr consent

ECON 8312. Economic Growth and Development. (2 cr.; Student Option; Every Fall & Spring)
Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course. prereq: 8311 or instr consent

ECON 8313. Economic Growth and Development. (2 cr.; Student Option; Every Spring)
Methods of analyzing dynamical systems; applying methods to new models of growth and development; deriving and evaluating models' quantitative implications in light of growth and development in a number of countries. Seven-week course. prereq: 8312 or instr consent

ECON 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

ECON 8381. Advanced Topics in Economic Development. (2 cr. [max 4 cr.]; Student Option; Periodic Fall & Spring)
Faculty and student presentations based on recent literature. Seven-week course. prereq: 8103 or instr consent; offered when feasible

ECON 8391. Workshop in Economic Growth and Development. (1-3 cr. [max 10 cr.]; Student Option; Every Fall)
Workshop in Economic Growth and Development prereq: instr consent

ECON 8392. Workshop in Economic Growth and Development. (1-3 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
tbd prereq: instr consent

ECON 8401. International Trade and Payments Theory. (2 cr.; Student Option; Every Fall)
Impact of trade on factor rentals. Stolper-Samuelson, Rybczynski, and factor price equalization theorems. Heckscher-Ohlin theorem. Derivation of offer curves and general international equilibrium. Transfer problem. Seven-week course. prereq: 8103, 8105 or instr consent

ECON 8402. International Trade and Payments Theory. (2 cr.; Student Option; Every Fall & Spring)
Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. This is a seven-week course. prereq: 8401 or instr consent

ECON 8403. International Trade and Payments Theory. (2 cr.; Student Option; Every Spring)
International business cycles; exchange rates; capital movements; international liquidity. This is a seven-week course. prereq: 8402 or instr consent

ECON 8404. International Trade and Payments Theory. (2 cr.; Student Option; Periodic Fall)
Theoretical models of international trade. Trade data, empirical work on trade. Seven-week course. prereq: [8402, 8403] or instr consent

ECON 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

ECON 8481. Advanced Topics in International Trade. (2 cr. [max 4 cr.]; Student Option; Every Fall & Spring)
ECON 8482. Advanced Topics in International Trade. (2 cr. [max 4 cr.]; Student Option; Periodic Fall & Spring) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8403 or instr consent

ECON 8491. Workshop in Trade and Development. (1-3 cr. [max 10 cr.]; Student Option; Every Fall) Workshop in Trade and Development prereq: instr consent

ECON 8492. Workshop in Trade and Development. (1-3 cr. [max 10 cr.]; Student Option; Every Spring) tbd prereq: instr consent

ECON 8501. Wages and Employment. (2 cr. [max 4 cr.]; Student Option; Every Fall) Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course. prereq: 8102, 8106 or instr consent

ECON 8502. Wages and Employment. (2 cr. [max 4 cr.]; Student Option; Every Fall & Spring) Economic analysis of labor markets and their operation under conditions of both individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage and employment theories and practices. Economic impacts of unions. Seven-week course. prereq: 8501 or instr consent

ECON 8503. Wages and Employment. (2 cr. [max 4 cr.]; Student Option; Every Spring) Economic analysis of labor markets and their operation under conditions of individual and collective bargaining. Implications of labor market operations for resource allocation, wage and price stability, income and employment growth. Wage structures and wage levels. Wage/employment theories/practices. Economic impacts of unions. Seven-week course. prereq: 8502 or instr consent

ECON 8581. Advanced Topics in Labor Economics. (2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8502 or instr consent

ECON 8582. Advanced Topics in Labor Economics. (2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8502 or instr consent

ECON 8601. Industrial Organization and Government Regulation. (2 cr.; Student Option; Every Fall) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course. prereq: 8102 or instr consent

ECON 8602. Industrial Organization and Government Regulation. (2 cr.; Student Option; Every Fall) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course. prereq: 8102 or instr consent

ECON 8603. Industrial Organization and Government Regulation. (2 cr.; Student Option; Every Spring) Behavior of businesses and industries: productivity, firm size distributions, exit-entry dynamics, etc. Theories of the firm, industry structure and performance, invention and innovation, and technology adoption. Positive and normative theories of regulation. Seven-week course. prereq: 8602 or instr consent

ECON 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral: no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ECON 8681. Advanced Topics in Industrial Organization. (2 cr. [max 4 cr.]; Student Option; Periodic Fall & Spring) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8603 or instr consent

ECON 8681. Workshop in Applied Microeconomics. (1-3 cr. [max 10 cr.]; Student Option; Every Fall) Workshop in Applied Microeconomics prereq: instr consent

ECON 8692. Workshop in Applied Microeconomics. (1-3 cr. [max 10 cr.]; Student Option; Every Spring) Workshop in Applied Microeconomics prereq: instr consent

ECON 8701. Monetary Economics. (2 cr.; Student Option; Every Fall) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course. prereq: 8103, 8106 or instr consent

ECON 8702. Monetary Economics. (2 cr.; Student Option; Every Fall & Spring) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course. prereq: 8701 or instr consent

ECON 8703. Monetary Economics. (2 cr. [max 4 cr.]; Student Option; Every Spring) Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course. prereq: 8702 or instr consent

ECON 8704. Financial Economics. (2 cr.; Student Option; Every Fall) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course. prereq: 8103, 8106 or instr consent

ECON 8705. Financial Economics. (2 cr.; Student Option; Every Fall & Spring) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course. prereq: 8704 or instr consent

ECON 8706. Financial Economics. (2 cr.; Student Option; Every Spring) Role of financial institutions in efficient allocation of risk; multiperiod and continuous-time securities markets; theory of firm under uncertainty; financial intermediation; derivation of empirical asset-pricing relationships; tests concerning alternative market structures. Seven-week course. prereq: 8705 or instr consent

ECON 8777. Thesis Credits. Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

ECON 8781. Advanced Topics in Monetary Economics. (2 cr. [max 4 cr.]; Student Option; Every Spring) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8702 or instr consent

ECON 8781. Workshop in Macroeconomics. (1-3 cr. [max 10 cr.]; Student Option; Every Fall) Workshop in Macroeconomics prereq: instr consent

ECON 8782. Workshop in Macroeconomics. (1-3 cr. [max 10 cr.]; Student Option; Every Spring) Workshop in Macroeconomics prereq: instr consent

ECON 8801. Public Economics. (2 cr. [max 4 cr.]; Student Option; Every Fall & Spring) Theories of public choice and role of government in economy. Economic effects of taxes, public debt, and public expenditure. Current problems in economics of public sector, including political economy. Seven-week course. prereq: 8103, 8106 or instr consent

ECON 8802. Public Economics. (2 cr.; Student Option; Every Fall & Spring) Theories of public choice and role of government in economy. Economic effects
of taxes, public debt, and public expenditure. Current problems in economics of public sector, including political economy. Seven-week course. prereq: 8801 or instr consent

**ECON 8803. Public Economics.** (2 cr.; Student Option; Periodic Spring) Theories of public choice and role of government in economy. Economic effects of taxes, public debt, and public expenditure. Current problems in economics of public sector, including political economy. Seven-week course. prereq: 8802 or instr consent

**ECON 8881. Advanced Topics in Public Economics.** (2 cr. [max 4 cr.]; Student Option; Every Fall) Faculty and student presentations based on recent literature. Seven-week course. prereq: 8803 or instr consent

**ECON 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

**ECON 8891. Workshop in Public Economics and Policy.** (1-3 cr. [max 10 cr.]; Student Option; Periodic Fall & Spring) Workshop in Public Economics and Policy prereq: instr consent

**ECON 8892. Workshop in Public Economics and Policy.** (1-3 cr. [max 10 cr.]; Student Option; Periodic Fall & Spring) Workshop in Public Economics and Policy prereq: instr consent

**ECON 8990. Individual Graduate Research.** (1-7 cr.; Student Option; Every Fall, Spring & Summer) Individual Graduate Research prereq: instr consent

### Education (EDUC)

**EDUC 8333. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

**EDUC 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**EDUC 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**EDUC 8777. Thesis Credits: Master's.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**EDUC 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

### Educational Psychology (EPSY)

**EPSY 5001. Learning, Cognition, and Assessment.** (3 cr.; Student Option; Every Fall, Spring & Summer) Principles of learning, cognition, cognitive development, classroom management, motivation, instruction, assessment. Behaviorism, cognitive/social constructivism, human information processing theory. Intelligence, knowledge acquisition, reasoning skills, scholastic achievement, standardized testing, reliability/validity, student evaluation, performance assessment, portfolios, demonstrations. Applications to instruction/organization of curricular materials. prereq: MED/initial licensure student or CLA music ed or preteaching major or instr consent; psych course recommended

**EPSY 5015. Teaching Students with Special Needs in Inclusive Settings.** (1 cr.; A-F only; Every Summer) Areas of exceptionality defined in federal/state regulations. Historical perspectives, definitions, etiology, characteristics, needs, and service delivery systems. Collaborating with special education personnel. prereq: Enrolled in a teacher initial licensure program

**EPSY 5016. Teaching Students with Special Needs in Inclusive Settings.** (1 cr.; A-F only; Every Fall) Attending to constant transitions/development in which children/adolescents negotiate their road to adulthood. How to foster learning/positive development. prereq: Enrolled in teacher initial licensure program

**EPSY 5017. Teaching Exceptional Students in General Education Classrooms.** (2 cr.; A-F or Audit; Every Summer) This course will provide an overview of the areas of exceptionality defined in federal and state regulations. The focus of this course will be on historical perspectives, definitions, etiology, characteristics, needs, and service delivery systems for each area of exceptionality as well as the general educator's role in collaborating with special education personnel in order to meet the needs of students with special needs.

**EPSY 5101. Intelligence and Creativity.** (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Contemporary theories of intelligence and intellectual development and contemporary theories of creativity and their implications for educational practices and psychological research.

**EPSY 5113. Psychology of Instruction and Technology.** (3 cr.; Student Option; Periodic Spring) Introduction to adult learning and instructional design. Application of core foundational knowledge to development of effective learning environments for adults. Topics include philosophy, learning theories, instructional models, development and experience, individual differences, evaluation, assessment, and technology.

**EPSY 5114. Psychology of Student Learning.** (3 cr.; A-F or Audit; Every Fall & Spring) This course is designed for students to engage in advanced study in the psychology of student learning, cognition, and development as it applies to educational psychology. Topics include: principles of learning, cognitive development, behaviorism, motivation, intelligence, reasoning, instruction, and assessment.

**EPSY 5119. Mind, Brain, and Education.** (3 cr.; Student Option No Audit; Spring Odd Year) How educationally relevant skills/concepts develop in both typical/atypical children. prereq: 3301 or equiv

**EPSY 5135. Human Relations Workshop.** (4 cr.; Student Option; Every Fall & Summer) Experiential course addressing issues of prejudice and discrimination in terms of history, power, and social perception. Includes knowledge and skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, effective leadership, judgment and decision-making, prejudice reduction, conflict resolution.

**EPSY 5151. Cooperative Learning.** (3 cr.; Student Option; Every Spring) Participants learn how to use cooperative learning in their setting. Topics include theory and research, teacher's role, essential components that make cooperation work, teaching social skills, assessment procedures, and collegial teaching teams.

**EPSY 5157. Social Psychology of Education.** (3 cr.; A-F or Audit; Every Fall) Overview of social psychology and its application to education. Participants study the major theories, research, and major figures in field. Class sessions include lectures, discussions, simulations, role-plays, and experiential exercises.

**EPSY 5191. Education of the Gifted and Talented.** (3 cr.; A-F or Audit; Every Spring & Summer) Theories of giftedness, talent development, instructional strategies, diversity and technological issues, implications for educational practices and psychological inquiry, and international considerations.

**EPSY 5200. Special Topics: Psychological Foundations.** (1-4 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Focus on special topics in psychological and methodological concepts relevant to advanced educational theory, research, and practice not covered in other courses.

**EPSY 5216. Introduction to Research in Educational Psychology and Human Development.** (3 cr.; A-F or Audit; Every Fall) Designing/conducting a research study. Reviewing literature, formulating research problem, using different approaches to gather
EPSY 5221. Principles of Educational and Psychological Measurement. (3 cr.; Student Option; Every Fall) Concepts, principles, and methods in educational/psychological measurement. Reliability, validity, item analysis, scores, score reports (e.g., grades). Modern measurement theories, including item response theory and generalizability theory. Emphasizes construction, interpretation, use, and evaluation of assessments regarding achievement, aptitude, interests, attitudes, personality, and exceptionality.

EPSY 5243. Principles and Methods of Evaluation. (3 cr.; Student Option; Every Fall, Spring & Summer) Introductory course in program evaluation; planning an evaluation study, collecting and analyzing information, reporting results; overview of the field of program evaluation.

EPSY 5244. Survey Design, Sampling, and Implementation. (3 cr.; Student Option; Every Fall) Survey methods, including mail, phone, and Web-based e-mail surveys. Principles of measurement, constructing questions/forms, pilot testing, sampling, data analysis, reporting. Students develop a survey proposal and a draft survey, pilot the survey, and develop sampling/data analysis plans. prereq: [5221 or 5231 or 5261 or equiv]. [CEHD grad student or MEd student]

EPSY 5245. Advanced Survey Data Analysis for Categorical and Rating Scale Data. (1 cr.; Student Option; Every Spring) Practical course. Specific nature of survey data (typically categorical or ordinal). Appropriate data analytic methods. prereq: 5244, 5261

EPSY 5246. Evaluation Colloquium: Psychological Foundations. (1 cr. [max 8 cr.]; S-N or Audit; Periodic Fall & Spring) Informal seminar of faculty and advanced students interested in the issues and problems of program evaluation. prereq: 5243 or EdPA 5501

EPSY 5247. Qualitative Methods in Educational Psychology. (3 cr.; Student Option; Every Fall) Introduction to qualitative methods of inquiry. Contrasting different research traditions (e.g., case study, phenomenology, ethnography, social interactionism, critical theory). Practice with field notes, observations, and interviewing. Use of NVIVO to track/code data. prereq: Graduate student or Applied Psychology in Educational and Community Settings Minor

EPSY 5261. Introductory Statistical Methods. (3 cr.; Student Option; Every Fall, Spring & Summer) Application of statistical concepts/procedures. Graphs, numerical summaries. Normal distribution, correlation/regression analyses, probability, statistical inferences for one or two samples. Hypothesis tests, Chi-square tests. Conceptual understanding/application of statistics.

EPSY 5262. Intermediate Statistical Methods. (3 cr.; Student Option; Every Fall & Spring) Application of statistical concepts/procedures. Analysis of variance, covariance, multiple regression. Experimental design: completely randomized, block, split plot/repeated measures. prereq: 3264 or 5261 or equiv

EPSY 5271. Becoming a Teacher of Statistics. (3 cr.; Student Option; Periodic Fall & Spring) Current methods of teaching first courses in statistics. Innovative teaching methods, materials, and technological tools. Types of first courses, reform recommendations, goals for student learning, recommended content, teaching methods, technology, student assessment. prereq: 5261 or equiv

EPSY 5272. Statistics Teaching Internship. (1-3 cr.; S-N only; Every Fall & Spring) Supervised teaching experience. prereq: Grad student, instr consent

EPSY 5400. Special Topics in Counseling Psychology. (1-4 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Theory, research, and practice in counseling and student personnel psychology. Topics vary.

EPSY 5415. Child and Adolescent Development and Counseling. (4 cr.; A-F or Audit; Every Fall & Summer) Development, issues, and needs of children, kindergarten through high school ages. Counseling/developmental theory/strategies, family/social environment. Cultural diversity, legal/ethical issues in counseling children/adolescents. prereq: Grad student or MEd student or K-12 [counseling endorsement or licensure] student

EPSY 5421. Leadership and Administration of Student Affairs. (3 cr.; Student Option; Every Fall, Spring & Summer) Theoretical advocacy/administrative structure, and evaluation methods used in college/university student affairs.

EPSY 5435. Introduction to School Counseling. (3-6 cr.; A-F only; Every Fall & Spring) History/evolution of school counselor role in schools. Duties/demands of school counselor. Examine comprehensive guidance programming in K-12 schools. Issues in school counseling profession. prereq: CSPP grad student in school counselor prog or instr consent

EPSY 5436. Crisis Management and Consulting in Schools. (3 cr.; A-F or Audit; Every Fall) Issues, topics, problems. Diversity in school counseling. Review, discussion, analysis of current literature. Students develop prevention, intervention, guidance programs for K-12 schools. prereq: CSPP grad student in school counselor program or instr consent

EPSY 5451. College Students Today. (3 cr.; Student Option; Every Fall, Spring & Summer) Issues involving diverse populations of students in colleges/universities. Student development theory, students' expectations/interests, how college affects student outcomes. Role of curricular/extracurricular activities and of student-faculty interactions.

EPSY 5461. Cross-Cultural Counseling. (3 cr.; A-F or Audit; Every Fall) Effect of cross-cultural/cross-national psychological differences in human traits/characteristics. Framework for development/implementation of counseling interventions.

EPSY 5604. Transition From School to Work and Community Living for Persons With Special Needs. (3 cr.; Student Option; Every Spring & Summer) Use of strategies/models for improving transition of youth from school to work and community living. Course content that specifically addresses all phases of student assessment, individualized transition planning. Parent, family, and student involvement in designing post school options. Community-based services (employment, residential living, social and recreational services, etc). Comprehensive interagency approaches.

EPSY 5605. Collaborative Practices for the Special Educator. (3 cr.; A-F only; Every Spring) Skills/knowledge required to consult/collaborate with school personnel, families, other professionals to maintain effective educational support.


EPSY 5611. Research-based Practices in Academic and Behavior Disabilities. (3 cr.; A-F only; Every Fall) Research that provides conceptual basis to aid in understanding of students with academic difficulties. Develop critical thinking skills through examination of research-based practices.

EPSY 5613. Foundations of Special Education I. (DSJ; 3 cr.; A-F or Audit; Periodic Fall, Spring & Summer) Organization of educational programs/services for people with disabilities. First course for students seeking to become licensed in special education.

EPSY 5614W. Assessment and Due Process in Special Education. (WI; 3 cr.; A-F or Audit; Every Spring & Summer) Participants will learn basic standardized assessment and how it directly relates to special education. In addition, students will use the assessment as part of an ongoing process for making instructional programming decisions. Students will apply skills in designing and evaluating assessment plans and in making eligibility decisions.

EPSY 5616. Classroom Management and Behavior Analytic Problem Solving. (3 cr.; Student Option; Every Fall, Spring & Summer)
Assumptions, principles, procedures of problem solving approach to analyzing behavior/programs for classroom management. Conducting observations, intervening, evaluating behavioral change.

EPSY 5617. Academic and Social Interventions for Students with Mild to Moderate Disabilities. (3 cr.; A-F only; Every Spring)
Use problem solving model to make data-based decisions regarding implementation and evaluation of instruction for students with academic and behavioral difficulties. prerequisites: instr consent

EPSY 5618. Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language. (3 cr.; A-F or Audit; Every Fall)
Historical/contemporary perspectives, empirical evidence relating to reading/written language instruction/assessment designed to improve outcomes of students with disabilities. Field work in tutoring.

EPSY 5619W. Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities. (WI; 3 cr.; A-F only; Every Fall)

EPSY 5621. Assessment and Instructional Design for Students with Developmental Disabilities. (3 cr.; A-F or Audit; Every Spring)
Methods/materials course. Functional/standards-based approaches to promoting academic learning in students with developmental disabilities. prerequisites: 5613, 5614

EPSY 5622. Programs and Curricula for Students with Developmental Disabilities. (3 cr.; Student Option; Every Summer)
Developing programs/curricula for students with moderate, severe, profound developmental delays, as well as severe multihandicapping conditions. Special consideration given to preparing children/youth for integrated community environments. prerequisites: 5621 or 5661 and 5662

EPSY 5623. Ethics in Applied Behavior Analysis. (3 cr.; A-F only; Every Fall, Spring & Summer)
This course explores ethical and professional considerations that pertain to the practice of applied behavior analysis as well as ethical and disciplinary standards of the profession. Specifically, this course examines the Professional and Ethical Compliance Code for Behavior Analysts. Emphasis will be placed upon ethical and professional conduct and legal issues relevant to BCBA level practitioners. Topics such as informed consent, due process, protection of confidentiality, and selection of least intrusive, least restrictive behavior change procedures will be discussed. This course will focus on ethical decision-making processes. Issues related to cultural and ethnic diversity and ethics in applied behavior analysis will also be explored.

EPSY 5624. Biomedical and Physical Impairments of Students with Developmental Disabilities. (2 cr.; A-F or Audit; Every Fall & Summer)

EPSY 5625. Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction. (2 cr.; A-F or Audit; Every Fall)
Overview of the issues, problems, and practical applications in designing early intervention services for young children with disabilities and their families.

EPSY 5626. Seminar: Developmental Disabilities and Instructional Management. (3 cr.; Student Option; Every Fall & Summer)
Data-based strategies for school and nonschool instruction of learners with developmental disabilities including assessment, design, implementation, and evaluation of curriculum and instruction: curriculum content, concept and task analysis, classroom arrangements, natural and instructional cues, corrections, and consequences. prerequisites: [5621, 5622] or instr consent

EPSY 5627. Seminar: Advanced Issues in Learning Disabilities. (3 cr.; A-F only; Every Fall & Summer)
Read, reflect, lead discussions related to issues in field of LD. Topics examined through relevant research in field of LD. prerequisites: Special Education graduate or licensure student or instr consent

EPSY 5628. Characteristics of Moderate to Severe Learning Disabilities. (3 cr.; A-F only; Every Fall & Summer)
Characteristics of moderate/severe learning disabilities including (but not limited to) cognitive processing, language, attention/memory, co-existing conditions. Dyslexia, dysgraphia, dyscalculia. prerequisites: Special Education graduate or licensure student or instr consent

EPSY 5629. Strategic Instructional Methods for Students Academically At-Risk. (3 cr.; A-F only; Every Fall & Summer)
Knowledge/skills needed to teach KU-CRL research-based learning strategies for students considered academically at-risk. Content relevant to basic skills/content instruction for students in K-12 settings will be included. prerequisites: Special Education graduate or licensure student or instr consent

EPSY 5631. Module 1: Introduction to Augmentative and Alternative Communication. (1 cr.; A-F only; Every Fall, Spring & Summer)
Terms/concepts related to augmentative/alternative communication. Myths/facts regarding AAC.

EPSY 5632. Module 2: Evidence-based Methods for AAC Assessment and Intervention. (2 cr.; A-F only; Every Fall & Summer)
Evidence-based tools to conduct augmentative/alternative communication (AAC) assessments. AAC intervention plans. Data-driven strategies to evaluate progress.

EPSY 5634. Module 4: Assistive technology with Deaf/Hard of Hearing Students. (2 cr.; A-F only; Every Spring & Summer)
Theoretical/applied study communication modalities for children/adults who are Deaf or Hard of Hearing. Assessment/development of models including gestures, speech reading, Cued Speech, sign language. Picture Exchange Communication Systems, high/low tech devices. prerequisites: Special Education licensure student or instr consent

EPSY 5636. Sensory Impairments of Students With Developmental Disabilities. (2 cr.; Student Option; Every Fall)
Characteristics of learners with visual/auditory impairments. Design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices. prerequisites: 5613, 5614

EPSY 5637. Core Practices in Special Education: Foundations of Special Education. (1 cr.; S-N only; Every Fall)
This course is an online module designed to be taken the first semester of a 4-semester sequence in the Clinical EBD Licensure Program. All materials necessary for proficient completion of the course will be delivered via on-line course. There will be no additional readings associated with this online module. prerequisites: Enrolled in Special Ed MEd or Special Ed ILP MEd program with EBD Residency-Based subplan

EPSY 5638. Core Practices in Special Education: IEP Writing. (1 cr.; S-N only; Every Spring)
This course is an online module designed to be taken the second semester, in conjunction with the IEP Process course, of a 4-semester sequence in the Clinical EBD Licensure Program. All materials necessary for proficient completion of the course will be delivered via on-line course. There will be no additional readings associated with this online module.

EPSY 5641. Foundations of Deaf Education. (3 cr.; A-F only; Every Fall)
Philosophical foundations of deaf and hard of hearing (DHH) education. Engage in discussion, debates and processes that have influenced deaf education, communication methodologies and placement options in the US. Considered from the perspective of deaf children, adults and their families.

EPSY 5642. Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing. (3 cr.; A-F only; Every Spring)
Early identification and intervention with deaf and hard of hearing children including the development of ASL and English. Emergent Literacy in the homes and the role of Deaf Mentors. Emphasis on the importance of early exposure to fully accessible language and addressing the issue of language deprivation. prerequisites: Preservice teacher in deaf education licensing program or instr consent

EPSY 5643. Seminar: Identity, Culture and Diversity in Deaf Education. (2 cr.; A-F only; Every Fall)
Reflecting on your own identity as a future teacher of the deaf and how to facilitate the identity development of your students. Having a deep understanding of the diversity of students and their families is essential to foster these relationships and communication. Synthesis of previously learned material into practice.

**EPSY 5644. Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing.** (3 cr.;/ A-F only; Every Fall) Perspectives and best practices related to the development of early language and literacy skills in ASL and English for deaf and hard of hearing children. prereq: Preservice teacher in deaf education licensing program or instr consent.

**EPSY 5645. Deaf Plus: Educating and Understanding Deaf Students with Disabilities.** (1 cr. ; A-F only; Every Summer) Building an understanding of the complex issues and best practices involved in educating deaf learners with disabilities. Working with families and service providers, identifying resources, understanding identification, placement, assessment and intervention strategies to modify curriculum to work with deaf students with varying disabilities.

**EPSY 5646. Best Practices Teaching Reading and Writing for School Age: Deaf and Hard of Hearing.** (3 cr. ; A-F only; Every Spring) Understanding and application of best practices for teaching reading/writing with DHH students in school age settings including incorporating bilingual strategies (making connections between ASL and English).

**EPSY 5647. Spoken Language Practices and Assistive Technology: Deaf and Hard of Hearing.** (2 cr. ; A-F only; Every Summer) Study of the role and function of spoken language, various assessments prepare children and how to analyze each language. Students gain knowledge of the parts of each language, various assessments prepare future teachers to evaluate and facilitate the development of ASL and English. Readings drawn from both bilingual and Deaf education.

**EPSY 5654. Current Research, Issues and Trends in Deaf Education.** (1 cr. ; A-F only; Every Spring) Examining current research, issue trends in Deaf Education to help prepare future teachers to develop an understanding of research and apply critical thinking to analyze new issues, problem solve, and consider participating in research to practice opportunities that may arise during their career in Deaf Education.

**EPSY 5656. Advanced Issues in Emotional Behavior Disorders.** (3 cr. ; A-F or Audit; Every Fall) Emphasis on children, youth, young adults. How emotional behavior disorders affects functioning in school/post-secondary life.

**EPSY 5657. Interventions for Behavioral Problems in School Settings.** (3 cr. ; A-F or Audit; Every Fall) Comprehensive behavioral programs for students with social and or emotional disabilities. Instructing students with social and or emotional disabilities.

**EPSY 5658. Characteristics of Moderate to Severe Emotional/Behavioral Disorders.** (3 cr. ; A-F only; Every Fall & Summer) Applying principles of assessment/ individualized intervention for students with severe emotional behavior disorders(EBD). prereq: Special Education graduate or licensure student.

**EPSY 5659. Foundations of Behavior Analysis.** (3 cr. ; A-F only; Every Fall) Behavior analysis is the science of behavior along a continuum of basic to applied learning processes, both operant and respondent. Applied behavior analysis (ABA) is concerned with the improvement and understanding of human behavior. It is the science in which strategies derived from the principals of basic behavior analysis are applied systematically to improve socially significant behavior and experimentation is used to identify the variables responsible for change (Cooper, Heron, & Heward, 2007). This course focuses on basic concepts and methodologies involved in behavior analysis, and their relation to other theories of learning and behavior. This course is designed for individuals interested in learning from the perspective of behavior analysis and individuals who are interested in learning theory as it applies to individuals with significant cognitive and language impairments. This course is also designed to prepare students for the Behavior Analyst Certification Board (BACB) exam.

**EPSY 5661. Introduction to Autism Spectrum Disorder.** (3 cr. ; A-F only; Every Fall) Knowledge/skills needed to promote learning/ success for school age children with Autism Spectrum Disorder. Definition, etiology, and characteristics of ASD. Current research/ issues. Collaborative problem solving, family-professional partnerships, educational programming.

**EPSY 5662. Assessment and Identification of Autism Spectrum Disorders.** (2 cr. ; A-F only; Every Summer) Selection/use of assessment procedures that may be used to screen/identify children with autism spectrum disorders. prereq: 5661, Spec Ed grad or licensure student or instr consent.

**EPSY 5663. Assessment and Intervention for Individuals with Autism Spectrum Disorder.** (3 cr. ; A-F only; Every Spring) Selection/use of range of procedures, including nd bias, specific assessments to assess/ identify children with autism spectrum disorder. Specific intervention strategies designed to teach beginning communication/social skills to children with Autism Spectrum Disorder (ASD). prereq: 5661, Spec Ed grad or licensure student or instr consent.

**EPSY 5664. Transitions for Individuals with Autism Spectrum Disorders.** (2 cr. ; A-F only; Every Summer) Legal/practical aspects of transition planning, specifically for students with ASD. prereq: 5661, [Spec Ed grad or licensure student or instr consent]

**EPSY 5668. Education of Preschool Children With Disabilities: Methods and Materials.** (3 cr. ; A-F only; Every Spring) Methods and materials available to maximize developmental and educational outcomes for young children with disabilities, age 3 to 5, and their families in home, community, and school-based settings. Develop, implement, and evaluate individualized education and family service plans. prereq: [5616, 5625] or instr consent.

**EPSY 5682. Education of Infants and Toddlers with Disabilities: Methods and Materials.** (3 cr. ; A-F only; Each Spring) Methods/materials available to maximize developmental and educational outcomes for young children with disabilities, birth to age 3, and their families in home, community, and school-based settings. Students develop, implement, and evaluate individualized education/family service plans. prereq: [5616, 5625] or instr consent.

**EPSY 5690. Experimental Teaching Seminar: Med Culminating Project.** (2 cr. ; A-F only; Every Fall & Spring). Experimental teaching utilizing data based instruction for affecting student growth. Conduct experimental teaching project during student teaching year. Guided through formal writing process for submitting short literature review or research report for M.Ed. prereq: instr consent.

**EPSY 5701. Practicum: Field Experience in General Education - Inclusive Classrooms.** (1-2 cr. ; S-N only; Every Fall & Spring) Field-Based Practicum. Observe and actively participate in an inclusive (with and without disabilities) general education classroom. An
emphasis is placed on communication skills and reflective practice.

EPSY 5704. Practicum: Special Education Field Experience in Middle and Secondary School Classrooms. (1-2 cr.; S-N only; Every Fall & Spring)
Pre-Student Teaching/Field-Based Practicum.
Gain a better understanding of the role of special education teachers (in a variety of settings) and related service professionals. Apply knowledge from University courses in school settings - connecting theory, research, and practice.

EPSY 5705. Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms. (1-2 cr.; S-N only; Every Fall & Spring)
Pre-Student Teaching/Field-Based Practicum.
Gain a better understanding of the role of special education teachers (in a variety of settings) and related service professionals. Apply knowledge from University courses in school settings - connecting theory, research, and practice.

EPSY 5706. Practicum in Moderate to Severe Developmental Disabilities. (2 cr.; S-N only; Every Fall & Spring)
Practicing principles required for successful inclusion. Address model for best practices/requirements specified by Minnesota Board of Teaching.

EPSY 5707. Practicum in Moderate to Severe Learning Disabilities. (3 cr.; S-N only; Every Fall & Spring)
Moderate/severe learning disabilities. Transfer of theoretical knowledge to practical application. Role of LD teacher in variety of settings.

EPSY 5708. Practicum in Moderate to Severe Emotional/Behavioral Disorders. (3 cr.; S-N only; Every Fall & Spring)
Moderate/severe emotional behavior disorders. Transfer of theoretical knowledge to practical application. Role of EBD teacher in variety of settings.

EPSY 5720. Special Topics: Special Education. (1-4 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer)

EPSY 5741. Student Teaching: Academic and Behavioral Strategist. (3-6 cr.; S-N only; Every Fall & Spring)
Transfer of theoretical knowledge to practical application. Responsibilities of special education teacher in variety of settings. prerequisite: Special education licensure program or instructor consent.

EPSY 5742. Student Teaching: Autism Spectrum Disorders. (6 cr.; S-N only; Every Fall & Spring)
Transfer of theoretical knowledge to practical application. Role/responsibilities of special education teacher in settings of elementary/secondary age.

EPSY 5751. Student Teaching for Deaf Education. (1-6 cr. [max 80 cr.]; A-F only; Every Spring)
Students participate in educational programming for infants, children, and youth who are deaf or hard of hearing. On-site, directed experiences under supervision of master teachers of deaf/hard of hearing students.

EPSY 5752. Student Teaching: Learning Disabilities. (1-6 cr. [max 10 cr.]; S-N or Audit; Every Fall, Spring & Summer)
Supervised experience in teaching related work in schools or other agencies serving children and adolescents with learning disabilities. prerequisite: instructor consent

EPSY 5754. Student Teaching: Social and Emotional Disabilities. (1-6 cr. [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer)
Teach students with social and emotional disorders at public schools and other appropriate sites. Attend a weekly seminar on student teaching competencies. prerequisite: Completion of all licensure coursework for social and emotional disorders, instructor consent

EPSY 5755. Student Teaching: Developmental Disabilities, Mild/Moderate. (1-6 cr.; A-F or Audit; Every Fall & Spring)
Supervised student teaching, or special practicum project, in schools or other agencies serving students at elementary/secondary levels who have mild to moderate developmental disabilities. prerequisite: Completion of all licensure coursework, instructor consent

EPSY 5756. Student Teaching: Developmental Disabilities, Moderate/Severe. (1-6 cr.; A-F or Audit; Every Fall & Spring)
Supervised student teaching, or special practicum projects, in schools or other agencies serving students at elementary/secondary levels who have moderate to severe developmental disabilities. prerequisite: Completion of all licensure coursework, instructor consent

EPSY 5761. Student Teaching in Early Childhood Special Education Settings for Children Aged Three to Five Years. (3 cr. [max 6 cr.]; S-N only; Every Fall & Spring)
Student teachers work closely with their cooperating teacher and University supervisor to design/implement programming for children in classrooms. Course includes a seminar with discussion, cooperative learning experiences, and some lectures. prerequisite: Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE, instructor consent; completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible

EPSY 5762. Student Teaching in Early Childhood Special Education for Children Aged Birth to Three Years. (3 cr. [max 6 cr.]; S-N only; Every Fall & Spring)
Student teachers work closely with cooperating teacher and University supervisor to design/implement programming for families with children aged birth-to-three in their homes.

Course includes seminar with discussion, cooperative learning experiences, and some lectures. prerequisite: Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE, instructor consent; completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible

EPSY 5763. Practicum in Special Education: Behavior Intervention Planning and Implementation. (2 cr.; S-N only; Every Fall)
This course will be delivered within a clinical model of instruction where the instructor serves as a coaching guide and the candidates participate in a community of practice with their peers. It is expected that given the instructor’s coaching and the interactions within the community of practice, that the candidate will complete the portfolio associated with this course and, as part of that completion, demonstrate proficiency in all competencies associated with this course in order to earn a passing grade. As such, there is not a didactic instruction component or assigned readings for this clinical model of instruction-based course.

EPSY 5764. Practicum in Special Education: IEP Process. (2 cr.; S-N only; Every Spring)
This course will be delivered within a clinical model of instruction where the instructor serves as a coaching guide and the candidates participate in a community of practice with their peers. It is expected that given the instructor’s coaching and the interactions within the community of practice, that the candidate will complete the portfolio associated with this course and, as part of that completion, demonstrate proficiency in all competencies associated with this course in order to earn a passing grade. As such, there is not a didactic instruction component or assigned readings for this clinical model of instruction-based course.

EPSY 5765. Practicum in Special Education: Instructional Planning and Delivery. (2 cr.; S-N only; Every Fall)
This course will be delivered within a clinical model of instruction where the instructor serves as a coaching guide and the candidates participate in a community of practice with their peers. It is expected that given the instructor’s coaching and the interactions within the community of practice, that the candidate will complete the portfolio associated with this course and, as part of that completion, demonstrate proficiency in all competencies associated with this course in order to earn a passing grade. As such, there is not a didactic instruction component or assigned readings for this clinical model of instruction-based course.

EPSY 5800. Special Topics in School Psychology. (1-9 cr. [max 36 cr.]; Student Option; Every Fall & Spring)
Current issues in school psychology or areas not normally available through regular curriculum offerings.

EPSY 5801. Assessment and Decision Making in School and Community Settings. (3 cr.; A-F or Audit; Every Fall & Spring)
Introduction to psychological and educational assessment for individuals who work with
is jointly determined by student and advising faculty member. prereq: instr consent

EPSY 8112. Mathematical Cognition. (3 cr.; ; Student Option; Fall Even Year)
Cognitive science research. Papers investigating how adults/children understand fundamental mathematical concepts. Papers drawn from psychology, neuroscience, education literatures. prereq: 5114 or equiv

EPSY 8113. The Psychology of Scientific Reasoning. (3 cr.; ; Student Option; Spring Even Year)
Research at intersection of cognitive science, educational psychology, science education. What psychology tells us about how people think, reason, make decisions. Read empirical research that explores psychological processes that underlie scientific reasoning. prereq: 5114 or equivalent

EPSY 8114. Seminar: Cognition and Learning. (3 cr.; ; Student Option; Every Fall)
Advanced study in critical analysis and application of contemporary psychological theory and research in cognition and learning for education.

EPSY 8116. Reading for Meaning: Cognitive Processes in the Comprehension of Texts. (3 cr.; ; Student Option; Every Fall)
Cognitive processes that take place during reading comprehension/imPLICATIONS of these processes for instruction/assessment.

EPSY 8117. Writing Empirical Paper and Research/Grant Proposals in Education and Psychology. (3 cr.; ; Student Option; Every Spring)
Scientific writing skills. Focuses on logic/argumentation. Each student produces an empirical paper or research proposal. Breaks down the writing process into components: one component per week. Each week, students write a section of their paper/proposal and critique others’ prereq: instr consent

EPSY 8118. Advanced Cognitive Psychology. (3 cr.; ; Student Option; Every Fall)
This course is a graduate introduction to cognitive psychology. It is “advanced” in the sense that it focuses on higher-level cognition, and also in its emphasis on theories and models in addition to empirical results. Graduate students interested in cognitive psychology are invited to register for the course, regardless of disciplinary background.

EPSY 8132. Personality Development and Socialization. (3 cr.; ; Student Option; Every Spring)
Major research and theoretical work. Developmental and educational influences on personality. prereq: Personality or child psych course

EPSY 8157. Key Topics and Issues in Applying Social Psychology to Education. (3 cr.; ; Student Option; Every Spring)
This course, designed for advanced graduate students, covers a number of classic and contemporary topics in social psychological theory, research, and methods, examining core theories and how they have persisted or changed over time and how those theories and approaches have been applied to research in and issues of education broadly conceived.

EPSY 8215. Advanced Research Methodologies in Education. (3 cr.; ; Student Option; Every Fall)

EPSY 8216. Seminar: Research Processes in Psychological Foundations of Education. (3 cr.; ; Student Option; Spring Even Year)
Advanced examination of research processes in educational psychology. Invited faculty discuss specific research designs. Students refine/implement research projects and present them in class. prereq: [5216, admitted to doctoral program in psych foundations] or instr consent

EPSY 8220. Special Topics: Seminar in Quantitative Methods. (1-6 cr.; ; Student Option; Periodic Fall, Spring & Summer)
Seminars focus on specialized current topics in methodology in statistics, measurement, evaluation, and statistics education, including primary-source readings and in-depth exploration of advanced methodologies.

EPSY 8222. Advanced Measurement: Theory and Application. (4 cr.; ; Student Option; Spring Odd Year)
Generalizability theory, item response theory, factor models for test items, binomial model. Application to problems of designing, linking assessments. Includes computer lab. prereq: [5221 or PSY 5862 or equiv], [8252 or equiv]

EPSY 8224. Performance Assessment Design and Analysis. (3 cr.; ; Student Option; Spring Even Year)
Conceptualization, design, implementation, analysis of performance assessments as employed in both small-scale (e.g., classrooms, large-scale (e.g., statewide, national testing programs), professional (e.g., teacher assessment, professional certification) settings. prereq: 5221, [5262 or 8261 or 8251 or equiv]

EPSY 8225. Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating. (3 cr.; ; Student Option; Spring Even Year)
Principles/practices of test score quality assurance, standard setting/equating. Operational testing programs. Focus on achievement tests. prereq: 5221, [8252 or equiv]

EPSY 8226. Item Response Models: Theory and Applications. (3 cr.; ; Student Option; Spring Even Year)
Item response theory. Application in education/psychology/social science. 1-, 2-, 3-parameter models for dichotomous/graded response models. Partial credit models for polytomous
EPSY 8251. Statistical Methods in Education I. (3 cr.; Student Option; Every Fall, Spring & Summer)
Statistical Methods in Education I is the first course in an entry-level, doctoral sequence for students in education. This course covers estimation and hypothesis testing with a particular focus on ANOVA and an introduction to multiple linear regression. Prepares students for EPSY 8252/8262. prereq: [EPSY 5261 or equiv] or undergrad statistics course

EPSY 8252. Statistical Methods in Education II. (3 cr.; Student Option; Every Fall & Spring)
Statistical Methods in Education II is the second course in an entry-level, doctoral sequence for students in education. This course focuses on multiple linear regression and provides an introduction to linear mixed models. prereq: [EPSY 8251, 8261 or equiv]

EPSY 8264. Advanced Multiple Regression Analysis. (3 cr.; Student Option; Every Fall)
General linear model used as context for regression. Matrix algebra, multiple regression, path analysis, polynomial regression, standardized regression, stepwise solutions, analysis of variance, weighted least squares, logistic regression. prereq: [EPSY 8252 or equiv], regression/ANOVA course, familiarity with statistical analysis package

EPSY 8265. Factor Analysis. (3 cr.; Student Option; Every Fall)
Factor analytic techniques/applications. Component, common factor, confirmatory analysis. Factor extraction, estimating number of dimensions. Rotation, factor scores, hierarchical factor analysis. prereq: [EPSY 8252 or equiv or instr consent]

EPSY 8266. Statistical Analysis Using Structural Equation Methods. (3 cr.; Student Option; Periodic Spring)
Quantitative techniques using manifest/latent variable approaches for analysis of educational/social science data. Introduction to structural equation modeling approaches to multiple regression, factor analysis, path modeling. Developing, estimating, interpreting structural equation models. prereq: 8265, [EPSY 8252 or equiv]

EPSY 8267. Applied Multivariate Analysis. (3 cr.; Student Option; Spring Every Year)
Use/interpretation of results from several multivariate statistical techniques. Matrix algebra, variance/covariance, Hotelling’s T2, GLM, MANOVA, MANCOVA, discriminant analysis, canonical correlations, dimensionality, principal components, latent composites, distance, hierarchical clustering, prereq: [EPSY 8252 or equiv], familiarity with matrix algebra, knowledge of a computerized statistics package

EPSY 8268. Hierarchical Linear Modeling in Educational Research. (3 cr.; Student Option; Every Fall)
Conceptual framework of hierarchical linear models for nested data, their application in educational research. Nature/effects of nested data, logic of hierarchical models, mixed-effects models. Estimation/hypothesis testing in these models, model-checking, nonlinear models. prereq: [EPSY 8252 or equiv]

EPSY 8271. Statistics Education Research Seminar: Studies on Teaching and Learning Statistics. (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)
Introduction to classic/current research related to teaching/learning of statistics. Research from psychology, education, and statistics. Students focus on a particular research question and review the literature related to that question.

EPSY 8282. Statistical Analysis of Longitudinal Data. (3 cr.; Student Option; Every Fall)
Traditional/modern approaches to analyzing longitudinal data. Dependent t-test, repeated measures ANOVA/MANOVA. Linear mixed models, multilevel models, generalized models. Required labs using SAS computer program. prereq: [EPSY 8252 or equiv]

EPSY 8283. Research Synthesis and Meta-Analysis. (3 cr.; Student Option; Fall Even Year)
Meta-analysis is a methodology for conducting quantitative literature reviews in which the outcomes of empirical research studies are aggregated and their variation studied. This course will cover topics on problem formulation, sampling, variable coding, data analysis, and presentation of results in meta-analytic research. prereq: EPSY 8252 or equiv

EPSY 8290. Special Topics: Seminar in Psychological Foundations. (1-6 cr. [max 15 cr.]; Student Option; Periodic Fall, Spring & Summer)
Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics. prereq: instr consent

EPSY 8300. Special Topics in Educational Psychology. (1-4 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

EPSY 8400. Topics: Counseling and Student Personnel Psychology. (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Topics in counseling and student personnel psychology, or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8402. Individual Counseling: Theories, Applications & Counseling Skills. (4 cr.; A-F only; Every Fall)
This course will give the student an opportunity to read, think critically about, dialogue, and write on central counseling theories and therapies. During this course, students will begin to develop a useful theoretical viewpoint that will guide their work with clients and assist them in understanding the work of other therapists. In addition, students will practice and receive feedback on basic (common factors) counseling skills as well as counseling skills that are specific to various types of treatment approaches.

EPSY 8403. Social/Cultural Contexts: Counseling and Skills. (3 cr.; A-F or Audit; Every Spring)
Bases personal dimensions of race, ethnicity, gender, class, beliefs, disability, age, sexual orientation, and geographic origin. Societal and personal biases and stereotypes; multicultural concepts and culturally appropriate counseling procedures. prereq: Grad ed psy major with CSPP subprog or instr consent

EPSY 8404. Group Counseling: Theory, Applications, and Skills. (3 cr.; A-F or Audit; Every Spring)
Theories, research, and procedures of group counseling and of groups such as psychoeducational groups. Applications to various settings and populations. Ethical issues in group work. Practice of group skills and techniques, including group participation and observation. prereq: Ed psy MA or PhD student with CSPP subprog or instr consent

EPSY 8405. Career Development: Theory, Skills, and Counseling Applications. (3 cr.; A-F or Audit; Every Fall)
Career development theory/practice over life span. Emphasizes career counseling for individuals/organizations, systems approaches to career programs in education/business. Traditional/contemporary theories/practices. prereq: CSPP grad student

EPSY 8406. Professional Ethics for Counselors and Psychologists. (3 cr.; A-F only; Every Fall)
Theory, research, and practice in counseling ethics. Scope/impact of professional ethics. Ethical decision making. Ethics and the law. Ethical practice in special settings. Scholarship/research in counseling ethics. Lectures, discussions, case studies, individual/group examination of original research. prereq: CSPP grad student

EPSY 8407. Assessing and Counseling Clients With Psychological Disorders. (4 cr.; A-F or Audit; Every Spring)
Etiology, symptom patterns, and assessment/treatment for various psychological disorders. DSM diagnoses. Empirically validated psychological assessment and counseling methods. Field-based enquiry. prereq: CSPP PhD or MA student or instr consent

EPSY 8411. Advanced Counseling Research. (4 cr.; A-F or Audit; Every Fall)
Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research. prereq: Ed psy PhD student with CSPP subprog or instr consent

EPSY 8412. Seminar: Advanced Counseling Theory and Ethics. (4 cr.; A-F or Audit; Every Spring)
Comparative analysis of theoretical models and methods used in contemporary counseling and...
psychotherapy; ethical standards and models of ethical decision making for professional roles. prereq: Ed psy PhD student with CSPP subprog or infr consent

**EPSY 8413. Personality Assessment of Adolescents and Adults.** (.3 cr.; A-F only; Every Spring)
Assessment interviews, objective personality assessments (e.g., MMPI-2), projective tests (e.g., Thematic Apperception Test), and assessment report writing. prereq: [8407 or PSY 5604H or PSY 8111 or PSY 8112], doctoral student, infr consent

**EPSY 8431. Master's Research Seminar: CSPP.** (.3 cr.; [max 4 cr.]; A-F or Audit; Every Spring)
Survey of research methods, data-based decision making, basic research design skills, and research evaluation. prereq: 5261-1 or equiv, 5221-1 or equiv, EPSY MA student with CSPP subprog or infr consent

**EPSY 8444, FTE: Doctoral.** (.1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

**EPSY 8452. Psychological Aspects of Counseling Supervision.** (.3 cr.; Student Option; Every Fall)
Theories, review of relevant research, demonstration, and in-class practice of supervision skills. prereq: Ed psy PhD student with CSPP subprog or infr consent

**EPSY 8501. Counseling Pre-Practicum I.** (.3 cr.; A-F or Audit; Every Fall)
Overview of basic helping skills through demonstration, in-class practice. prereq: CSPP or genetic counseling) grad student

**EPSY 8502. Field Placement in Counseling and Student Personnel Psychology.** (.2 cr.; S-N or Audit; Every Fall & Spring)
Students participate under supervision in practitioner activities within a counseling work environment. prereq: 8501 or infr consent

**EPSY 8503. Counseling Practicum I.** (.1-4 cr.; A-F or Audit; Every Fall)
Beginning-level supervised practice in counseling with individuals and groups; emphasizes systematic evaluation of student's counseling practice through direct observations, video, and audio tapes. prereq: 8502 or infr consent

**EPSY 8504. Counseling Practicum II.** (.1-4 cr.; A-F or Audit; Every Spring)
Intermediate supervised practice in counseling with individuals and groups; emphasizes ethical issues with systematic evaluation of student's practice through direct observations, video, and audio tapes, prereq: 8503 or infr consent

**EPSY 8509. Supervision Practicum: CSPP.** (1-2 cr.; [max 6 cr.]; Student Option; Every Fall & Spring)
Doctoral students meet weekly with master's prepracticum or practicum students for didactic supervision activities. Specific activities determined by master's prepracticum or practicum instructor. Doctoral students meet weekly with master's prepracticum or practicum instructor and other doctoral student supervisors for consultation/supervision. prereq: [Ed psy PhD student with CSPP subprog] or infr consent

**EPSY 8512. Internship: CSPP.** (.1-12 cr.; S-N only; Every Fall, Spring & Summer)
Supervised internship in counseling psychology. prereq: EdPsy PhD student with CSPP subprog

**EPSY 8521. Practicum in Student Affairs and Student Development.** (.1-4 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring)
Supervised practice in university and college student development offices. prereq: EdPsy MA or PhD student with CSPP subprog or infr consent

**EPSY 8522. Counseling Practicum: Advanced.** (.3 cr. [max 12 cr.]; A-F only; Every Fall & Spring)
Advanced skills-practicum in counseling, counseling psychology, or student development. prereq: [Grad EdPsy PhD student with CSPP subprog] or infr consent; instructor consent required after 2 repeats

**EPSY 8600. Special Topics: Special Education Issues.** (.1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Current trends (e.g., schoolwide discipline, models of collaboration, and diversity) investigated by formulating research projects. Students write a media piece describing an issue and its impact on the community.

**EPSY 8602. Advanced Topics in Special Education Research.** (3 cr. [max 12 cr.]; A-F only; Every Fall & Spring)
This course will offer sections on varying topics focused on research, policy, practice, and related issues in special education and disability services for advanced graduate seminars. The course is intended to allow enrolled students to conduct in-depth and focused review and analysis of scholarship in a contemporary area of special education, and to provide each student the opportunity to develop in-depth understanding of a specific topic within this area. This is a seminar course, with a combination of faculty-presented, student-presented, and group discussion content. Course topics will include an overview of relevant theoretical models, research methods, empirical and other findings, and areas of emerging interest, scholarship, policy, and practice. prereq: Completion of EPSY 8701, 8702, and 8694 or equivalent coursework; doctoral student in Special Education or a related academic area, or permission of instructor

**EPSY 8612. Seminar: Students with Academic Difficulties.** (.3 cr.; A-F or Audit; Every Fall & Spring)
Survey, analysis, and application of relevant theories and research related to current issues. Students in course develop skills in scholarly inquiry, writing, and debate.

**EPSY 8651. Seminar on Social and Emotional Disabilities.** (.3 cr.; A-F or Audit; Every Fall & Spring)
Review and critical analysis of current trends and future directions of education of students with social and emotional disabilities.

**EPSY 8666. Doctoral Pre-Thesis Credits.** (.1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**EPSY 8694. Research in Special Education.** (.3 cr.; Student Option; Every Fall & Spring)
Design and implementation of research related to the unique developmental characteristics of exceptional learners.

**EPSY 8701. Doctoral Core Seminar: Special Education I.** (.3 cr. [max 6 cr.]; A-F or Audit; Every Fall)
Required for students with a family/life span focus on social development, behavioral interaction, and cultural interactions. prereq: EdPsy PhD student with spec ed subprog or infr consent

**EPSY 8702. Doctoral Core Seminar: Special Education II.** (.3 cr. [max 6 cr.]; A-F or Audit; Every Spring)
Required for students focusing on communication/language/academics. prereq: 8701 or infr consent

**EPSY 8706. Single Case Designs in Intervention Research.** (.3 cr.; Student Option; Periodic Spring)
Design and analysis of single-case experiments to examine effects of interventions on individual behavior in school, home, and community.

**EPSY 8707. Principles of Behavior Analysis and Learning.** (.3 cr.; A-F only; Every Fall)
Historical development of behavioral science. Thinking about learning/behavior, applying principles to common human experiences. Scholarly leadership skills. prereq: [Grad student, foundational course in [learning or psychology]] or infr consent

**EPSY 8708. Functional Behavior Assessment.** (.3 cr.; A-F only; Every Spring)
Applications of principles of behavior. Historical/contemporary approaches. Functional analysis. Treatment of challenging behavior/learning problems. prereq: [Grad student, one [learning or psychology] course] or infr consent

**EPSY 8709. Sp Ed Issues - Language & Early Literacy Dev., Asmnt, & Intervention for Young Children.** (3 cr.; A-F only; Fall Even Year)
This seminar course will address contemporary issues in theory, assessment, and interventions to promote language and early literacy development for young children (typically, those not yet age-eligible to enroll in kindergarten) at risk for later reading delays. The course will review and analyze relevant theoretical models, basic research related
to these theories, and applied research in assessment and intervention, particularly research conducted in the past five years as well as emerging issues of research and practice.

EPSY 8772. Seminar in Early Intervention. (2 cr.; Student Option; Every Fall & Spring) Explores research from diverse disciplines related to education of infants, toddlers, and preschool children with disabilities and their families. Discusses practical application of this research.

EPSY 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

EPSY 8800. Special Topics in School Psychology. (1-4 cr. [max 9 cr.]; Student Option; Every Spring & Summer) Issues or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8811. Assessment in School Psychology I: Foundations of Academic Assessment. (3 cr.; A-F or Audit; Every Fall) Theories and models of psychoeducational assessment of children and adolescents within home, school, and community. Conceptual and empirical foundations of eco-behavioral assessment that lead to efficient but comprehensive assessment of children presented from problem-solving perspective. prereq: Grad ed psy major with school psy subprog or instr consent

EPSY 8812. Assessment in School Psychology II: Intellectual and Social-Emotional Domains. (3 cr.; A-F or Audit; Every Spring) Builds on EPSY 8811. Emphasizes gathering data on a child's intellectual and social-emotional functioning and educational progress, prereq: Grad ed psy major with school psy subprog or instr consent

EPSY 8813. Introductory Practicum in School Psychology. (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) Students complete a variety of learning activities intended to foster familiarity with the school environment and role of the school psychologist including school observations, and formal and informal assessment techniques. All measures complement other facets of assessment presented in EPSY 8811 and 8812.

EPSY 8815. Behavioral and Social Emotional Prevention and Intervention. (3 cr.; A-F or Audit; Periodic Fall & Spring) Theories and research-based practices underlying prevention and intervention practices to support students? behavioral, social, and emotional development. Applied projects and assignments in practicum placements. prereq: EPSY 8821, 8811, 8812

EPSY 8816. Academic Prevention and Intervention. (3 cr.; A-F or Audit; Every Fall & Spring) Theories and research-based approaches to prevention, instruction, and intervention practices to support students? cognitive and academic development in core curricular domains. Applied projects and assignments in practicum placements.

EPSY 8817. Problem Analysis and Consultation in School Psychology. (3 cr.; A-F or Audit; Every Spring) Practical application of problem analysis and consultation models with school staff, parents, and students. Theories, approaches, and barriers to research-based indirect services in school psychology. Applied projects and assignments in practicum placements.

EPSY 8818. Intermediate Practicum in School Psychology. (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) Students complete a variety of learning activities intended to foster familiarity with the role of the school psychologist including formal and informal assessment techniques, academic and social-emotional interventions, and consultation. All interventions and consultation activities are linked to didactic portions of EPSY 8815, 8816, 8817. prereq: concurrent registration is required (or allowed) in 8815 or concurrent registration is required (or allowed) in 8816

EPSY 8819. Emotion & Childhood Psychopathology. (3 cr.; A-F only; Every Spring) This seminar is designed to provide an overview of historical and current perspectives on emotion and childhood psychopathology, including current diagnostic and classification systems, with emphasis on specific disorders. The course will focus on disorders that are typically observed by psychologists working in schools and other applied settings.

EPSY 8821. Issues in School Psychology. (3 cr.; A-F or Audit; Every Fall & Spring) School psychologists in professional field of specialization in psychology/education. Historical, theoretical, and research basis of school psychology. How school systems operate. Common roles/functions of school psychologists. In-class discussion, didactic/field-based assignments. prereq: EPSY grad student with SchlPsy subprog

EPSY 8822. Research in School Psychology. (3 cr. [max 12 cr.]; A-F only; Every Fall & Spring) Integrative, developmental series of discussions/activities about research in school psychology. Instruction/discussion regarding consumption, synthesis, conduct, dissemination of school psychology research.

EPSY 8823. Ethics and Professional Standards in School Psychology. (3 cr.; A-F or Audit; Every Fall & Spring) Ethics, law, and current educational issues applied to study/practice of school psychology. Ethical principles, state/federal laws governing educational practices. How mandates are applied to work of school psychologists in general/special populations (e.g., special education, ESL, ethnic/racial minorities). Students apply learning as researchers and practicing school psychologists in schools. prereq: 8821

EPSY 8831. Comprehensive School Practicum in School Psychology. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) Supervised school field placement requiring assessment, consultation, prevention, and intervention activities.

EPSY 8832. Advanced Practicum in School Psychology. (3 cr. [max 6 cr.]; A-F only; Every Fall, Spring & Summer) Supervised field placement individualized to student interests and training goals. May require variety of assessment, consultation, prevention, and intervention activities.

EPSY 8841. Practicum: Instruction and Supervision in School Psychology. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall, Spring & Summer) Didactic training/supervised experience teaching. Knowledge/skills in strategies for effective classroom instruction/supervision in individual/small group instruction. Construct teaching portfolio. prereq: Grad ed psy major with school psy subprog or instr consent

EPSY 8842. Internship: School Psychological Services. (1-10 cr. [max 99 cr.]; S-N or Audit; Every Fall, Spring & Summer) Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years. prereq: Grad ed psy major with school psy subprog, instr consent

EPSY 8843. Internship - School Psychology. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring) Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years. prereq: instr consent

EPSY 8849. Assessment in Early Childhood. (3 cr.; A-F or Audit; Spring Even Year) Training psychologists/researchers in use of various assessment tools, including observational assessment strategies, for children birth-age 7. Intended primarily for graduate level practitioners-in-training interested in applied information on assessment/intervention services. prereq: (8811, 8812) or equivalent in related programs

EPSY 8850. Doctoral Seminar in School Psychology: Research, Training, Practice, Policy Issues, and Action Plans. (3 cr.; A-F only; Every Fall & Spring) Critical issues in school psychology led by students or visiting professionals. Outside reading/research. Scientific findings/implications for training, practice, policy, and research. Students create professional-development plan. prereq: [(Grad student in school psychology, coursework in school psychology) or advanced PhD student from related department], instr consent

EPSY 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required
EPSY 8905. History and Systems of Psychology: Landmark Issues in Educational Psychology. (3 cr.; Student Option; Every Spring) Critical issues in learning and cognition, statistics and measurement, counseling, school psychology, social psychology of education, and special education. Prereq: Ed psy PhD student

EPSY 8993. Directed Study: Educational Psychology. (1-10 cr. [max 20 cr.]; A-F or Audit; Every Fall, Spring & Summer) Arranged independently with individual faculty members. Prereq: instr consent

EPSY 8994. Research Problems: Educational Psychology. (1-6 cr. [max 18 cr.]; A-F or Audit; Every Fall, Spring & Summer) Research methodology, techniques, and literature. Students participate in formulating/executing research proposal. Prereq: instr consent

Educational/Human Development (EDHD)

EDHD 5004. Teaching Students With Special Needs in Inclusive Settings. (2 cr.; A-F or Audit; Every Fall, Spring & Summer) Exceptionalities in educational settings as defined in federal/state rules/regulations. Historical perspectives, definitions, etiology, needs, characteristics. Service delivery systems for each exceptionality. Prereq: Teacher preparation program in [CEHD or music education or agriculture education or DirecTrack] or instr consent; licensure students must take this course for a grade

EDHD 5100. International Topics for Graduate Students. (1-12 cr.; Student Option; Every Fall, Spring & Summer) Off-campus course. Topics from research exploration to academic/engagement activities. Delivered in international setting. Course requirements are determined by instructor(s) and reflect graduate-level rigor.

EDHD 5200. Special Topics: Professional Development for Educators. (1-12 cr.; Student Option; Every Summer) Special topics course that permits offering a variety of research-based and scholarly content to meet the needs of educators from P-12 settings.

EDHD 5300. Special Topics in Education and Human Development. (1-6 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Special topics in education and human development.

Electrical & Computer Eng (EE)

EE 5041. Industrial Assignment for Graduate Students. (1 cr.; S-N only; Every Fall, Spring & Summer) Optional industrial work assignment. Evaluation based on student's formal written report covering semester's work assignment. This course counts for 6 credits of Academic Progress for the semester in which it is taken. Prereq: Consent of Advisor and Office of the DGS

EE 5121. Transistor Device Modeling for Circuit Simulation. (3 cr.; Student Option; Periodic Fall & Spring) Basics of MOS, bipolar theory. Evolution of popular device models from early SPICE models to current industry standards. Prereq: [3115, 3161, CSE grad student] or dept consent

EE 5141. Introduction to Microsystems Technology. (4 cr.; Student Option; Every Spring) Microelectromechanical systems composed of microsensors, microactuators, and electronics integrated onto common substrate. Design, fabrication, and operation principles. Labs on micromachining, photolithography, etching, thin film deposition, metalization, packaging, and device characterization. Prereq: [3161, 3601, CSE grad student] or dept consent

EE 5163. Semiconductor Properties and Devices I. (3 cr.; Student Option; Every Fall) Prerequisites/properties of semiconductor devices. Selected topics in semiconductor materials, statistics, and transport. Aspects of transport in p-n junctions, heterojunctions. Prereq: [3161, 3601, CSE grad student] or dept consent

EE 5164. Semiconductor Properties and Devices II. (3 cr.; Student Option; Every Spring) Prerequisites/properties of semiconductor devices. Charge control in different FETs, transport, modeling. Bipolar transistor models (Ebers-Moll, Gummel-Poon), heterostructure bipolar transistors. Special devices. Prereq: 5163 or instr consent

EE 5171. Microelectronic Fabrication. (4 cr.; Student Option; Every Fall) Fabrication of microelectronic devices. Silicon integrated circuits, GaAs devices. Lithography, oxidation, diffusion. Process integration of various technologies, including CMOS, double poly bipolar, and GaAs MESFET. Prereq: CSE grad student or dept consent

EE 5173. Basic Microelectronics Laboratory. (1 cr.; Student Option; Every Fall) Students fabricate a polysilicon gate, single-layer metal, NMOS chip, performing 80 percent of processing, including photolithography, diffusion, oxidation, and etching. In-process measurement results are compared with final electrical test results. Simple circuits are used to estimate technology performance. Prereq: [5171 or concurrent registration is required (or allowed) in 5171], CSE grad student] or dept consent

EE 5181. Micro and Nanotechnology by Self Assembly. (3 cr.; Student Option; Spring Odd Year) Self-assembly process of micro and nano structures for realization of 1-, 2-, 3-dimensional micro- and nano-devices. Micro and nanoscale fabrication by electrostatic, magnetic, surface tension, Capillary, intrinsic and extrinsic forces. Nanoscale lithographic patterning. Devices packaging, Self-healing process. Prereq: EE 3161, Phys 1302

EE 5231. Linear Systems and Optimal Control. (3 cr.; Student Option; Every Fall) Properties and modeling of linear systems. Linear quadratic and linear-quadratic-Gaussian regulators. Maximum principle. Prereq: [3015, CSE grad student] or instr consent

EE 5235. Robust Control System Design. (3 cr.; Student Option; Every Spring) Development of control system design ideas; frequency response techniques in design of single-input/single-output (and MIMO) systems. Robust control concepts. CAD tools. Prereq: CSE grad, 3015, 5231 or instr consent

EE 5239. Introduction to Nonlinear Optimization. (3 cr.; Student Option; Periodic Fall & Spring) Nonlinear optimization, Analytical/computational methods. Constrained optimization methods. Convex analysis, Lagrangian relaxation, non-differentiable optimization, applications in integer programming. Optimality conditions, Lagrange multiplier theory, duality theory. Control, communications, management science applications. Prereq: [3025, Math 2373, Math 2374, CSE grad student] or dept consent


EE 5301. VLSI Design Automation I. (3 cr.; Student Option; Periodic Fall & Spring) Basic graph/numerical algorithms. Algorithms for logic/high-level synthesis. Simulation algorithms at logic/circuit level. Physical-design algorithms. Prereq: [3031, CSE grad student] or dept consent


EE 5323. VLSI Design I. (3 cr.; Student Option; Every Fall) Combinational static CMOS circuits. Transmission gate networks. Clocking strategies, sequential circuits. CMOS process flows, design rules, structured layout techniques. Dynamic circuits, including Domino CMOS and DCVS. Performance analysis, design optimization, device sizing. Prereq: [2301, 3115, CSE grad student] or dept consent

EE 5324. VLSI Design II. (3 cr.; Student Option; Every Spring) CMOS arithmetic logic units, high-speed carry chains, fast CMOS multipliers. High-speed
performance parallel shifters. CMOS memory cells, array structures, read/write circuits. Design for testability, including scan design and built-in self test. VLSI case studies. prereq: [5323, CSE grad student] or dept consent

EE 5327. VLSI Design Laboratory. (3 cr.; Student Option; Every Spring) Complete design of an integrated circuit. Designs evaluated by computer simulation. prereq: [4301, CSE grad student] or concurrent registration is required (or allowed in 5323). CSE grad student] or dept consent

EE 5329. VLSI Digital Signal Processing Systems. (3 cr.; Student Option; Periodic Fall & Spring) Programmable architectures for signal/media processing. Data-flow representation. Architecture transformations. Low-power design. Architecture for two's complement/redundant representation, carry-save, and canonical signed digit. Scheduling/allocation for high-level synthesis. prereq: [[5323 or concurrent registration is required (or allowed in 5323)], CSE grad student] or dept consent

EE 5333. Analog Integrated Circuit Design. (3 cr.; Student Option; Every Fall) Fundamental circuits for analog signal processing. Design issues associated with MOS/BJT devices. Design/testing of circuits. Selected topics (e.g., modeling of basic IC components, design of operational amplifier or comparator or analog sampled-data circuit filter). prereq: [3115, CSE grad student] or dept consent

EE 5340. Physics of Computing: Basics. (3 cr.; Student Option; Every Spring) Physics of Computer will explore how physical principles and limits have been shaping paradigms of computing. A key goal of this course is to understand how (and to what extent) a paradigm shift in computing can help with emerging energy problems. Topics include: Physical limits of computing, coding and information theoretical foundations, computing with beyond-CMOS devices, reversible computing, quantum computing, stochastic computing. Previous course in Computer Architecture is suggested but not required.

EE 5351. Applied Parallel Programming. (3 cr.; Student Option; Every Fall) Parallel programming/architecture. Application development for many-core processors. Computational thinking, types of parallelism, programming models, mapping computations effectively to parallel hardware, efficient data structures, paradigms for efficient parallel algorithms, application case studies. prereq: [4363 or equivalent], programming experience (C/C++ preferred)

EE 5355. Algorithmic Techniques for Scalable Many-core Computing. (3 cr.; Student Option; Spring Odd Year) Algorithm techniques for enhancing the scalability of parallel software: scatter-together, problem decomposition, binning, privatization, tiling, regularization, compaction, double-buffering, and data layout. These techniques address the most challenging problems in building scalable parallel software: limited parallelism, data contention, insufficient memory bandwidth, load balance, and communication latency. Programming assignments will be given to reinforce the understanding of the techniques. prereq: basic knowledge of CUDA, experience working in a Unix environment, and experience developing and running scientific codes written in C or C++. Completion of EE 5351 is not required but highly recommended.

EE 5364. Advanced Computer Architecture. (3 cr.; Student Option; Every Fall) Instruction set architecture, processor microarchitecture. Memory and I/O systems. Interactions between computer software and hardware. Methodologies of computer design. prereq: [4363 or CSci 4203], CSE grad student] or dept consent

EE 5367. Computer Systems Performance Measurement and Evaluation. (3 cr.; Student Option; Periodic Fall & Spring) Tools/techniques for analyzing computer hardware/software performance. Benchmark programs, measurement tools, performance metrics. Deterministic/probabilistic simulation techniques, random number generation/testing. Bottleleneck analysis. prereq: [4363 or 5361 or CSci 4203 or 5201], [CSE grad student] or dept consent

EE 5373. Data Modeling Using R. (1 cr.; A-F only; Periodic Fall & Spring) Introduction to data modeling and the R language programming. Multi-factor linear regression modeling. Residual analysis and model quality evaluation. Response prediction. Training and testing. Integral lab. An introductory course in probability and statistics is suggested but not required; basic programming skills in some high-level programming language, such as C/C++, Java, Fortran, etc also suggested.

EE 5381. Telecommunications Networks. (3 cr.; Student Option; Periodic Fall & Spring) Fundamental concepts of modern telecommunications networks, mathematical tools required for their performance analysis. Layered network architecture, point-to-point protocols/links, delay models, multiaccess communication/routing. prereq: [4501, 5531, CSE grad student] or dept consent

EE 5391. Computing With Neural Networks. (3 cr.; Student Option; Periodic Fall & Spring) Neural networks as a computational model. Connections to AI, statistics and model-based computation. Associative memory and matrix computation; Hopfield networks. Supervised networks for classification and prediction. Unsupervised networks for data reduction. Associative recognition/retrieval, optimization, time series prediction, knowledge extraction. prereq: [3025 or Stat 3091], CSE grad student] or dept consent


Information-Theoretic Analysis. Feedback in digital circuits/genetic regulatory systems. Synthesizing stochastic logic and probabilistic biochemistry. prereq: MATH 2263 or dept consent


EE 5505. Wireless Communication. (3 cr.; Student Option; Every Spring) Introduction to wireless communication systems. Propagation modeling, digital communication over fading channels, diversity and spread spectrum techniques, radio mobile cellular systems design, performance evaluation. Current European, North American, and Japanese wireless networks. prereq: [4501, CSE grad student] or dept consent; 5501 recommended


EE 5549. Digital Signal Processing Structures for VLSI. (3 cr.; Student Option; Periodic Fall & Spring) Pipelining. Parallel processing. Fast convolution, FIR, rank-order, IIR, lattice, adaptive digital filters. Scaling and roundoff noise. DCT. Viterbi coders. Lossless coders,
video compression. prereq: [4541, CSE grad student] or dept consent

EE 5551. Multiscale and Multirate Signal Processing. (3 cr.; Student Option; Periodic Fall & Spring)
Scaling equations. Discrete wavelet transform. Applications in signal/image processing.
prereq: [4541, 5551, CSE grad student] or dept consent

EE 5561. Image Processing and Applications. (3 cr.; Student Option; Every Spring)
Two-dimensional digital filtering/transforms. Application to image enhancement, restoration, compression, and segmentation. prereq: [4541, 5581, CSE grad student] or instr consent

EE 5581. Information Theory and Coding. (3 cr.; Student Option; Fall Even Year)
Source/channel models, codes for sources/channels. Entropy, mutual information, capacity, rate-distortion functions. Coding theorems. prereq: [5531, CSE grad student] or dept consent

EE 5583. Error Control Coding. (3 cr.; Student Option; Periodic Spring)
Error-correcting codes. Concepts, properties, polynomial representation. BCH, Golay, Reed-Muller/Reed-Solomon codes. Convolutional codes. Iterative codes. prereq: [3025, Math 2373] or equiv. [CSE grad student or dept consent

EE 5585. Data Compression. (3 cr.; Student Option; Periodic Fall & Spring)

EE 5601. Introduction to RF/Microwave Engineering. (3 cr.; Student Option; Periodic Fall & Spring)

EE 5602. RF/Microwave Circuit Design. (3 cr.; Student Option; Periodic Fall & Spring)
Transmission lines, network analysis concepts. CAD tools for passive/active designs. Diode based circuit designs (detectors, frequency multipliers, mixers). Transistor based circuit design (amplifiers, oscillators, mixer/doubler). prereq: [5601 or equiv]. [CSE grad student or instr consent

EE 5611. Plasma-Aided Manufacturing. (4 cr.; A-F or Audit; Periodic Fall & Spring)
Manufacturing using plasma processes. Plasma properties as a processing medium. Plasma spraying, welding and microelectronics processing. Process control and system design; industrial speakers. Cross-disciplinary experience between heat transfer design issues and manufacturing technology. prereq: [(ME 3321, ME 3322) or equiv. [upper div CSE or grad student] or dept consent

EE 5613. RF/Microwave Circuit Design Laboratory. (2 cr.; A-F only; Every Spring)
Scattering parameters, planar lumped circuits, transmission lines, RF/microwave substrate materials, matching networks/tuning elements, resonators, filters, combiners/dividers, couplers. Integral lab. prereq: [5601 or concurrent registration is required (or allowed in 5601), CSE grad student] or dept consent

EE 5616. Antenna Theory and Design. (3 cr.; Student Option; Periodic Fall & Spring)
Antenna performance parameters, vector potential/radiation integral, wire antenna structures, broadband antenna structures, microstrip/aperture theory, antenna measurements. prereq: [5601 or concurrent registration is required (or allowed in 5601), CSE grad student] or dept consent

EE 5621. Physical Optics. (3 cr.; Student Option; Every Spring)
Physical optics principles, including Fourier analysis of optical systems/images, scalar diffraction theory, interferometry, and coherence theory. Diffractive optical elements, holography, astronomical imaging, optical information processing, microoptics. prereq: [3015, CSE grad student] or dept consent

EE 5622. Physical Optics Laboratory. (1 cr.; Student Option; Every Spring)

EE 5624. Optical Electronics. (4 cr.; Student Option; Every Fall)
Fundamentals of lasers, including propagation of Gaussian beam, optical resonators, and theory of laser oscillation. Polarization optics, electro-optic, acousto-optic modulation, nonlinear optics, phase conjugation. prereq: [3601 or Phys 3002]. CSE grad student] or dept consent

EE 5627. Optical Fiber Communication. (3 cr.; Student Option; Periodic Fall & Spring)

EE 5628. Fiber Optics Laboratory. (1 cr.; Student Option; Spring Odd Year)
Experiments in fiber optics. Dielectric waveguides, modes in optical fibers, fiber dispersion/attenuation, properties of light sources/detectors, optical communication systems. prereq: [5627 or concurrent registration is required (or allowed in 5627), CSE grad student] or instr consent

EE 5629. Optical System Design. (2 cr.; Student Option; Periodic Fall & Spring)
Elementary or paraxial optics. Non-paraxial, exact ray tracing. Energy considerations in instrument design. Fourier optics and image quality. Design examples: telescopes, microscopes, diffraction-limited lenses, projectors, scientific instruments. prereq: CSE grad student or dept consent

EE 5640. Introduction to Nano-Optics. (3 cr.; Student Option; Every Fall)
This course will cover the physics and technology of nano-optics and plasmonics and their potential applications in biochemical sensing, super-resolution imaging, optical trapping, light emission, and spectroscopy. The following topics will be covered: - Maxwell's equations, E&M of metals - Fresnel's equations, light propagation in periodic media - Physics of surface plasmon waves - Metallic waveguides: metal-insulator-metal vs. insulator-metal-insulator - Optical antennas - Noble metal nanoparticles: Synthesis, optical properties, and applications - Optical biosensors based on surface plasmon resonance (SPR) - Surface enhanced Raman scattering (SERS) - Surface enhanced Infrared Absorption (SEIRA) - Super-resolution imaging and near-field optical microscopy - Light transmission through nano-apertures (extraordinary optical transmission) - Plasmonics at long wavelengths (infrared and terahertz) - Plasmonics in atomically thick materials Knowledge of Maxwell's equations, Matlab, or Mathematica coding is suggested but not required.

EE 5649. Infrared Devices and Technology. (3 cr.; Student Option; Periodic Fall)
One of the most economically and scientifically important but relatively unknown device technologies is infrared detection, sensing and imaging. Today the application space is much larger than traditional military applications and includes weather and climate satellites, industrial process control, petrochemical analysis, pollution sensing, astronomy, and biomedical clinical diagnostics. This class covers the basic physics of infrared emission and absorption in solid-state materials, molecules, and the atmosphere. It also discusses detector technology (with particular emphasis on types of semiconductor and quantum-dot photon detectors, microbolometers, and thermoelectric detectors) and the infrared spectroscopy of molecules to show why the infrared is so important in the study of chemical, biological, and atmospheric systems. The class will also examine types of commonly used spectrometers: cavity, dispersive, and FTIR and sampling of important applications: passive and active standoff detection, satellite climate and atmospheric monitoring, industrial and petrochemical analysis, and LiDAR. Other topics will be introduced as time allows.

EE 5653. Physical Principles of Magnetic Materials. (3 cr.; Student Option; Every Fall)
Physics of diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism. Ferromagnetic phenomena.
Characteristics of protection components. 
prereq: [4721, CSE grad student] or dept consent

EE 5741. Advanced Power Electronics. (3 cr.; Student Option; Periodic Spring) 
Physics of solid-state power devices, passive components, magnetic optimization, advanced topologies. 
Unify power factor correction circuits, EMI issues, snubbers, soft switching in dc/ac converters. Practical considerations. 
very low voltage output converters. Integrated computer simulations. 
prereq: CSE graduate student or dept consent

EE 5745. Wind Energy Essentials. (2 cr.; Student Option; Every Fall) 
prereq: CSE graduate student or dept consent

EE 5811. Biological Instrumentation. (3 cr.; Student Option; Spring Odd Year) 
This course will cover the physics and technology of biological instruments. 
The operating principles of optical, electrical, and mechanical biosensors will be discussed, followed by transport and delivery of biomolecules to the sensors. Techniques to manufacture these sensing devices, along with microfluidic packaging, will be covered. Lectures will be complemented by lab demo sessions to give students hands-on experiences in microfluidic chip fabrication, microscopy, and particle trapping experiments.

EE 5940. Special Topics in Electrical Engineering I. (1-4 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer) 
Special topics in electrical and computer engineering. 
Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1-4 cr.; max 12 cr.; Student Option; Every Fall & Spring) 
Special topics in electrical and computer engineering. 
Topics vary.

EE 5960. Special Topics in Electrical Engineering III. (1-4 cr.; max 12 cr.; Student Option; Every Fall & Spring) 
Special topics in electrical and computer engineering. 
Topics vary.

EE 5970. Special Topics in Electrical Engineering IV. (1-4 cr.; max 12 cr.; Student Option; Periodic Fall & Spring) 
Special topics in electrical and computer engineering. 
Topics vary. prereq: EE or CompE graduate student or instr consent; only available for Rochester Campus

EE 5980. Teaching, Grading, and Lab Instruction Seminar. (1 cr.; No Grade Associated; Every Fall) 
The purpose of this course is to provide guidance and instruction in teaching, grading, and laboratory procedures. 
In addition, you will be provided with structured links to self-help resources, support from faculty, peers, and staff that will improve your effectiveness and efficiency while teaching and grading. 
The course is broken out into four components: 
- A pre-seimester orientation and series of three workshops (4 hours) - A series of bi-weekly seminars spaced throughout the semester (approx. 4 hours) - A private teaching consultation by CEI (3 hours, lab TAs only) - A wrap-up discussion session (2 hours)

EE 5990. Curricular Practical Training. (1-2 cr.; max 6 cr.; S-N or Audit; Every Fall, Spring & Summer) 
Industrial work assignment involving advanced electrical engineering technology. Review by faculty member. Final report covering work assignment. prereq: Grad student, instr consent

EE 8100. Advanced Topics in Electronics. (1-3 cr.; max 12 cr.; Student Option; Periodic Fall) 
Topics vary according to needs and staff availability. prereq: instr consent

EE 8141. Advanced Heterojunction Transistors. (3 cr.; Student Option; Periodic Fall) 
Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship. prereq: 5664 or instructor consent

EE 8161. Physics of Semiconductors. (3 cr.; Student Option; Periodic Fall & Spring) 

EE 8163. Quantum Electronics. (3 cr.; A-F or Audit; Periodic Fall & Spring) 

EE 8190. Electronics Seminar. (1 cr.; max 3 cr.; S-N or Audit; Every Fall & Spring) 
Current literature, individual assignments. 
prereq: instr consent

EE 8210. System Theory Seminar. (1 cr.; max 3 cr.; S-N or Audit; Periodic Fall & Spring) 
Current literature, individual assignments.

EE 8213. Advanced System Theory. (3 cr.; Student Option; Periodic Fall) 
Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis. prereq: IT grad student, instr consent
EE 8215. Nonlinear Systems. (3 cr.; Student Option; Periodic Fall & Spring) Current topics in stability analysis of nonlinear systems, design of controllers for nonlinear systems, discrete-time and stochastic nonlinear systems. prereq: instr consent

EE 8230. Control Theory Seminar. (1 cr. [max 3 cr.]; S-N or Audit; Periodic Fall & Spring) Current literature, individual assignments.

EE 8231. Optimization Theory. (3 cr.; Student Option; Periodic Fall) Introduction to optimization in engineering; approximation theory. Least squares estimation, optimal control theory, and computational approaches. prereq: instr consent


EE 8300. Advanced Topics in Computers. (1-3 cr. [max 12 cr.]; Student Option; Periodic Fall) Topics vary according to needs and staff availability. prereq: instr consent

EE 8310. Advanced Topics in VLSI. (1-3 cr. [max 12 cr.]; Student Option; Periodic Fall) Topics vary according to needs and staff availability. prereq: instr consent

EE 8320. Advanced Topics in Design Automation. (1-3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall) State-of-the-art automated design tools for electronic system design. Topics vary. prereq: Grad student or instr consent

EE 8331. CMOS Data Converters: A/D and D/A. (3 cr.; Student Option; Every Fall & Spring) Data converters, low power low voltage analog circuits. Basic background in design of CMOS analog-to-digital and digital-to-analog converters. Special circuit design techniques for low power design. Students design/test several design problems. prereq: 5333 or instr consent

EE 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

EE 8337. Analog Circuits for Wire/Wireless Communications. (3 cr.; A-F or Audit; Every Spring) Basic background, advanced design concepts necessary to design integrated CMOS RF circuits. Emphasizes CMOS and RF. Where appropriate, mention is made of bipolar circuits and applications to other communications areas. prereq: 5333

EE 8350. Advanced Verification Methodologies for VLSI Systems. (3 cr.; Student Option; Every Fall) Object-oriented programming in SystemVerilog. Randomization techniques, threads, interprocess communication, and functional coverage determination. Advanced interfaces and assertion-based verification. UVM tests, components, agents, environments, factory pattern, transactions, and sequences. Formal and semi-formal verification methods. Other advanced verification techniques of current research interest. Prerequisites: EE 5327 VLSI Design Lab or equivalent

EE 8351. Design Automation Techniques for Variation-Aware Computing. (3 cr.; Student Option; Fall Even Year) High-performance chip design can only be performed with the assistance of design automation tools that comprehend the needs of the designer and deliver solutions that can correctly analyze and optimize these systems. The objective of this class is to provide a view of this emerging universe and acquaint students with new research in this area. Specific topics to be covered include 1) Overview of technology trends and emerging systems 2) Variation-aware design and 3) Design automation issues. Prerequisites: CSE grad student. Some background in VLSI design and/or design automation is suggested but not required. Such prior exposure will make the experience in the class much more meaningful.

EE 8360. Computer Systems Seminar. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Current literature, individual assignments.


EE 8370. Computer Aided Design Seminar. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Current literature, individual assignments. prereq: [EE or CompE or CSci] grad major, instr consent

EE 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

EE 8500. Seminar: Communications. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Current literature, individual assignments.

EE 8510. Advanced Topics in Communications. (1-3 cr. [max 12 cr.]; Student Option; Periodic Fall) Topics vary according to needs and staff availability. prereq: instr consent

EE 8520. Advanced Topics in Signal Processing. (1-3 cr. [max 12 cr.]; Student Option; Every Spring) Topics vary according to needs and staff availability. prereq: instr consent

EE 8581. Detection and Estimation Theory. (3 cr.; Student Option; Periodic Spring) Risk theory approach to detection and estimation, random process representation, signal parameter estimation. Waveform estimation; detection of phase, frequency, and delay in signals. Applications to communications and radar-sonar signal design and processing. prereq: 5531 or instr consent

EE 8591. Predictive Learning from Data. (3 cr.; Student Option; Fall Even Year) Methods for estimating dependencies from data have been traditionally explored in such diverse fields as: statistics (multivariate regression and classification), engineering (pattern recognition, system identification), computer science (artificial intelligence, machine learning, data mining) and bioinformatics. Recent interest in learning methods is triggered by the widespread use of digital technology and availability of data. Unfortunately, developments in each field are seldom related to other fields. This course is concerned with estimation of predictive data-analytic models that are estimated using past data, but are used for prediction or decision making with new data. This course will first present general conceptual framework for learning predictive models from data, using Vapnik-Chervonenkis (VC) theoretical framework, and then discuss various methods developed in statistics, pattern recognition and machine learning. Course descriptions will emphasize methodological aspects of machine learning, rather than development of new algorithms. prereq: CSE grad student or instr consent

EE 8601. Advanced Electromagnetic Theory. (3 cr.; A-F or Audit; Periodic Fall) Aspects of electromagnetic theory. Review of introductory material. Scattering theory, geometric theory of diffraction, integral equation methods, Green's functions. prereq: 4601 or equiv

EE 8610. Seminar: Electronics, Fields, and Photonics. (3 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Students are assigned readings from current literature and make individual presentations to class. From time to time outside speakers present research papers. prereq: EE grad major or instr consent

EE 8611. Plasma Physics. (3 cr.; Student Option; Periodic Fall) Plasma theory and charged particle transport phenomena: collision processes, orbit theory, kinetic theory, Boltzmann transport equation, moment (continuity) equations, magnetohydrodynamics, transport properties. Applications of plasma theory to modeling of dc, rf, and microwave discharges. prereq: instr consent

EE 8620. Advanced Topics in Magnetics. (3 cr.; [max 12 cr.]; Student Option; Periodic Fall) Topics vary according to needs and staff availability. prereq: 5683 or instr consent

EE 8630. Advanced Topics in Electromagnetics. (3 cr. [max 12 cr.]; Student Option;) Topics vary according to needs and staff availability.
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

EE 8660. Seminar: Magnetics. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Current literature, individual assignments.

EE 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; dept consent for 3rd/4th registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

EE 8725. Advanced Power System Analysis and Economics. (3 cr.; Student Option; Periodic Fall) Solving sets of equations that involve large sparse matrices. Sparse matrix storage, ordering schemes, application to power flow, short circuit calculation, optimal power flow, and state estimation. prereq: 4721, CSE grad student or instr consent

EE 8741. Power Electronics in Power Systems. (3 cr.; Student Option; Periodic Fall) Impact of power electronics loads on power quality. Passive and active filters. Active input current wave shaping. HVDC transmission. Static VAR control, energy storage systems. Interconnecting photovoltaic and wind generators. Static phase shifters and circuit breakers for flexible AC transmission (FACTS). prereq: 4741, IT grad student or instr consent

EE 8744. Modeling, Analysis, and Control of Renewable Energy Systems. (3 cr.; Student Option; Every Fall) The electrical power system has been widely recognized as the most important engineering achievement of the 20th century. High power quality and availability are maintained in the bulk power system mainly by enforcing hierarchical operational practices, central decision making, and topological redundancy. However, this status quo is being challenged by changing generation, consumption and operational landscapes. Particularly, increased renewable generation, supply scarcity, the impetus to improve resiliency to extenuating weather impacts, and expanding electricity access call for the development of transformative architectural and operational paradigms. Recognizing these developments, this course will present enabling modeling, analysis, and control methods that will be integral to architect next-generation renewable-based power systems. These methods will be developed adopting a bottom-up approach by leveraging recent theoretical advances in circuit theory, nonlinear systems, complex networks, and stochastic processes.

EE 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

EE 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) Thesis credit.

EE 8920. Teaching Experience in Electrical and Computer Engineering. (1 cr. [max 3 cr.]; S-N only; Every Spring) Coteach class under guidance of faculty mentor. Students directly teach approximately half of the classes. Feedback to improve teaching effectiveness. Meet regularly with peers and instructor to discuss teaching concerns/issues. prereq: PhD candidate in electrical engineering, passed written preliminary exam

EE 8925. Ethics in Electrical and Computer Engineering. (1 cr.; S-N only; Every Fall) Topics on issues such as data integrity, professional conduct, authorship, plagiarism, patents, copyrights, conflicts, and disclosures. Students study cases, present findings, and write report. prereq: Grad student in electrical engineering

EE 8940. Special Investigations. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Studies of approved theoretical or experimental topics. prereq: 1-3 cr [may be repeated for cr]; IT grad student or instr consent

EE 8950. Advanced Topics in Electrical and Computer Engineering. (1-3 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Topics vary according to needs and staff availability. prereq: Cr ar [may be repeated for cr]; instr consent

EE 8965. Plan C Project I. (3 cr.; Student Option; Every Fall, Spring & Summer) Project topics arranged between student and adviser. Written reports. prereq: Grad EE major

EE 8967. Plan C Project II. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Project topics arranged between student and adviser. Written reports. prereq: EE grad student

EE 8970. Graduate Seminar I. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall) Recent developments in electrical engineering, related disciplines. prereq: Grad student

EE 8980. Graduate Seminar II. (1 cr. [max 3 cr.]; S-N or Audit; Every Spring) Recent developments in electrical engineering, related disciplines.

Endodontics (ENDO)


ENDO 5304. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Fall & Summer) Diagnosis/treatment of clinical cases. Complex cases, new/unique techniques.

ENDO 5305. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Fall) Diagnosis/treatment of clinical cases. Complex cases, new techniques. prereq: 5304
ENDO 5306. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Spring) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5307. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Summer) Diagnosis/treatment of clinical cases. Complex cases, new techniques. prereq: 5306

ENDO 5308. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Fall) Diagnosis/treatment of clinical cases. Complex cases, new techniques. prereq: 5307, dept consent

ENDO 5309. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Spring) Diagnosis/treatment of clinical cases. Complex cases, new techniques. prereq: 5308

ENDO 5310. Advanced Clinical Endodontics. (1-6 cr.; A-F or Audit; Every Summer) Diagnosis/treatment of clinical cases. Complex cases, new techniques. prereq: 5309

ENDO 5311. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Summer) Each student is assigned weekly periods (8 hours/week) and is responsible for all emergencies in the endodontic clinic during this time. prereq: dept consent

ENDO 5312. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Fall) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5311

ENDO 5313. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Spring) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5312

ENDO 5314. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Summer) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5313

ENDO 5315. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Fall) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5314, dept consent

ENDO 5316. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Spring) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5315

ENDO 5317. Advanced Endodontic Emergency. (1 cr.; S-N or Audit; Every Summer) Students assigned 8 hrs/wk), are responsible for emergencies in clinic. prereq: 5316

ENDO 5329. Clinical Seminar I. (1 cr.; A-F or Audit; Every Fall) Oral/visual presentation of endodontic cases with follow up. Presentation of surgery cases before surgery. prereq: dept consent

ENDO 5330. Review of Cases. (1-2 cr.; A-F or Audit; Every Spring & Summer) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery. prereq: 5329

ENDO 5331. Review of Cases. (1 cr.; A-F or Audit; Every Fall) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery. prereq: 5330

ENDO 5332. Review of cases. (1 cr.; A-F or Audit; Every Spring) Oral and visual presentation of endodontic cases with follow up. Presentations of surgery cases before surgeries. prereq: dept consent

ENDO 5400. Advanced Endodontics for the General Dentist. (1 cr.; S-N or Audit; Periodic Fall & Spring) Advanced diagnosis/treatment of endodontics in clinic/office setting. Internship. prereq: dept consent


ENDO 8001. Research in Endodontics. (1-2 cr.; Student Option; Every Fall) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis. prereq: dept consent

ENDO 8002. Research in Endodontics. (1-2 cr.; Student Option; Every Spring & Summer) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis. prereq: dept consent

ENDO 8004. Research in Endodontics. (1-2 cr.; Student Option; Every Fall) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis. prereq: dept consent

ENDO 8005. Research in Endodontics. (1-2 cr.; A-F only; Every Spring) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis. prereq: dept consent

ENDO 8310. Literature Review. (2 cr.; A-F or Audit; Every Fall) Critical review of classic and current endodontic literature. prereq: dept consent

ENDO 8311. Literature Review. (2 cr.; A-F or Audit; Every Spring & Summer) Critical review of classic/current endodontic literature. prereq: 8310

ENDO 8312. Literature Review. (2 cr.; A-F or Audit; Every Fall) Critical review of classic/current endodontic literature. prereq: 8311

ENDO 8313. Literature Review. (2 cr.; A-F or Audit; Every Spring) Critical review of classic/current endodontic literature. prereq: 8312

ENDO 8320. Advanced Endodontic Lecture. (1 cr.; A-F or Audit; Every Fall) Pulpal and periapical pathology, diagnosis, and treatment planning. prereq: dept consent

ENDO 8321. Advanced Endodontic Lecture. (1 cr.; A-F or Audit; Every Spring & Summer) Pulpal/periapical pathology, diagnosis, treatment planning. prereq: 8320

ENDO 8322. Advanced Endodontic Lecture. (1 cr.; A-F or Audit; Every Fall) Pulpal/periapical pathology, diagnosis, treatment planning. prereq: 8321

ENDO 8323. Advanced Endodontic Lecture. (1 cr.; A-F or Audit; Every Spring) Pulpal/periapical pathology, diagnosis, treatment planning. prereq: 8322

ENDO 8335. Endodontics/Periodontics Seminar. (1 cr.; S-N or Audit; Every Spring) Discussions of endo-perio problems. prereq: dept consent

English as a Second Language (ESL)

ESL 5006. English for Business Interactions. (2 cr. [max 4 cr.]; Student Option; Every Fall & Spring) Designed for high-intermediate to advanced non-native speakers of English who are currently business majors or in closely related major. Writing for business communication, self-editing skills, communication styles, presentations, telephone communication. prereq: Grad, non-native English speaker

ESL 5008. Speaking for Professional Settings. (2 cr.; Student Option; Every Fall & Spring) This course is designed for graduate students who are non-native speakers of English seeking to improve their English speaking skills for professional contexts. The course assumes that students already have a high level of proficiency in English; this course will help students refine their skills for specific professional situations. The course covers topics such as small talk, networking, interviewing, and presentation skills. Students will increase their confidence to communicate in a variety of settings including informal exchanges, career fairs, conference presentations, and job interviews. prereq: Graduate student

ESL 5302. Academic Writing. (4 cr. [max 8 cr.]; Student Option; Every Fall & Spring) This four credit course is designed for graduate students for whom English is not a native language. This course focuses on foundational writing skills and emphasizes the writing process - developing ideas, drafting, revising, and editing. Guided textual analyses of readings are used to develop writing skills through the close examination of strategies employed by accomplished writers. Through ongoing, active participation, students learn...
to (1) match writing to audience and purpose, 
(2) produce different genres of academic writing, (3) incorporate source material into writing, and (4) critique their writing and that of others. Emphasis is on basic writing skills culminate in students’ ability to transfer acquired skills into discipline-specific writing.

Through development of personal voice and an appreciation for the importance of the credibility of the writer, students also learn to recognize and avoid plagiarism. Problems with sentence structure, lexical grammar, and diction are addressed individually.

ESL 5900. Special Topics in English Language. (1-5 cr. max 15 cr.; Student Option; Periodic Fall, Spring & Summer)
Topics vary. prereq: Non-native speaker of English

English: Literature (ENGL)

ENGL 5001. Ph.D. Colloquium: Introduction to Literary Theory and Literary Studies in the Modern University. (3 cr.; Student Option; Every Spring)
Where and what is literary study vis-à-vis the history of the discipline, of the humanities, and of the university—all in the context of a graduate education. Literary theory focusing on key theoretical works that address the discipline, the humanities, and the university.

ENGL 5020. Studies in Narrative. (3 cr. max 6 cr.; Student Option; Periodic Fall & Spring)
Examine issues related to reading and understanding narrative in a variety of interpretive contexts. Topics may include "The 19th- century English (American, Anglophone) Novel," "Introduction to Narrative," or "Techniques of the Novel." Topics specified in the Class Schedule.

ENGL 5040. Theories of Film. (3 cr. max 9 cr.; Student Option; Periodic Fall)
Advanced topics regarding film in a variety of interpretive contexts, from the range and historic development of American, English, and Anglophone film (e.g., "Fascism and Film," "Queer Cinemas"). Topics and viewing times announced in Class Schedule. prereq: Grad student or instr consent

ENGL 5090. Readings in Special Subjects. (1-4 cr. max 12 cr.; Student Option; Every Fall & Spring)
General background preparation for advanced study. Diverse selection of literatures written in English, usually bridging national cultures and time periods. Readings specified in Class Schedule.

ENGL 5110. Medieval Literatures and Cultures: Intro to Medieval Studies. (3 cr. max 9 cr.; Student Option; Every Spring)
Major and representative works of the Middle Ages. Topics specified in the Class Schedule.

ENGL 5121. Readings in Early Modern Literature and Culture. (3 cr. max 9 cr.; Student Option; Periodic Fall & Spring)
Topics readings in early modern poetry, prose, fiction, and drama. Attention to relevant scholarship or criticism. Preparation for work in other courses or seminars. prereq: Grad student or instr consent

ENGL 5140. Readings in 18th Century Literature and Culture. (3 cr.; Student Option; Every Spring)
Literature written in English, 1660-1798. Topics may include British literature of Reformation and 18th century, 18th-century American literature, a genre (e.g., 18th-century novel). prereq: Grad student or instr consent

ENGL 5150. Readings in 19th-Century Literature and Culture. (3 cr. max 9 cr.; Student Option; Periodic Fall, Spring & Summer)
Topics may include British Romantic or Victorian literatures. American literature, important writers from a particular literary school, a genre (e.g., the novel). Readings.

ENGL 5170. Readings in 20th-Century Literature and Culture. (3 cr. max 9 cr.; Student Option; Periodic Fall) British, Irish, or American literatures, or topics involving literatures of two nations. Focuses either on a few important writers from a particular literary school or on a genre (e.g., drama). Topics specified in Class Schedule.

ENGL 5300. Readings in American Minority Literature. (3 cr. max 9 cr.; Student Option; Every Fall)
Contextual readings of 19th-20th-century American minority writers. Topics specified in Class Schedule.

ENGL 5501. Origins of Cultural Studies. (3 cr.; Student Option; Periodic Fall & Spring)
Intellectual map of the creation of cultural studies as a unique approach to studying social meanings. Key figures and concepts, including nineteenth- and early twentieth century precursors.

ENGL 5510. Readings in Criticism and Theory. (3 cr. max 9 cr.; Student Option; Spring Odd Year)

ENGL 5593. The African-American Novel. (3 cr.; Student Option; Every Fall)

ENGL 5597. Seminar: Harlem Renaissance. (3 cr.; Student Option; Every Fall & Spring)
Multidisciplinary review of Jazz Age’s Harlem Renaissance: literature, popular culture, visual arts, political journalism, major black writers/figures. prereq: Grad student or instr consent

ENGL 5701. Great River Review. (4 cr.; Student Option; Every Spring)
Students will be assigned roles, both editorial and managerial, to assist in production of The Great River Review journal. They will explore and present on the history of the small magazine in American literature and meet with Twin Cities publishing professionals.

ENGL 5743. History of Rhetoric and Writing. (3 cr.; Student Option; Periodic Fall & Spring)
Assumptions of classical/contemporary rhetorical theory, especially as they influence interdisciplinary field of composition studies. prereq: Grad student or instr consent

ENGL 5790. Topics in Rhetoric, Composition, and Language. (3 cr. max 9 cr.; Student Option; Periodic Fall & Spring)
Topics specified in Class Schedule. prereq: Grad student or instr consent

ENGL 5800. Practicum in the Teaching of English. (1-3 cr.; Student Option; Every Fall)
Discussion of and practice in recitation, lecture, small-groups, tutoring, individual conferences, and evaluation of writing/reading. Emphasizes theory informing effective course design/teaching for different disciplinary goals. Topics vary. See Class Schedule. prereq: Grad student or instr consent

ENGL 5805. Writing for Publication. (3 cr.; Student Option; Fall Even Year)
Conference presentations, book reviews, revision of seminar papers for journal publication, and preparation of a scholarly monograph. Style, goals, and policies of journal and university press editors/readers. Electronic publication. Professional concerns. prereq: Grad student or instr consent

ENGL 5992. Directed Readings, Study, or Research. (1-3 cr. max 45 cr.; Student Option; Every Fall, Spring & Summer)
TBD Prereq: Grad student or instr consent.

ENGL 8090. Seminar in Special Subjects. (3 cr. max 12 cr.; Student Option; Every Fall)
Sample topics; literature of World War II, writings of the Holocaust, literature of English Civil War, advanced versification.

ENGL 8110. Seminar: Medieval Literature and Culture. (3 cr. max 12 cr.; Student Option; Periodic Fall & Spring)
Sample topics: Chaucer; "Piers Plowman"; Middle English literature, 1300-1475; medieval literary theory; literature/class in 14th-century; texts/heresies in late Middle Ages.

ENGL 8120. Seminar in Early Modern Literature and Culture. (3 cr. max 12 cr.; A-F or Audit; Every Fall & Spring)
British writers/topics, from Reformation to French Revolution. In first half of period (which divides at 1640), a typical topic is Spenser and epic tradition; in second half, women historians before Wollstonecraft.

ENGL 8140. Seminar in 18th Century Literature and Culture. (3 cr. max 12 cr.; Student Option; Periodic Fall & Spring)
Advanced study of literature written in English, 1660-1798. Topics may include British literature of Reformation and 18th century, 18th-century American literature, a genre (e.g.,
18th-century novel), prereq: Grad student or instr consent

ENGL 8150. Seminar in Shakespeare.  (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Perspectives/works vary with offering and instructor. Recent topics include Global Shakespeare, Shakespearian Comedy, and Shakespeare and Performance.

ENGL 8170. Seminar in 19th-Century British Literature and Culture.  (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)

ENGL 8180. Seminar in 20th-Century British Literature and Culture.  (3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall)
Sample topics: modernism, Bloomsbury Group, working-class/immigrant literature. Topics specified in Class Schedule.

ENGL 8190. Seminar in 20th-Century Anglophone Literatures and Cultures.  (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Topics in Anglophone literatures of Canada, Africa, the Caribbean, India and Pakistan, and the Pacific. Sample topics: Stuart Hall and Black Britain; Salman Rushdie and cosmopolitan literatures; national literatures and partitioned states. Topics specified in Class Schedule.

ENGL 8200. Seminar in American Literature.  (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)

ENGL 8290. Topics, Figures, and Themes in American Literature.  (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)

ENGL 8300. Seminar in American Minority Literature.  (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Sample topics: Harlem Renaissance, ethnic autobiographies, Black Arts movement. Topics specified in Class Schedule.

ENGL 8333. FTE: Master's.  (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
Sample topics: Harriet Jacobs, Margaret Walker, and other African-American women writers. Topics specified in Class Schedule.

ENGL 8400. Seminar in Post-Colonial Literature, Culture, and Theory.  (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Sample topics: Marxism and nationalism; modern India; feminism and decolonization; "the Empire Writes Back"; Islam and the West. Topics specified in Class Schedule.

ENGL 8444. FTE: Doctoral.  (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
FTE Doctoral credits

ENGL 8510. Studies in Criticism and Theory.  (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Developments within critical theory that have affected literary criticism, by altering conceptions of its object ("literature") or by challenging conceptions of critical practice. Topics specified in Class Schedule.

ENGL 8520. Seminar: Cultural Theory and Practice.  (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Sample topics: semiotics applied to perspective paintings, numbers, and money; analysis of a particular set of cultural practices by applying various theories to them. Topics specified in Class Schedule.

ENGL 8530. Seminar in Feminist Criticism.  (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Brief history of feminist criticism, in-depth treatment of contemporary perspectives/issues. Topics specified in Class Schedule.

ENGL 8600. Seminar in Language, Rhetoric, Literature, and Composition.  (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)

ENGL 8625. Dissertation Seminar: Preparing the Book List and Prospectus.  (2 cr.; Student Option; Every Spring)
Assembling book list, defining field of study, and articulating a rationale for list. How to conceptualize/develop dissertation prospectus. Students work with faculty instructor, advising committee, and peer writing group. Prereq: English PhD student in (3rd or 4th yr); at least 12 cr completed

ENGL 8626. Dissertation Seminar: Writing the Dissertation.  (2 cr.; Student Option; Every Spring)
Conceptualizing dissertation (using model of Graduate School doctoral Dissertation Fellowship application). Producing dissertation draft chapter/proposal. Students work with instructor, advising committees, and peer writing groups. Prereq: English PhD student, passed prelim exam

ENGL 8666. Doctoral Pre-Thesis Credits.  (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Doctoral Pre-Thesis Credits prerequisite: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ENGL 8888. Thesis Credit: Doctoral.  (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

ENGL 8992. Directed Reading in Language, Literature, Culture, Rhetoric, Composition, or Creative Writing.  (1-9 cr. [max 15 cr.]; Student Option; Every Fall & Spring)
Directed Reading in Language, Literature, Culture, Rhetoric, Composition, or Creative Writing prerequisite: student consent, dept consent
by pivotal 20th-century writers such as John Hersey, Joseph Mitchell, Lillian Ross, Michael Herr, Norman Mailer, Gay Talese, Joan Didion, Tom Wolfe, and Hunter S. Thompson, and will trace how their pioneering methods influenced contemporary journalism as well as the documentary films of Errol Morris and contemporary nonfiction writers expanding into new forms.

**ENGW 5701. Great River Review.** (4 cr.; Student Option; Every Spring)
Students will be assigned roles, both editorial and managerial, to assist in production of The Great River Review journal. They will explore and present on the history of the small magazine in American literature and meet with Twin Cities publishing professionals.

**ENGW 5993. Directed Study in Writing.** (1-4 cr. [max 18 cr.]; Student Option; Every Spring & Summer)
Projects in writing poetry, fiction, drama, and nonfiction, or study of ways to improve writing. Prereq: instr consent, dept consent, college consent.

**ENGW 8101. Reading Across Genres.** (4 cr.; Student Option No Audit; Every Fall)
Contemporary writing in fiction, poetry, creative nonfiction. Primarily reading course rather than writing course. Prereq: Students may not audit this course.

**ENGW 8110. Seminar: Writing of Fiction.** (4 cr. [max 16 cr.]; Student Option; Every Spring)
Focuses on full-length book (e.g., novel, short story collection). Assignments in common. Individual project. Prereq: dept consent.

**ENGW 8120. Seminar: Writing of Poetry.** (4 cr. [max 8 cr.]; Student Option; Every Spring)
Focuses on exploration and practice of various styles. Assignments in common and individual project. Prereq: dept consent.

**ENGW 8130. Seminar: Writing of Literary Nonfiction.** (4 cr. [max 8 cr.]; Student Option; Every Fall & Spring)
Advanced workshop. Assignments in common and individual projects. Prereq: dept consent.

**ENGW 8140. Thesis Seminar: Poetry.** (4 cr. [max 8 cr.]; Student Option; Every Fall)
For students working on their creative project. Prereq: Creative writing MFA student, instr consent.

**ENGW 8150. Thesis Seminar: Fiction.** (4 cr. [max 8 cr.]; Student Option; Every Fall)
Students work on creative project. Prereq: Creative writing MFA student, instr consent.

**ENGW 8160. Thesis Seminar: Nonfiction.** (4 cr. [max 8 cr.]; Student Option; Every Fall)
Students work on their creative project. Prereq: Creative writing MFA student, instr consent.

**ENGW 8170. MFA Practicum: EngW 1101W.** (1-3 cr.; S-N only; Every Fall & Spring)
Teaching Practicum for Teaching Assistants assigned to EngW 1101W. Prereq: Creative writing MFA student, instr consent.

**ENGW 8180. Thesis Seminar: Multi-Genre.** (4 cr.; A-F only; Every Fall)
Thesis preparation course for advanced graduate students in the creative writing MFA program. Prereq: MFA creative writing program grad student.

**ENGW 8310. Topics in Creative Writing.** (2-8 cr. [max 8 cr.]; Student Option; Periodic Fall & Spring)
Special topics in fiction, literary nonfiction, poetry. Topics specified in Class Schedule. Prereq: [English or creative writing] grad major or dept consent.

**ENGW 8333. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
No description. Prereq: Master’s student, adviser and DGS consent.

**ENGW 8990. MFA Creative Thesis.** (2-8 cr. [max 48 cr.]; Student Option; Every Fall, Spring & Summer)
For students working on their creative project. Prereq: 8140, 8150, 8160, creative writing MFA student, instr consent.

**Entomology (ENT)**

**ENT 5011. Insect Structure and Function.** (4 cr.; A-F or Audit; Every Spring)
Comparative study of insect structures/functions from evolutionary perspective. Introduction to physiology of digestion, respiration, other organ systems.

**ENT 5021. Insect Biodiversity and Evolution.** (4 cr.; Student Option; Every Fall)

**ENT 5025. Field Methods in Insect Taxonomy.** (1 cr.; Student Option; Fall Odd Year)

**ENT 5041. Insect Ecology.** (3 cr.; Student Option; Fall Even Year)
Synthetic analysis of the causes of insect diversity and of fluctuations in insect abundance. Focus on abiotic, biotic, and evolutionary mechanisms influencing insect populations and communities. Prereq: Biol 5041 or EEB 5122 or instr consent.

**ENT 5051. Scientific Illustration of Insects.** (3 cr.; Student Option; Spring Even Year)

**ENT 5061. Insect Molecular Science.** (2 cr.; Student Option; Periodic Fall & Spring)
Molecular genetic techniques and their applications. Emphasizes insect species other than Drosophila. Application of genetic techniques to physiological processes. Prereq: [5011, basic genetics course] or instr consent.

**ENT 5081. Insects, Aquatic Habitats, and Pollution.** (3 cr.; A-F or Audit; Every Fall)

**ENT 5121. Applied Experimental Design.** (4 cr.; Student Option; Periodic Fall)
Principles of sampling methodologies, experimental design, and statistical analyses. Methods/procedures in generating scientific hypotheses. Organizing, initiating, conducting, and analyzing scientific experiments. Using experimental designs and statistical procedures. Offered with AGRO 5121. Prereq: Stat 5021 or equiv or instr consent.

**ENT 5126. Spatial and Temporal Analysis of Ecological Data.** (3 cr. [max 6 cr.]; A-F or Audit; Spring Even Year)
This course covers linear models (regression and ANOVA) and extensions to temporal data and spatial point processes, lattice/areal data, and geostatistics. The course bridges sufficient theory to understand why contending with spatiotemporal dependence is important with enough application to make students confident in their own data analyses.

**ENT 5275. Medical Entomology.** (3 cr.; Student Option; Every Fall)
Biological arthropod vectors of human disease. Emphasizes disease transmission and host, vector, and pathogen interactions. Prereq: instr consent.

**ENT 5341. Biological Control of Insects and Weeds.** (3-4 cr.; Student Option; Periodic Spring)
Biological control of arthropod pests and weeds. Analysis of relevant ecological theory and case studies; biological control agents. Lab includes natural enemy identification, short experiments, and computer exercises. Prereq: 3001, Biol 1009, EEB 3001 or grad.

**ENT 5361. Aquatic Insects.** (4 cr.; A-F or Audit; Every Spring)
Taxonomy, natural history of aquatic insects including their importance in aquatic ecology, water resource management, recreation, and conservation. Emphasizes family-level identification of immatures/adults. Field trips scheduled to local aquatic habitats. A collection is required. Prereq: instr consent.

**ENT 5900. Basic Entomology.** (1-6 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
For graduate students who need to make up certain deficiencies in their biological science background. Prereq: instr consent.
ENT 5910. Special Problems in Entomology. (1-6 cr. ; max 10 cr.) ; Student Option; Every Fall & Spring) Individual field, lab, or library studies in various aspects of entomology. prereq: instr consent

ENT 5920. Special Lectures in Entomology. (1-4 cr. ; max 12 cr.) ; S-N only; Every Fall & Spring) Lectures or labs in special fields of entomological research. Given by visiting scholar or regular staff member.

ENT 8006. Supervised Laboratory or Extension Teaching Experience. (1-3 cr. ; A-F or Audit; Every Fall, Spring & Summer) Training/experience conducting lab or extension based educational activities in Entomology. Students select a faculty member to serve as their sponsor, and develop lecture outlines or instructional aids such as web sites, web-based training sites, print materials, demonstration aids, and demonstration projects. Students prepare/conduct lab or extension presentations. Overviews of web-based instructional aids. prereq: 3005 or equiv or instr consent

ENT 8051. Toxicology. (2 cr. ; Student Option; Periodic Fall) Chemistry, mode of action of conventional insecticides. Insect growth regulators, microbial pesticides. Transgenic viruses, genetically modified plants. Offered alternate years. prereq: [5011, [organic, inorganic] chem courses, biochem course] or instr consent

ENT 8061. Scientific Communication and Ethics. (1 cr. ; S-N or Audit; Every Fall) Students develop/use critical elements of scientific communication, within an ethical framework. Elements in writing scientific manuscripts and research proposals. Oral communication for scientific, outreach, and classroom presentations.

ENT 8200. Colloquium in Social Insects. (1-3 cr. ; Student Option; Periodic Spring) Current research on bees, wasps, ants, and termites. Student critiques and research reports. prereq: 3020 or 3200

ENT 8210. Colloquium in Insect Evolution. (1-3 cr. ; Student Option; Periodic Fall) Research issues in systematics and evolution. Comparative biology, biogeography, and molecular evolution. Students may re-enroll as topics alternate. Students critique papers from primary literature. prereq: 5371 or instr consent

ENT 8240. Colloquium in Insect Ecology. (1-2 cr. ; Student Option; Every Fall & Spring) Advanced topics. prereq: 5041 or 5045 or instr consent

ENT 8300. Graduate Seminar. (1-2 cr. ; S-N or Audit; Every Fall & Spring) Oral and written reports on and discussion by students of selected topics from current literature. prereq: instr consent

ENT 8333. FTE: Master’s. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

ENT 8444. FTE: Doctoral. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

ENT 8594. Research in Entomology. (1-16 cr. ; max 96 cr.; S-N or Audit; Every Fall & Spring) Directed research.

ENT 8666. Doctoral Pre-Thesis Credits. (1-6 cr. ; max 12 cr.) ; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr. doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ENT 8777. Thesis Credits: Master’s. (1-18 cr. ; max 50 cr.) ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; minimum of 10 cr required [Plan A only]

ENT 8888. Thesis Credit: Doctoral. (1-24 cr. ; max 100 cr.) ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Entrepreneurship (ENTR)

ENTR 6010. Opportunity Identification and Evaluation. (4 cr. ; A-F only; Periodic Fall) Developing the ability to spot, select, and evaluate business opportunities for new firm startups and corporate ventures. Core concepts, models, guidelines. Acquisition of practical knowledge/skill through direct observation, interaction, and practice. prereq: MBA student

ENTR 6020. Business Formation. (4 cr. ; A-F only; Every Fall & Spring) Business formation from concept development through startup. Business concept, plan, forecast, and budget. Resource markets/assembly. Problems/opportunities from concept stage through establishment of viable business. Cases, exercises, projects, business plans, guest speakers. prereq: MBA student

ENTR 6021. Preparing and Implementing the Business Plan. (2 cr. ; max 4 cr.) ; A-F only; Every Fall & Spring) Students work collaboratively to develop/implement business plans for a business venture, given a business opportunity. Pre/ gossip. Pre/ acquisition. Student teams present aspects of their business plan: “elevator pitch,” company mission, product/service value proposition, market segmentation, competitive analysis, strategy, marketing plan, financial projections. Students comment on each other’s plans. prereq: MBA student

ENTR 6023. Financing Business Ventures. (4 cr. ; A-F only; Every Spring & Summer) Translating a business plan into a financing plan. Developing alternative financing. Choosing a plan, based on financial/ nonfinancial criteria. Types of non-Fortune 1,000-type businesses as financiers view them. U.S. financial institutions: what they finance, their financing criteria. Financing instruments used in the United States, when/why to use them. Cases, exercises, guest speakers. prereq: MBA student

ENTR 6036. Managing the Growing Business. (2 cr. ; A-F only; Every Spring & Summer) Challenges posed by rapid growth/change in independent startups. Infrastructure development, radical changes in strategy, continuous needs for substantial additional resources. Emphasizes analysis of factors accelerating/impeding growth and review/creation of growth strategies. Integration of concepts from strategy, operations, marketing, finance, and human resource management. prereq: MBA student

ENTR 6037. Corporate Venturing. (2 cr. ; A-F or Audit; Every Fall & Summer) Entrepreneurial role of top management in maintaining/creating stakeholder value through formation/acquisition of new businesses, products, or markets within established corporations. Strategic role of corporate venturing. Cases, guest speakers, group projects. prereq: MBA student

ENTR 6041. Initiating New Product Design and Business Development. (2-4 cr. ; max 10 cr.) ; A-F only; Every Fall & Spring) Product development projects sponsored by business organizations. Supervision by faculty adviser/executives from sponsoring company. Lectures, workshops, guest speakers, team meetings, company visits, projects. prereq: MBA student

ENTR 6042. Implementing New Product Design and Business Development. (4 cr. ; max 8 cr.) ; A-F only; Every Spring) Implementation of product development projects begun in the Fall term in ENTR 6041. Projects are sponsored by businesses. Supervision by faculty advisors and sponsoring executives. Lectures, workshops, guest speakers, team meetings, company visits, and projects. prereq: MBA student

ENTR 6080. Technology Commercialization for Scientists and Engineers. (1-2 cr. ; S-N or Audit; Periodic Fall) Theoretical knowledge and real-world examples of skills/knowledge required to commercialize scientific discoveries/engineering inventions. Commercializing technology process, including starting/running a new company. prereq: Registered Ph.D. student in [IT or College of Biological Sciences or College of Agriculture, Food and Environmental Sciences or Medical School], instr consent

assembly. Problems/opportunities from concept stage through establishment of viable business. Cases, exercises, projects, speakers. prereq: CSOM grad student or instr consent


ENTR 6087. New Product Design and Business Development. (6 cr.; A-F only; Periodic Fall, Spring & Summer) Nine month project course in designing new products and business plans through prototype stage. Teams of CSOM and CSE students work with personnel from sponsoring organizations. Weekly lectures and team meetings. Formal design reviews and presentations. prereq: Grad student in CSOM or CSE or instr consent

ENTR 6089. Research Seminar in Entrepreneurial Studies. (1 cr.; A-F only; Periodic Fall) Research into populations of individual new and growing businesses. Evaluation of existing studies, development of research questions; selection of research methods, information collection and analysis. Final report suitable for publication. prereq: Grad student in CSOM or instr consent

ENTR 6090. Topics in Entrepreneurship. (2-4 cr. (max 8 cr.); A-F only; Every Fall & Spring) Selected topics in value creation; in business formation, growth, restructuring; in social and economic impact of new businesses, and entrepreneurship and public policy. prereq: CSOM grad student or instr consent

ESPM 5015. Invasive Plants and Animals. (3 cr.; Student Option; Fall Odd Year) Overview of invasive plants/animals in North America and around the world. A range of taxa are covered along with their impact and approaches to control. Readings, discussions, and lectures from experts on topics such as invasion theory and real-world management.

ESPM 5031. Applied Global Positioning Systems for Geographic Information Systems. (3 cr.; A-F or Audit; Every Spring) GPS principles, operations, techniques to improve accuracy. Datum, projections, and coordinate systems. Differential correction, accuracy assessments discussed/applied in lab exercises. Code/carryer phase GPS used in exercises. GPS handheld units, PDA based ArcPad/GPS equipment. Transferring field data to/from desktop systems, integrating GIS data with GPS. prereq: Grad student or instr consent

ESPM 5061. Water Quality and Natural Resources. (3 cr.; Student Option; Every Fall & Spring) Recent literature in field. Complements 4061. Ecology of aquatic ecosystems, how they are valuable to society and changed by landscape management. Case studies, impaired waters, TMDL process, student engagement in simulating water quality decision making.

ESPM 5071. Ecological Restoration. (3 cr.; Student Option; Every Fall) Ecological/physiological concepts for revegetation of grasslands, wetlands, forests, and landscapes. Plant selection, plant establishment/evaluation. State/federal programs that administer restoration/reclamation. Field trips. prereq: [One college course in ecology, one college course in [plant science or botany]] or instr consent

ESPM 5102. Managing International Natural Resources Programs and Projects: Forests, Water and Land Use. (3 cr.; A-F only; Every Spring) Global hot spots where biodiversity is threatened by multiple stressors (zoonotic disease, rapid growth, opening of new frontiers, climate change). Strategies to address complex situations. Emphasis on learning interdisciplinary applied skills, management practices, hands-on techniques.

ESPM 5108. Ecology of Managed Systems. (4 cr.; A-F or Audit; Every Fall) Analysis of functioning of ecosystems primarily structured by managed plant communities. Managed forests, field-crop agroecosystems, rangelands, aquatic systems. Structure-function relations. Roles of biodiversity in productivity, resource-use efficiency, nutrient cycling, resilience. Emerging principles for design of sustainable managed ecosystems, provision of ecological services. prereq: Sr or grad student

ESPM 5111. Hydrology and Water Quality Field Methods. (3 cr.; A-F or Audit; Every Spring) Integrates water quality, surface/groundwater hydrology. Case studies, hands-on field data collection, calculations of hydrological/water quality parameters. Meteorological data, snow hydrology, stream gauging, well monitoring, automatic water samplers. Designing water quality sampling program. Geomorphology, interception, infiltration. prereq: Grad student or instr consent


ESPM 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3 cr.; Student Option; Every Spring) Introduction to survey, measurement, and modeling concepts/methods for study of natural resources and environmental issues. Emphasizes survey design for data collection, estimation, and analysis for issues encompassing land, water, air, vegetation, animal, soil, and human/social variables.

ESPM 5241. Natural Resource and Environmental Policy. (3 cr.; Student Option; Every Spring) Political processes at play in management of environment and how disagreements are addressed by different stakeholders, private-sector interests, government agencies and institutions, communities, and nonprofit organizations. prereq: Grad student or instr consent

ESPM 5242. Methods for Environmental and Natural Resource Policy Analysis. (3 cr.; A-F only; Fall Even Year) Methods, formal and informal, for analyzing environmental and natural resource policies. How to critically evaluate policies, using economic and non-economic decision-making criteria. Application of policy analysis principles/concepts to environmental/natural resource problems. Recognizing politically-charged environment in which decisions over use, management, and protection of these resources often occur. prereq: grad student

ESPM 5245. Sustainable Land Use Planning and Policy. (3 cr.; A-F or Audit; Every Fall) Planning theories, concepts, and constructs. Policies, processes, and tools for sustainable land use planning. Scientific/technical literature related to land use planning. Skills needed to participate in sustainable land use planning.

ESPM 5251. Natural Resources in Sustainable International Development. (3 cr.; A-F or Audit; Every Fall) International perspectives on resource use in developing countries. Integration of natural resource issues with social, economic, and policy considerations. Agriculture, forestry, agriculture, non-timber forest products, water resources, certification, development issues. Latin American case studies. prereq: Grad student or instr consent

ESPM 5256. Natural Resource Law and the Management of Public Lands and Waters. (3 cr.; A-F or Audit; Spring Odd Year) This course is intended to provide non-law students with an understanding of the role of the judiciary in the management of public lands and public waters. The course will examine Constitutional provisions affecting the management of public resources, the concept of property rights, major principles of water law, the role of the legal system in environmental review, the scope of legal authority granted to administrative agencies, and limitations of private property rights to protect public lands and public waters. The class will introduce students to the concepts of legal reasoning including case synthesis and analysis. The class will be taught using a combination of lecture, guest lectures, written exercises and class participation. prereq: grad student

ESPM 5261. Economics and Natural Resources Management. (4 cr.; A-F or Audit; Every Spring)

ESPM 5295. GIS in Environmental Science and Management. (4 cr.; A-F or Audit; Every Fall)
Application of geographic information science and technologies (GIS) in complex environmental problems. Students gain experience in spatial data collection, database development, and spatial analysis, including GNSS and field attribute collection, image interpretation, and existing data fusion, raster/vector data integration and analysis, information extraction from LIDAR data, DEM conditioning and hydrologic analysis, neighborhood analysis, bulk processing and automation, and scripting. Problems vary depending on topics, often with extra-University partners. *Please note that students should have completed a semester-long, introductory lab/lecture GIS course at the graduate or undergraduate level before enrolling in this course, e.g., FNRM 5131. We do not require any given course because students come from varied universities and backgrounds. That said, we assume a knowledge commensurate with a comprehensive introductory course. Students seeking a first course are directed to FNRM 5131. If you have questions regarding your capabilities, please contact the instructor prior to enrolling.

ESPM 5402. Biometeorology. (3 cr.; Student Option; Fall Even Year)
This course examines the interactions between the atmosphere and the Earth’s surface. We will discuss the principles of the surface energy and radiation balance, air motion in the atmospheric boundary layer, land surface parameterization for climate models, boundary layer budgets, and field research methods. The course aims to achieve exemplary learning through hands-on activities and examining recent field studies conducted in natural and managed ecosystems. prereq: MATH 1271, PHYS 1201, STAT 3011, [instructor consent]

ESPM 5480. Topics in Natural Resources. (1-4 cr.; max 6 cr.; Student Option; Every Fall, Spring & Summer)
Lectures by visiting scholar or regular staff member. Topics specified in class schedule.

ESPM 5555. Wetland Soils. (3 cr.; A-F or Audit; Every Fall)
Morphology, chemistry, hydrology, formation of mineral/organic soils in wet environments. Soil morphological indicators of wet conditions, field techniques of identifying hydric soils for wetland delineations. Peatlands. Wetland benefits, preservation, regulation, mitigation. Field trips, lab, field hydric soil delineation project. prereq: SOIL 1125 or 2125 or equiv or instr consent; concurrent registration is required (or allowed) in SOIL 4511 recommended

ESPM 5575. Wetlands. (3 cr.; Student Option; Every Spring)
Freshwater wetland classification, wetland biota, current/historic status of wetlands, value of wetlands. National, regional, Minnesota wetlands conservation strategies. Ecological principles used in wetland management. prereq: 3575, [or grad student or instr consent]

ESPM 5601. Principles of Waste Management. (3 cr.; A-F or Audit; Every Spring)

ESPM 5602. Regulations and Corporate Environmental Management. (3 cr.; A-F only; Every Spring)
Concepts, major issues relating to industrial ecology and industry as they are influenced by current standards/regulations at local, state, and national levels. prereq: APEC 1101 or ECON 1101

ESPM 5603. Environmental Life Cycle Analysis. (3 cr.; A-F only; Every Fall)
Concepts, major issues relating to inventory and subsequent analysis of production systems. Production system from holistic point of view, using term commonly used in industrial ecology: "the metabolic system." prereq: Math 1142 or [Math 1271, Math 1282], Econ 1101 or ApEc 1101

ESPM 5604. Environmental Management Systems and Strategy. (3 cr.; A-F only; Every Fall)
Environmental problems such as climate change, ozone depletion, and loss of biodiversity.

ESPM 5605. Recycling: Extending Raw Materials Supplies. (3 cr.; A-F only; Every Spring)

ESPM 5607. Industrial Biotechnology and the Environment. (3 cr.; A-F only; Every Spring)
Biotechnology pertaining to biobased products development and their environmental impact. prereq: BIOL 1009, CHEM 1021

ESPM 5703. Agroforestry in Watershed Management. (3 cr.; Student Option; Spring Even Year)
Biological, physical, and environmental attributes of agroforestry as pertains to watershed management. Coupling production with watershed protection benefits. Implications for policy, economics, and human dimensions in sustainable development. Examples/case studies from North America and developing countries. prereq: Grad student or instr consent

ESPM 5811. Environmental Interpretation. (3 cr.; A-F or Audit; Every Spring)

Experimental and Clinical Phar (ECP)

ECP 5220. Regulatory Issues in Drug Research. (2 cr.; Student Option; Every Fall)
Regulatory issues explored in conducting drug research trials. Performing different aspects of clinical trials. Lectures, readings, small group discussions, homework assignments. prereq: ECP grad student or Pharm.D. professional student or instr consent

ECP 5290. Clinical Clerkship. (1-8 cr.; max 16 cr.; Student Option; Every Fall)
Supervised study of pharmaceutical services at University of Minnesota Medical Center, Fairview or affiliated institutions. prereq: Grad experimental and clinical pharmacology

ECP 5620. Drug Metabolism and Disposition. (3 cr.; A-F or Audit; Spring Even Year)
Oxidative/conjugative enzymes systems involved in human drug metabolism/disposition. Various in vitro models used to evaluate drug metabolism or chemical entity, pros/cons of each. Factors involved in conducting in vivo studies. Components used to predict in vivo drug disposition from in vivo studies. prereq: Grad student or instr consent

ECP 5993. Directed Study in Experimental and Clinical Pharmacology. (1-4 cr.; max 8 cr.; Student Option; Every Fall & Spring)
Student working with faculty member designs a directed study course, including a complete syllabus, appropriate time commitment, and workload for number of credits.

ECP 5994. Directed Research in Experimental and Clinical Pharmacology. (1-4 cr.; Student Option; Every Fall & Spring)
Student works with faculty adviser to design a scientific research project.

ECP 8100. Seminar. (1-2 cr.; max 16 cr.; Student Option; Every Fall & Spring)
Selected topics in experimental/clinical pharmacology. prereq: ECP grad student or instr consent

ECP 8200. Research Problems. (1-8 cr.; max 16 cr.; Student Option; Every Fall, Spring & Summer)
Individually designed research experience directed at contemporary problems related to drug use. prereq: Grad SACP major (ECP Track) or instr consent

ECP 8210. Clinical Therapeutics. (3 cr.; Student Option; Periodic Fall)
Topics in clinical pharmacology that illustrate continuum of pathophysiology of a disease...
This course will develop computer skills to apply nonlinear regression models to describe the pharmacokinetics and pharmacodynamics of biologics. Prerequisite: A course in basic pharmacokinetics; enrollment in the Experimental & Clinical Pharmacology or Pharmaceutics graduate program, or instructor consent.

ECP 8444. FTE: Doctoral. (1 cr; No Grade Associated; Every Fall, Spring & Summer) FTE: doctoral. Prerequisite: Doctoral student, advisor, and DGS consent.

ECP 8666. Doctoral Pre-Thesis Credits. (1-6 cr; [max 12 cr]; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits, prerequisite: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2005 may register up to four times, up to 60 combined cr.

ECP 8777. Thesis Credits: Master's. (1-18 cr; [max 50 cr]; No Grade Associated; Every Fall, Spring & Summer) Thesis credits: master's, prerequisite: Max 18 cr per semester or summer; 10 cr total required [Plan A only].

ECP 8888. Thesis Credit: Doctoral. (1-24 cr; [max 100 cr]; No Grade Associated; Every Fall, Spring & Summer) Thesis credit: doctoral, prerequisite: Max 18 cr per semester or summer; 24 cr required.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1-4 cr; [max 8 cr]; Student Option; Every Fall & Spring) Topic varies depending on faculty teaching course. Prerequisite: ECP grad program or instructor consent.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1-4 cr; [max 8 cr]; Student Option; Every Fall & Spring) Instructor consent.

ECP 8993. Directed Study in Experimental and Clinical Pharmacology. (1-6 cr; [max 12 cr]; Student Option; Every Fall & Spring) Instructor consent.

Family Med & Community Health (FMCH)

FMCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (1 cr; A-F or Audit; Summer Even Year) Taken with 5345. Practicum of lecture, demonstration, small-group discussion, clinical teaching, and computer-assisted instruction. Academic ethics, policies, copyright issues, tenure, academic freedom, problem-based learning. Prerequisite: concurrent registration is required (or allowed) in 5345, instructor consent.

FMCH 5564. Family Practice Seminar. (1 cr; [max 9 cr]; O-N or Audit; Every Fall & Spring) Knowledge, skills, and attitudes in biomedical and behavioral sciences that form foundation for academic discipline of family medicine; medical decision making, common problems and procedures, family theory and assessment, clinical pharmacology, human sexuality. Prerequisite: MD or DO degree.

FMCH 5580. Clinical Issues in Human Sexuality. (2 cr; O-N or Audit; Every Fall & Spring) Assisted and treatment techniques pertaining to common sexual problems. Prerequisite: Enrollment in health sci grad programs in CSPP, Psy, PubH, SW or FSoS or instructor consent.

FMCH 5950. Clinical Issues in Human Sexuality. (2 cr; O-N or Audit; Every Fall & Spring) Assisted and treatment techniques pertaining to common sexual problems. Prerequisite: Enrollment in health sci grad programs in CSPP, Psy, PubH, SW or FSoS or instructor consent.

FMCH 7200. Introduction to Residency in Family Medicine. (2 cr; H-N only; Every Fall, Spring & Summer) This 2-week elective is offered at all of the University of Minnesota-affiliated Twin Cities residency programs in Family Medicine, and select other local programs. This elective provides students the opportunity to experience the full spectrum of Family Medicine and Community Health at that program. All efforts will be made to place the student at the program of their choice. The student will work with Family Medicine faculty physicians and residents in all the facets of Family Medicine care including: office, inpatient hospital service, labor and delivery, overnight call, procedures and, where applicable, nursing home rounds or home visits.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Program (RPAP): Pediatrics.

FMCH 7506. Rural Physician Associate Program (RPAP): Pediatrics. (6 cr.; H-N or Audit; Every Fall & Spring) Community-based elective with extensive pediatrics experience in a rural setting. prereq: 7501

FMCH 7507. Rural Physician Associate Program (RPAP): Otolaryngology. (2-4 cr.; P-N or Audit; Every Spring) Community-based elective with extensive otolaryngology experience in a rural setting.

FMCH 7508. Rural Physician Associate Program (RPAP): Urology. (2-4 cr.; P-N or Audit; Every Fall, Spring & Summer) Community-based elective with extensive urology experience in a rural setting.

FMCH 7509. Rural Physician Associate Program (RPAP): Primary Care Clerkship I. (4 cr.; H-N or Audit; Every Fall & Spring) Community-based elective with extensive primary care experience in a rural setting. prereq: 7501

FMCH 7510. Rural Physician Associate Program (RPAP): Primary Care Clerkship II. (4 cr.; H-N or Audit; Every Fall, Spring & Summer) Community-based elective with extensive primary care experience in a rural setting. prereq: 7509

FMCH 7511. Urban Community Ambulatory Medicine (UCAM). (4 cr.; H-N only; Every Fall, Spring & Summer) UCAM provides 12 weeks of ambulatory continuity experience in an underserved urban community Family Medicine Clinic. UCAM expands the Family Medicine Clerkship exposure to patient diversity, low income, multicultural urban medicine, and community health. Students are required to attend the Family Medicine Clerkship/Primary Care Selective seminars as well as 4 UCAM seminars. From a scheduling point of view, UCAM combines the 6 weeks of Family Medicine Clerkship/Primary Care Selective with 4 extra weeks of elective credit. The principles of urban medicine will be blended throughout the 12 weeks, as will the project. Each student will participate in a community health project and complete a journal about his/her experience. The community health project ideally combines the EBM focus of the Family Medicine clerkship project with a longitudinal project. Prereq: FMCH 7600 and FMCH 7700

FMCH 7512. Urban Community Ambulatory Medicine (UCAM). (4 cr.; H-N or Audit; Every Fall, Spring & Summer) Expands primary-care clerkship (PCC) into 16 weeks of primary care experience in one underserved urban clinic. Students attend PCC seminars during first eight weeks, followed by weekly seminars covering patient diversity, indigenous medicine, and community health. prereq: 7511, InMd 5508, InMd 7509

FMCH 7513. Rural Physician Associate Program (RPAP): Orthopaedic SurgeryRSU. (2-4 cr.; P-N or Audit; Periodic Fall & Spring) Community-based elective with extensive orthopaedic surgery experience in a rural setting. prereq: Accepted into RPAP

FMCH 7515. RPAP: Emergency Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) tbd

FMCH 7516. Research in Human Sexuality. (2-4 cr.; [max 8 cr.]; H-N only; Every Fall, Spring & Summer) This elective consists of clinical and/or laboratory research related to human sexuality in areas such as incest, rape, gender dysphoria, compulsive sexual behavior, sex offenses, and sexual dysfunction. It is adaptable to the specific interests of the student and faculty.

FMCH 7518. Inpatient Family Medicine. (2 cr.; H-N only; Every Fall, Spring & Summer) Students will participate in the family medicine residency inpatient teaching service. This service consists of a variety of patients including pediatric, obstetric, geriatric, and other adult patients. Supervision and teaching are provided by a family medicine faculty who participates daily in didactic teaching, x-ray rounds, and hospital rounds. Members of the team include a medical student, first and second year resident, and the chief resident. These individuals share responsibility for patients on the service and perform initial histories and physicals, write daily orders and progress notes, complete discharge summaries, and communicate with consultants and family members. Students will also attend daily noon conferences. Call is required at some sites. Prereq: FMCH 7600 or FMCH 7523; and MED 7500

FMCH 7519. Clinical Practice of Occupational Medicine. (2-4 cr.; H-N or Audit; Every Fall, Spring & Summer) Students perform complete occupational health history, set up basic problem-solving approaches to occupational health problems.

FMCH 7520. Rural Rotation in Family Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) This course is intended for students interested in observing and participating in Family Medicine in the rural setting. Students participate in patient care in the patient's home, in long-term facilities, in the doctor's office and in the hospital. Students observe close interrelationships between practicing physicians and the community.

FMCH 7521. Topics in Immigrant Health. (4 cr.; H-N only; Every Spring) Course is designed to offer an intensive multidimensional exploration of immigrant health using clinical, multimedia, academic and on-line learning. The course will include an individualized in-depth project and an individualized learning plan will be developed between each student and the course director after assessing the student's experience, background and interest. This course will combine clinical experiences at a variety of sites which serve immigrant patients with text-based and web-based reading, on-line research, group and individual community visits and on-line and class discussions to provide students with an opportunity to study in-depth the issues that communities and methods by which those barriers are being overcome.

FMCH 7524. Rotation in Palliative Medicine and Hospice. (2 cr.; H-N only; Every Fall, Spring & Summer)
Introduces students to the field of palliative care and hospice medicine. Students will participate in patient care with hospice staff and palliative care physicians and other practitioners in the hospital, nursing home, clinic, and patient's homes. Students will directly work with interdisciplinary teams in their daily work, and spend time with practitioners in social work, nursing, spiritual health, music therapy, and physicians.

**FMCH 7525. Cardiovascular Medicine.** (2 cr.; H-N only; Every Fall & Spring) Students will participate in daily cardiology inpatient rounds. They will work 1:1 with the rounding cardiologist for the week. Responsibilities include the initial cardiology consultation and daily rounds on patients in the hospital. prereq: Med 7500

**FMCH 7526. Medicine and the Arts.** (2 cr.; P-N only; Every Fall) Students will work with the course directors to tailor a course of study that will immerse them in forms of art and creative expression (such as literature, film, visual art, music, etc.) that reflect—and are inspired by—the practice of medicine.

**FMCH 7527. Lesbian, Gay, Bisexual, and Transgender (LGBT) Health.** (2 cr.; P-N only; Every Fall) In this course, students will gain an understanding of health risks experienced by LGBT individuals and will practice assessing sexual orientation, gender identity, sexual health, and discussing specific health concerns and treatment options in order to become comfortable working with this population. Students will also hear from LGBT individuals themselves about their healthcare experiences and how they wish to be treated. In addition, physicians who are LGB or transgender will talk about managing their professional and personal identities, as well as being “out” in the community and identifying as an LGBT-friendly healthcare provider.

**FMCH 7530. Preceptorship in Community Family Medicine.** (2 cr.; H-N only; Every Fall, Spring & Summer) This course is intended for students interested in pursuing family medicine as a career, or for students wishing to acquire a broadly-based medical background before training in another specialty. The student will usually participate in inpatient and outpatient care in the family medicine clinic and in the hospital.

**FMCH 7531. Introduction to Healthcare for the Underserved.** (2-6 cr.; H-N or Audit; Every Fall & Spring) Introduces students to the health care needs and challenges faced by special population groups served by Family Medicine. These include immigrant and refugee populations, minority populations, and various other underserved groups. During this rotation based in a clinic serving one or more of these population groups, the student will become familiar with the unique health needs of a population and the resources and methods used to address those needs. Issues such as communication, education, and traditional healing beliefs and systems will be addressed. Typically, 2.5 days per week will be spent in direct patient care, 1 day is reserved for students to perform independent learning around the population to be studied while the remaining 1.5 days may be spent in a variety of non-direct patient care or community-based activities, depending on the clinic site.

**FMCH 7535. Community Health in Family Medicine.** (3 cr.; H-N or Audit; Every Fall, Spring & Summer) Individually designed outpatient rotation. Combines clinical work in urban setting with a series of experiences in the community. preq: At least two six-week rotations in medicine or pediatrics or obstetrics or surgery

**FMCH 7537. Sports Medicine.** (4 cr.; H-N only; Every Fall & Spring) Students will gain experience in the field of sports medicine including exposure to the disciplines of primary care sports medicine, orthopedic sports medicine, sports physical therapy, and athletic training.

**FMCH 7538. Sports Medicine in Duluth.** (4 cr.; H-N only; Every Fall, Spring & Summer) This course is an opportunity for students interested in primary care or a musculo-skeletal specialty to develop an appreciation for the role of sports medicine in his/her practice. The student will work closely with full-time sports medicine physicians and allied health providers, including physical therapists and athletic trainers.

**FMCH 7540. Sports Medicine: USA Soccer Cup.** (2 cr.; H-N only; Every Summer) Course held immediately prior to the start of the USA Soccer Cup Tournaments every July. This course consists of didactic lectures and hands on workshops focusing on sports medicine topics with an emphasis on soccer.

**FMCH 7544. Outpatient-HIV Management in Family Medicine.** (2 cr.; H-N only; Every Fall, Spring & Summer) The overall goal of this course is to familiarize the student with the many illnesses and complications of HIV disease, current Hepatitis C treatment, and some travel medicine. This includes the medical, psychological, social and economic problems which the HIV patient faces. The student will become familiar with the many antiviral medications used in HIV disease.

**FMCH 7551. Rural Community Ambulatory Medicine PCC.** (12 cr. [max 24 cr.]; H-N only; Every Fall, Spring & Summer) Twelve-week course. Four weeks in a Twin Cities Family Residency clinic, eight weeks in a selected Rural Community. Exposure to patients from diverse backgrounds in an outpatient setting to rural medicine, delivery systems, and community health. Small-group seminars, one-day Hospice experience, project, final exam.

**FMCH 7560. Alcohol and Drug Addiction Treatment.** (2 cr.; H-N only; Every Fall, Spring & Summer) Intensive exposure to current approaches to therapy and rehabilitation of chemically dependent patients. For most of these patients, alcohol is the most abused drug. The course includes participant observation in group therapy sessions and lectures.

**FMCH 7577. An Introduction to Complementary and Alternative Therapies.** (3 cr.; O-N or Audit; Periodic Fall & Spring) Complementary therapies and their integration with allopathic treatments. Observation of complementary care providers in community. Examine culturally-based approaches to healthcare. Weekly seminars, special project, use of Internet, preq: Internet access, basic e-mail skills; Nurs 5609 recommended

**FMCH 7585. Sexual Problems in Clinical Practice.** (2 cr.; P-N only; Every Fall, Spring & Summer) This course requires a minimum commitment of 40 hours per week (some evening time possible) over a 2-4 week period. Students will have the opportunity for observation and practice of sex-related education and counseling through participation in intake and assessment sessions, individual and conjoint sessions, and group sex therapy. Each student will be supervised by a member of the Program in Human Sexuality staff. The student is expected to participate in several hours of staff conferences and seminars each week. Readings will be assigned.

**FMCH 7595. Family Medicine Research.** (2-8 cr.; H-N only; Every Fall, Spring & Summer) Academic research in collaboration with member of academic or clinical faculty. Identification of parameters/methodological components of family medicine research. Develops knowledge/skills essential for academic careers in family medicine.

**FMCH 7599. Family Medicine Independent Study.** (2-8 cr.; H-N only; Every Fall, Spring & Summer) This course is intended for a student interested in pursuing a Family Medicine project that does not fit well in one of the other Family Medicine elective descriptions. For any directed study project, there will be a written agreement between the student and Course Director.

**FMCH 7600. Family Medicine Four-Week Clerkship.** (4 cr.; H-N only; Every Fall, Spring & Summer) Ambulatory four-week clerkship.

**FMCH 7700. UCAM Family Medicine Selective.** (4 cr.; P-N only; Every Fall, Spring & Summer) Four-week ambulatory experience in family medicine clinic.

**FMCH 7701. RPAP: Family Medicine Clerkship.** (4 cr.; H-N only; Every Fall, Spring & Summer) Community-based elective. Extensive primary care experience in rural setting.

**FMCH 7702. RPAP: Primary Care Selective.** (4 cr.; P-N only; Every Fall, Spring & Summer) Community-based elective. Extensive primary care experience in rural setting.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
FSOS 5426. Alcohol and Drugs: Families and Culture. (3 cr.; Student Option; Periodic Fall, Spring & Summer) Overview of psychology/sociology of drug use/abuse. Life-span, epidemiological, familial, cultural data regarding use. Fundamentals of licit/illicit drug use behavior. Gender, ethnicity, social class, sexuality, sexual orientation, disability.

FSOS 5429. Counseling Skills Practicum I. (3 cr.; Student Option; Periodic Fall, Spring & Summer) Basic counseling skills. Counselor needs/motivations, non-verbal communication, basic/advanced empathy, identifying strengths, maintaining focus, challenging discrepancies, use of self. Emphasizes building from client strengths, learning through role-playing.


FSOS 5702. Prevention Science Research Methodology. (3 cr.; A-F or Audit; Every Fall & Spring) This course is intended to provide students with broad exposure to topics in research methodology within the field of prevention science. Prevention science as a discipline focuses on the etiology and prevention of social, physical and mental health problems and the translation of that information to promote health and well-being. This course will emphasize research methodology as it pertains to preventive interventions in youth and family contexts. The course is intended to serve as a survey of a wide range of topics within these areas, with research design, measurement issues, and analytic methods representing the major foci. Topics will be covered with attention to the community contexts within which prevention research often occurs as well as the ethical and human subjects issues that may arise. Students who successfully complete the course are expected to be able to interpret and critically evaluate prevention research methodology as well as identify appropriate methodological strategies to address research questions within prevention science.

FSOS 5703. New Topics in Prevention: Implementation and Dissemination. (3 cr.; A-F or Audit; Every Spring) This is an interdisciplinary course focused on the new science of implementation and dissemination of evidence-based/empirically-supported family-focused psychosocial prevention programs. Course content will include an overview of conceptual and theoretical foundations of implementation research, key research questions, methods for evaluating implementation and dissemination efforts, and case examples from the empirical literature. The course will take an ecological perspective to the implementation of family-based prevention programs, addressing questions such as how widespread efforts to install programs in communities can ensure that programs create change in children and families.

FSOS 5900. Special Topics in Family, Youth, and Community. (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Topics not dealt with in regular courses. Topics vary by offering.

FSOS 5902. Family Education Perspectives. (3 cr.; A-F only; Every Fall) Origines, evolution, and critique of alternative perspectives on family education. Implications for educators, programs, and participants. Online course that requires collaborative learning.


FSOS 5932. Introduction to Parent Education. (1 cr.; A-F only; Every Fall & Summer) Philosophy, history, and models of parent education. Ethical, critically reflective professional practice. Observation of parent and family education practice.


FSOS 5942. Everyday Experiences of Families. (3 cr.; A-F only; Every Spring & Summer) Culture and everyday experiences of diverse families. Relevance to parent education and to professional development of parent educators. Research/theoretical knowledge woven with observation/personal reflection.


FSOS 5944. Parent Education Curriculum. (3 cr.; A-F only; Every Fall) How parent learning and development, child development, and family systems theories influence curriculum approaches and materials in parent education. Student develop construct, critique curriculum on self-selected topics in parent and family education.

FSOS 5945. Teaching and Learning in Parent Education. (2 cr.; A-F only; Every Fall) Students select/use parent education teaching strategies/processes to meet needs of various populations of adult learners. Critical
FSOS 5946. Assessment and Evaluation in Parent Education. (3 cr.; A-F only; Every Spring) Theory, terminology, issues, and approaches in assessment and evaluation. Application to monitoring parent education program performance, assessing program quality, and measuring parent learning and development. Design of evaluation plan for self-designed curriculum. prereq: 5943, 5444, or instr consent

FSOS 5949. Student Teaching in Parent Education. (2 cr.; A-F only; Every Spring) Supervised parent education practice to meet individual student needs and interests. Online discussion, reflection, and cooperative learning. prereq: Application for student teaching; FSOS 5937, 5942, 5943, 5944, 5945.

FSOS 8001. Conceptual Frameworks in the Family. (3 cr.; A-F only; Every Fall) Major theoretical models about families, emphasizing sociohistorical context.

FSOS 8002. Advanced Family Conceptual Frameworks. (3 cr.; A-F only; Every Spring) Builds on FSOS 8001 by focusing specifically on family level research questions. Family development/critical theoretical perspectives that can be used to understand/study family processes/contemporary ecological issues. prereq: 8001 or instr consent

FSOS 8003. Current Issues in Family Science. (3 cr.; Student Option; Every Fall) Content, theories, and methodologies in family science. Emphasizes findings of recent/emerging areas of research. Readings covering a wide range of topics. Critical examination of research studies. Targeted class discussion.


FSOS 8007. Ethical Issues and Moral Dilemmas in Family Life. (5 cr.; Student Option; Periodic Fall) Multidisciplinary perspectives of ethics, social norms, family law, family policy, family economics, and family decision-making. Focuses on differing perspectives of individuals representing various ethnicities, socio-economic levels, religions, and sexual orientations.

FSOS 8013. Qualitative Family Research Methods. (3 cr.; A-F only; Periodic Fall & Spring) Approaches to qualitative family research evaluation. Phenomenological, feminist, grounded theory, content analytic, ethnemethodological, ethnographic, program evaluation. Theory, research examples, student projects.

FSOS 8014. Quantitative Family Research Methods II. (3 cr.; A-F only; Every Spring) Quantitative research process, from developing research question to putting findings to use. Major course project basis for class discussion. Family research. Applying research knowledge to study of families. prereq: [5014 or equiv], [8001 or equiv]. [two stat courses or instr consent]

FSOS 8015. Advanced Qualitative Family Research Methods. (3 cr.; A-F only; Every Fall) Applying qualitative research methods to understand individual/collective meaning, experience within/across diverse family systems. prereq: 8013 or instr consent

FSOS 8031. Family of Origin. (3 cr.; S-N or Audit; Periodic Fall & Spring) In-depth study of each student’s family of origin in a group of other students and a clinical faculty therapy supervisor. prereq: Preference given to marriage and fam therapy students

FSOS 8033. Problems in Families. (3 cr.; Student Option; Periodic Spring) Family therapy assessment/treatment approaches to problems such as depression, alcoholism, and sexual abuse, and to challenges of varying family structures, such as single-parent/remarried families. prereq: [8032 or equiv], instr consent

FSOS 8034. Marriage and Family Therapy Supervision. (3 cr.; Student Option; Periodic Fall) Theories of supervision, structures for supervision, methods of supervision, evaluation process, legal/ethical issues. Therapist-client-supervisor relationships, potential problems, contextual issues. prereq: FSOS doctoral student enrolled in Couple Family Therapy (CFT) or instr consent

FSOS 8035. Assessment of Couples and Families. (3 cr.; A-F or Audit; Periodic Fall) Issues in research and clinical assessment. Assumptions and values underlying assessment approaches. Specific assessment techniques discussed, evaluated, and administered. Ethical, legal, and practical issues. prereq: 8014 or equiv or instr consent

FSOS 8036. Couple/Marriage and Family Therapy Research. (3 cr.; A-F only; Periodic Fall & Spring) Historical/contemporary approaches to C/MFT research with emphasis on prevention, intervention, dissemination from variety of perspectives. prereq: FSOS doctoral student enrolled in Couple Family Therapy (CFT) or instr consent

FSOS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2-10 cr.; A-F or Audit; Periodic Fall & Spring) Boundaries and triangles, gender inequities, family law, confidentiality and reporting requirements, dual roles, client diversity, and value clashes. prereq: [8032, practicum or internship exper] or [grad student in cooperating mental hlth practice prog who has completed 1 course on therapy with children

FSOS 8039. Clinical Interventions for Couples. (3 cr.; A-F or Audit; Periodic Fall) Interventions into problems faced by couples at various ages and stages of their relationship. Developing and implementing effective strategies for problem solving, relationship maintenance, and partner growth, including integration of sex therapy into ongoing couple therapy. prereq: 8032 or equiv or instr consent

FSOS 8043. Family Theory Development: A Systemic Perspective. (3 cr.; Student Option; Periodic Fall & Spring) Concepts and principles of systems and ecosystems and their applications in family science; emphasizes theoretical integration and development of research models with appropriate methodologies. prereq: 8001 or equiv or instr consent, FSOS PhD student beyond 1st yr

FSOS 8047. Integrative Research Seminar. (3 cr.; Student Option; Every Spring) For advanced doctoral students primarily in family social science who are working on independent research projects. Giving and receiving of constructive criticism and support in integrating theories, methods, and applications in order to create a totality that is logically coherent and conceptually and methodologically sound. prereq: 8001 or equiv, 8013 or equiv, 8014 or equiv

FSOS 8010. Family Stress, Coping, and Adaptation. (3 cr.; Student Option; Periodic Fall & Spring) Helping families become more resilient to stress by decreasing vulnerability to crises and traumatic stress disorders. Students develop research or intervention proposal on family stress, coping, adaptation, crisis, trauma, or resilience. prereq: 8001 or equiv, research methods course

FSOS 8014. Family Policy Seminar. (3 cr.; Student Option; Periodic Spring) Distinguishing family policy research from other family research. Conceptual frameworks, methods, and roles family policy research can play in policy-making and knowledge-building processes.

FSOS 8015. Family Gerontology. (3 cr.; Student Option; Periodic Spring) Integrates gerontology and family studies; new lines of inquiry, qualitative and quantitative, into aging families. Family gerontological research, family relationships, family and long-term care institutions, theoretical frameworks and research methods, and research and interventions. prereq: 4154 or equiv or instr consent

FSOS 8107. Family Values Research: Theories and Critical Methods. (3 cr.; Student Option; Periodic Fall)
Interdisciplinary seminar on critical modes of inquiry in the family domain that require designing studies using normative theories, examining values as units of observation, and solving practical problems by collaborative strategies designed to encourage change. prereq: 8013 or equiv, 8014 or equiv or instr consent; WCHE 8920 recommended

FSOS 8150. Topics in Family Social Science. (1-6 cr.; Student Option; Every Fall, Spring & Summer)
Special seminars on timely topics. prereq: FSOS grad student or instr consent

FSOS 8151. Preparation for Independent Teaching in Family Studies. (1 cr. [max 3 cr.]; S-N only; Every Fall & Spring)
Practicum. Skills to independently teach family sciences courses to undergrads. prereq: instr consent

FSOS 8160. Topics in Marriage and Family Therapy. (1-6 cr.; Student Option; Periodic Fall)
Special seminars on timely topics. prereq: MFT grad student or instr consent

FSOS 8193. Directed Study in Family Social Science. (1-6 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer)
Directed study. prereq: Doctoral student in FSOS or related field

FSOS 8200. Orientation for Family Social Science. (1 cr.; S-N or Audit; Every Fall)
TBD

FSOS 8201. Teaching Family Courses in Higher Education I. (3 cr.; S-N or Audit; Periodic Fall & Spring)
Students cooperatively plan, administer, and evaluate (with a graduate faculty supervisor) an undergraduate core course. Improvement of teaching and evaluation methods, and conceptualization and presentation of research-based course in family studies. prereq: 12 FSOS grad cr; teaching assistant exper recommended

FSOS 8202. Teaching Family Courses in Higher Education II. (3 cr.; S-N or Audit; Periodic Fall & Spring)
Under faculty supervision, students teach an undergraduate course in family social science for which they have appropriate academic preparation and professional experience. prereq: 8201 or equiv

FSOS 8275. Clinical Consultation with Couples and Families. (3 cr.; S-N or Audit; Periodic Fall & Spring)
Supervised students serve as a consultation group working with community clinicians and their clients, utilizing a one-way window and observation room; opportunities for cotherapy. prereq: instr consent; required for grad FSOS majors in marriage and family therapy prog

FSOS 8295. Couple/Marriage Family Therapy Practicum. (1-6 cr. [max 24 cr.]; S-N only; Every Fall, Spring & Summer)

FSOS 8296. Couple/Marriage Family Therapy Internship. (1-12 cr.; S-N only; Every Fall, Spring & Summer)
Supervised clinical/other professional practical experiences in couple/marriage, family therapy. prereq: FSOS doctoral student enrolled in Couple Family Therapy (CFT) or instr consent

FSOS 8297. Supervision of Supervision. (1-3 cr. [max 12 cr.]; S-N or Audit; Every Fall, Spring & Summer)
Hands-on practicum to gain AAMFT-approved supervisor status. prereq: MFT student, instr consent

FSOS 8333. FTE: Masters. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

FSOS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

FSOS 8550. Advanced Topics in Family Social Science. (1-6 cr.; A-F or Audit; Every Fall & Spring)
Special seminars on topics suited to student needs.

FSOS 8560. Advanced Clinical Topics in Marriage and Family Therapy. (1-6 cr. [max 36 cr.]; A-F or Audit; Periodic Spring)
Special advanced topics or seminars.

FSOS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

FSOS 8755. Master's Paper: Plan B Project. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer)
Graduate faculty work with students on research for Plan B paper. prereq: FSOS MA student

FSOS 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

FSOS 8794. Directed Research in Family Social Science. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer)
Student Option; Every Fall, Spring & Summer)
Directed research in family social science.

FSOS 8888. Thesis Credit: Doctoral. (1-24 cr.; S-N or Audit; Every Fall, Spring & Summer)
Max 18 cr per semester or summer; 24 cr required

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

Finance (FINA)

FINA 5422. Financial Econometrics and Computational Methods I. (2 cr.; A-F only; Every Fall)
This course provides an introduction to the methods used in empirical finance. A review of statistics is followed by intensive instruction on matrix algebra that culminates in a fundamental understanding of linear regression, the basic empirical tool. Asset pricing theories are discussed and developed and then methods are derived to test them. The course will emphasize estimation and inference using computer-based applications.

FINA 5423. Financial Econometrics and Computational Methods II. (2 cr.; A-F only; Every Fall)
This course builds on Financial Econometrics I and provides instruction on the econometrics used in empirical finance. Topics will include time series analysis, parametric models of volatility, evaluation of asset pricing theories, and models for risk management. The course will emphasize estimation and inference using computer-based applications.

FINA 6121. Debt Markets, Interest Rates, and Hedging. (2 cr.; A-F only; Every Fall & Spring)

FINA 6122. Financial Management of Depository Institutions. (2 cr.; A-F only; Every Spring)
Commercial banks, other depository institutions. Asset/liability management, risk management, geographic expansion, investment banking, public policy issues. Lectures, student presentations, project. prereq: MBA 6230, MBA student

FINA 6123. Financial Services Industry. (2 cr.; A-F only; Every Fall)
This course gives an overview of the U.S. financial services industry, emphasizing the overall environment, key institutional details, and underlying economic functions. After introducing financial markets and institutions and their functions, we look at the biggest sectors of this industry (banking, insurance, securities dealing, money management, etc.) in more depth. We conclude with a discussion of the impact of "fintech" on this sector.

FINA 6222. Mergers and Acquisitions. (2 cr.; A-F only; Every Spring)
How corporate managers achieve growth through mergers/acquisitions. Examine buyer/seller motivations in context of M&A
FINA 6241. Corporate Finance Analysis and Decisions. (4 cr.; A-F only; Every Fall & Spring)
Theory/applied understanding of corporate financial decisions. Adjusted present value, economic value added options. Impact of financing decisions on real asset valuation, managerial incentives, corporate strategy. prereq: MBA 6230, MBA student

FINA 6242. Advanced Corporate Finance Analysis and Decisions. (4 cr.; A-F only; Every Fall)
Theory/practice of efficiently managing working capital, fixed assets. Emphasizes mergers/ acquisitions, corporate restructuring, real options. Use of derivatives as financing tools, in deal structure. prereq: 6241, MBA student

FINA 6321. Portfolio Analysis and Management. (2 cr.; A-F only; Every Fall)

FINA 6322. Financial Modeling. (2 cr.; A-F only; Every Spring & Summer)
Financial modeling tools to build, maintain, and interpret comprehensive financial models that provide the framework for understanding businesses and their historical performance, plans estratégies, and market values. Financial analytics/modeling skills. prereq: MBA 6230, MBA student

FINA 6323. Advanced Financial Modeling. (2 cr.; A-F only; Every Fall)
Advanced financial modeling tools to build, operate, and understand business performance, and M&A, equity, and credit securities analysis models that have become central to sophisticated financial analysis of all operating businesses, transactions, and securities. How to analyze by way of financial models.

FINA 6324. Securitization Markets. (2 cr.; A-F only; Every Spring)
Splitting risks. Redirecting risks to investors able to analyze and take on those risks. Reasons for development of securitization. Products, the similarities in character. How to build simple models and analyze examples of actual securitized liabilities. prereq: 6121, MBA student

FINA 6325. Behavioral Finance. (2 cr.; A-F only; Every Spring)
Psychology/realistic settings that guide/develop alternative theories of financial market. How behavioral finance complements traditional paradigm on investors' trading patterns, behavior of asset prices, corporate finance, various Wall Street institutions/practices. prereq: MBA student

FINA 6329. Advanced Topics in Fixed Income and Derivatives. (2 cr.; A-F only; Periodic Fall & Spring)
Economics and mechanics of derivatives. First phase focuses on theoretical and institutional foundations for various derivatives instruments and markets. Second phase is practicum in which student groups build working models of derivatives. prereq: (credit will not be granted if already received for 6541)

FINA 6404. Industry Vertical: Finance. (2 cr.; A-F only; Every Spring)
Focus on firms engaged in three major sub areas of financial services including retail banking, investment, and international markets subsectors. Cases and live case studies to focus on firms ranging from Wells Fargo, Berkshire Hathaway, Cargill, and Piper Jaffray. Federal oversight focus includes the Security and Exchange Commission and the Department of Treasury.

FINA 6421. Topics in Corporate Finance. (2-4 cr.; A-F only; Periodic Fall)
Advanced-level coverage of topics in corporate finance. Analytical foundations reviewed/ expanded. Opportunities for applying concepts in complex settings. Major report or presentation. prereq: MBA 6230, MBA student

FINA 6422. Mergers and Acquisitions. (2-4 cr.; A-F only; Every Spring)
Various means for corporate managers to achieve growth through mergers/acquisitions. Leverage skills mastered in core curriculum. Examine both buyer/seller motivations in context of M&A transactions/strategic alliances. Private equity in M&A marketplace. prereq: 6241, MBA student

FINA 6529. Advanced Topics in Fixed Income and Derivatives. (2 cr.; A-F only; Periodic Fall & Spring)
Economics and mechanics of derivatives. First phase focuses on theoretical and institutional foundations for various derivatives instruments and markets. Second phase is practicum in which student groups build working models of derivatives. prereq: (credit will not be granted if already received for 6541)

FINA 6621. International Financial Management. (2 cr.; A-F only; Every Spring)

FINA 6801. Finance Independent Study. (1-6 cr.; max 12 cr.; A-F only; Periodic Fall & Spring)
Independent study. prereq: MBA student, instr consent

FINA 8802. Theory of Capital Markets I: Discrete Time. (2 cr.; Student Option; Every Spring)
Modern asset pricing theory. Static/discrete time frameworks. Fundamental asset pricing equation. Classical finance models: CAPM, consumption-based CAPM, APT. Complete markets, representative agent, Pareto optimality. Challenges to theories. Approaches such as habit formation, heterogeneous agents (incomplete markets) model. prereq: [Econ 8101, Econ 8102, business admin PhD student] or instr consent

FINA 8803. Theory of Capital Markets II: Continuous Time. (2 cr.; Student Option; Every Spring)
Continuous-time financial economics. Emphasizes mathematical/statistical tools. It processes, Girsanov?’s theorem, risk-neutral pricing. How to formulate/analyze continuous-time models. prereq: [Econ 8101, Econ 8102, Business admin PhD student] or instr consent

FINA 8810. Topics in Asset Pricing. (2 cr.; max 4 cr.; A-F or Audit; Fall Even Year)
Current topics in asset pricing literature. Students read papers on these topics, rederive the main results, identify the main assumptions and thus identify ideas on how to improve upon the current literature. prereq: Business admin PhD student or instr consent

FINA 8812. Corporate Finance I. (2 cr.; Student Option; Every Fall & Spring)
Corporate control, managerial incentives, corporate governance, capital structure. What assets are collected within firm. What determines boundaries of firm. Empirical evidence in support of theoretical models. Modern theories of firm, based on incomplete contracts. How corporate finance decisions expand/limit scope of firm. prereq: [Econ 8103, Econ 8104, business admin PhD student] or instr consent

FINA 8813. Corporate Finance II. (2 cr.; Student Option; Every Fall & Spring)

FINA 8820. Topics in Corporate Finance. (2 cr.; max 4 cr.; A-F or Audit; Fall Odd Year)
Current topics in corporate finance literature. Students read current papers, rederive the main results, identify the main assumptions and thus identify ideas on how to improve on the current literature. prereq: Business admin PhD student or instr consent
FINA 8822. Empirical Methods in Finance. (4 cr.; Student Option; Every Spring)
Empirical techniques in analysis of financial markets, how they are applied to actual market data. Statistical properties of asset returns, efficient markets hypothesis. Empirical tests of asset pricing models (CAPM, APT, Intertemporal CAPM, Consumption CAPM). Tests of conditional asset pricing models. prereq: 8802, 8803

FINA 8823. Empirical Corporate Finance. (4 cr.; Student Option; Every Spring)
Current empirical research on corporate finance. Mergers/acquisitions, equity offerings, event studies, tests of market efficiency, impact of corporate governance, compensation policies, initial public offerings. prereq: 8802, 8803

FINA 8890. Seminar: Finance Topics. (2-4 cr. [max 16 cr.]; A-F only; Every Fall & Spring) Current topics/problems of interest considered in depth. Topics vary. Prereq: [8802, 8812, 8822, 8823] or equiv; business admin student or instr consent

FINA 8892. Independent Study in Finance. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Problems or developments of special interest to the student. prereq: Business admin PhD student or instr consent

FINA 8894. Directed Research in Finance. (1-8 cr. [max 16 cr.]; Student Option; Every Fall & Spring) Individualized directed research on a project of interest to the student, approved and advised by faculty. prereq: Business admin PhD student specializing in finance or instr consent

Financial Mathematics (FM)

FM 5001. Preparation for Financial Mathematics I. (3 cr.; Student Option; Every Fall) Mathematics needed for MFM program. prereq: Grad MFM major or MFM program director approval

FM 5002. Preparation for Financial Mathematics II. (3 cr.; Student Option; Every Spring) Mathematics needed for MFM program. prereq: 5001, program director approval

FM 5011. Mathematical Background for Finance I. (4 cr.; Student Option; Every Fall) Mathematics needed for MFM program. Focuses on finance. prereq: [5001, 5002] with grade of at least B or [MFM program director approval, grad MFM major]

FM 5012. Mathematical Background for Finance II. (4 cr.; Student Option; Every Spring) Mathematics needed for MFM program. Focuses on finance. prereq: 5011, grad MFM major, program director approval

FM 5021. Mathematical Theory Applied to Finance I. (4 cr.; Student Option; Every Fall) Bridge between theory and application. prereq: [5011 or concurrent registration is required (or allowed) in 5011], grad MFM major, program director approval

FM 5022. Mathematical Theory Applied to Finance II. (4 cr.; Student Option; Every Spring) Bridge between theory and application. prereq: 5021, [5012 or concurrent registration is required (or allowed) in 5012], grad MFM major, program director approval

FM 5031. A Practitioner's Course in Finance I. (4 cr.; Student Option; Every Fall) Practical course taught by industry professionals. Focuses on hands-on real-world problem solving. prereq: [5021 or concurrent registration is required (or allowed) in 5021], grad MFM major, program director approval

FM 5032. A Practitioner's Course in Finance II. (4 cr.; Student Option; Every Spring) Taught by industry professionals. Focuses on hands-on real-world problem solving. prereq: 5031, [5022 or concurrent registration is required (or allowed) in 5022], grad MFM major, program director approval

FM 5091. Computation, Algorithms, and Coding in Finance I. (4 cr.; Student Option; Every Fall) Implements popular finance models and numerical techniques using mainstream computational tools/languages. prereq: Grad MFM major, program director approval

FM 5092. Computation, Algorithms, and Coding in Finance II. (4 cr.; Student Option; Every Spring) Implements popular finance models and numerical techniques using mainstream computational tools/languages. prereq: 5091, grad MFM major, program director approval

FM 5090. Topics in Financial Mathematics. (1-2 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) The course will focus on a special topic in quantitative finance that supplements the regular curriculum of the Master of Financial Mathematics program. The course features experts, often finance industry practitioners, who share their experience and knowledge. prereq: enrolled in the Master of Financial Mathematics program or instr consent

Fisheries and Wildlife (FW)

FW 5003. Human Dimensions of Biological Conservation. (3 cr.; Student Option; Every Fall) Survey of social, psychological, economic, policy aspects of managing/conserving wildlife, fisheries, and related resources. prereq: [Biol 1001 or Biol 1009], Biol 3407

FW 5051. Analysis of Populations. (4 cr.; Student Option; Every Spring) Regulation, growth, general dynamics of populations. Data needed to describe populations, population growth, population models, regulatory mechanisms. prereq: [4001 or STAT 3011 or ESPM 3012], [Biol 3407 or BIOL 3408W or BIOL 3807], Senior or grad student
Practical techniques to maximize human/animal safety and encourage effective operations. Preparation procedures, legal responsibilities, capture/drugs/delivery systems, safety measures, ethical issues, basic veterinary procedures for handling wildlife. Field course. Uses live animals. prereq: General biology. [grad student or vet med student or FW sr]

FW 8051. Statistical Modeling of Ecological Data using R and WinBugs/JAGS. (4 cr.; Student Option; Every Spring) Regression methods for modeling ecological data. Real world examples from ecology, as well as environmental/natural resource sciences/management. Computer-based solutions using R/Bayesian modeling software. prereq: Graduate-level statistics class. [working knowledge of program R or instr consent]

FW 8200. Seminar. (1-4 cr. [max 16 cr.]; S-N or Audit; Every Fall & Spring) Oral and written student reports on selected topics from current literature in fisheries biology and management and wildlife. Lectures by and discussions with faculty and visiting specialists.

FW 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

FW 8394. Research in Fisheries. (1-4 cr.; Student Option; Every Fall, Spring & Summer) Directed research.

FW 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

FW 8452. Conservation Biology. (3 cr.; A-F or Audit; Every Fall) Seminar examining population- to system-level biological issues (genetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

FW 8459. Stream and River Ecology. (3 cr.; Student Option; Fall Even Year) Structure/dynamics of running waters from ecosystem perspective. Historical perspective, basic hydrology/fluvial geomorphology, terrestrial-aquatic interactions, detrital dynamics, metabolism, drift, trophic relations, biotic/abiotic interactions, ecosystem experiments and natural alterations, stability/succession, ecosystem dynamics in a watershed. prereq: Limnology course or instr consent

FW 8461. Advanced Topics in Fish Physiology. (1 cr.; Student Option; Periodic Fall) Lectures, discussion, current literature. Complements 5459. prereq: Vertebrate physiology course or instr consent

FW 8462. Advanced Topics in Fish Behavior. (1 cr.; Student Option; Periodic Fall & Spring)

Current literature. Complements 5459. prereq: 5459 or behavior course or instr consent

FW 8465. Fish Habitats and Restoration. (3 cr.; Student Option; Fall Odd Year) Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams. prereq: Intro ecology course or instr consent

FW 8494. Research in Wildlife. (1-4 cr.; Student Option; Every Fall) Directed research. prereq: instr consent

FW 8576. Biology and Management of Large Mammals. (2 cr.; A-F or Audit; Every Fall) Ungulates. Ecology, population dynamics, energy, nutrition, predation, disease/parasites, social behavior. Research approaches, management implications/practices. Key information on North American species. prereq: [Ecology course, [wildlife, forestry, and ecology grad student]] or instr consent

FW 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

FW 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

FW 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Food Science and Nutrition (FSCN)

FSCN 5122. Food Fermentations and Biotechnology. (2 cr.; A-F only; Every Fall) Major food fermentations important for today's food industry, with particular focus on microbiological components. Fermentations cover all major commodity food groups of dairy, cereal, meat, vegetables, fruits. prereq: MICB 3301, BIOL 4003

FSCN 5123. Molecular Biology for Applied Scientists. (1 cr.; A-F only; Every Fall) Half semester course. Two hours per week for 8 weeks. Basics of molecular biology/how it has been used for biotechnological applications. Origins of molecular biology from discovery of DNA as inheritance material within cells to advent of gene cloning/sequencing technologies. prereq: MicB 3301 or FScN 2021 or instr consent

FSCN 5123. Molecular Biology for Applied Scientists. (1 cr.; A-F only; Every Fall) Half semester course. Two hours per week for 8 weeks. Basics of molecular biology/how it has been used for biotechnological applications. Origins of molecular biology from discovery of DNA as inheritance material within cells to advent of gene cloning/sequencing technologies. prereq: MicB 3301 or FScN 2021 or instr consent

FSCN 5131. Food Quality for Graduate Credit. (3 cr.; Student Option; Every Fall) Management systems, statistical procedures, regulatory requirements involved with producing quality food/ingredients. Risk assessment/management, good manufacturing practices, hazard analysis critical control point (HACCP), statistical methods for process control, total quality management, food/drug laws. Prereq: Food Science Grad Student Student may select grading basis if instructor approves. A-F registration is required for class to count toward degree.

FSCN 5312. Food Analysis. (4 cr.; A-F or Audit; Every Fall) Analytical tools needed for investigation in Food Science/Technology, whether by food industry, governmental agencies, or universities. Application of quantitative/qualitative physical, chemical/instrumental methods used for analysis/examination of food constituents. Sensory evaluation techniques, evaluation of methods/interpretation of results. prereq: 4112, STAT 3011

FSCN 5441. Introduction to New Product Development. (2 cr.; Student Option; Fall Even, Spring Odd Year) This course is designed to give students an overview of the product development process including management systems, team dynamics, technical problem solving, idea generation, and differences between different categories of food R&D. Prerequisites: FSCN 4112

FSCN 5461. Food Packaging. (2 cr.; Student Option; Fall Odd Year) Materials, principles, and procedures of packaging as they apply to food products. Emphasis is on consumer products, but the principles also apply to bulk and institutional foods and ingredients. prereq: 1102, 3102, Phys 1102 or Phys 1302

FSCN 5481. Sensory Evaluation of Food Quality. (2 cr.; Student Option; Periodic Spring) Fundamentals of sensory perception. Test designs and methods in studying sensory qualities of foods. Issues in sensory evaluation. Group research project. prereq: 3102, STAT 3011

FSCN 5521. Flavor Technology. (2 cr.; Student Option; Spring Even Year) Overview of flavor chemistry/related technology. Analytical techniques, mechanisms of flavor development (chemical/biogenesis), off-flavors, industrial production/application of food flavorings. prereq: 4112

FSCN 5531. Grains: Introduction to Cereal Chemistry and Technology. (2 cr.; Student Option; Periodic Fall & Spring) Origins, structure, biochemistry, and cellular properties of major cereal grains as they relate to primary processing (milling) and secondary processing (production of cereal products). prereq: Biol 1009, Chem 1022

FSCN 5541. Dairy Product Chemistry and Technology. (2 cr.; Student Option; Fall Odd Year) Designed for upper division Food Science undergraduate/graduate students.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Physiology of milk production in ruminants. Resulting composition. Chemical, physical, microbiological properties of milk components. How milk products are manufactured. prereq: 3102, 4112. Food Science major, upper division undergraduate or graduate student

FSCN 5601. Management of Eating Disorders. (3 cr.; Student Option; Every Fall & Spring)

Etiology, occurrence, course, treatment, prevention of eating disorders from multidisciplinary perspective. Roles and responsibilities of eating disorder treatment team members of varying types across various treatment milieus. Prereq: Junior, senior or graduate student in nutrition or health related program or instructor consent.

FSCN 8310. General Seminar. (; 1 cr. [max 2 cr.]; S-N or Audit; Every Fall & Spring)

Presentations by faculty, graduate students, and outside speakers. prereq: instr consent

FSCN 8318. Current Issues in Food Science. (; 2 cr. [max 4 cr.]; A-F or Audit; Every Spring)

Current issues in Food Science and how they impact the food industry. Prerequisites: FSCN 4112, FSCN 4121, Department Consent.

FSCN 8320. Advanced Topics in Food Science. (; 1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)

Recent research or special topics.

FSCN 8330. Research Topics. (; 1 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer)

Seminar in which faculty member or group of faculty/graduate students discuss research progress or review/discuss current research literature.

FSCN 8331. Food Proteins. (; 2 cr.; Student Option; Spring Even Year)

Protein biochemistry as applied to food systems/processing. Forces that determine protein structure. Isolation/characterization of food proteins. Structure/function relationships in handling/processing food protein systems. prereq: 4112, 4312

FSCN 8333. FTE: Master’s. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)

No requirements. prereq: Master's student, adviser and DGS consent

FSCN 8335. Carbohydrate Chemistry in Food and Nutrition. (; 2 cr.; Student Option; Every Spring)

Carbohydrates as food components, their use as food ingredients. Reactions of mono/di/polysaccharides during food processing. Biosynthesis of carbohydrates, their metabolism. Methods in carbohydrate analysis. prereq: 4112

FSCN 8336. Lipid Chemistry and Rancidity of Foods. (; 2 cr.; Student Option; Periodic Fall)

Chemistry of food lipid oxidation/rancidification. Protective functions of antioxidants. prereq: 4112

FSCN 8337. Flavor Chemistry. (; 2 cr.; Student Option; Periodic Fall)

Chemistry involved in formation, analysis, and release of flavoring materials in foods. prereq: 4111

FSCN 8338. Antioxidants in Food: Practical Applications. (; 2 cr.; Student Option; Every Spring)

Mechanisms of antioxidant activities in food systems. Free radical scavengers, hydroperoxide stabilizers, synergists, metal chelators, singlet oxygen quenchers, substance reducing hydroperoxides. Practical applications of antioxidants in various food systems, effect of antioxidants on health/diseases. prereq: 4111, Bioc 3021, food chemistry, organic chemistry, biochemistry

FSCN 8391. Independent Study: Food Science. (; 1-4 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer)

Includes written reports. prereq: instr consent

FSCN 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)

(No description) prereq: Doctoral student, adviser and DGS consent

FSCN 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)

tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

FSCN 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)

(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

FSCN 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)

(No description) prereq: Max 18 cr per semester or summer; 24 cr required

Foreign Study (FOST)

FOST 5000. Study Abroad. (0-18 cr. [max 40 cr.]; Student Option; Every Fall, Spring & Summer)

Study abroad registration. prereq: dept consent

FOST 5010. Study Abroad Directed Study. (0-10 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)

Study abroad course.

FOST 5020. Global Experience Program. (0-6 cr. [max 18 cr.]; Student Option; Every Fall & Summer)

The course is used to award credit for work successfully completed on the Global Experience Program study abroad internship program. Evaluation standards and work load are determined by the graduate faculty member who signs the Global Experience Program learning contract required of each participant. Number of contact hours varies from location to location. prereq: Must have graduate student status

Foreign Study - SPAN (FSSP)

FSSP 5960. Preparatory Seminar for SPAN Overseas Research. (4 cr.; A-F or Audit; Every Summer)

Preparatory seminar for SPAN overseas research. prereq: dept consent

FSSP 5970W. Seminar for SPAN Overseas Research. (WI; 4 cr.; A-F or Audit; Every Summer)

Seminar for SPAN overseas research. prereq: dept consent

Forest and Natural Res. Mgmt. (FNRM)

FNRM 5101. Park and Protected Area Tourism. (3 cr.; A-F or Audit; Fall Odd Year)

Tourism is a significant industry locally, nationally, and internationally. Park and protected area attractions are among the most visited but also the most vulnerable attractions. This course is designed to familiarize you with the basic concept of park and protected area tourism, including cultural and ecotourism, and then develop your expertise to plan and evaluate sustainable tourism development and operations. Accordingly, you will complete assignments that apply the knowledge gained to planning and evaluation activities. This course is offered partially online. COURSE OBJECTIVES By the end of the class you will be able to: 1. Differentiate and appreciate the complexities involved with defining and developing nature, eco, heritage, geo-, park and protected, cultural & "sustainable tourism." 2. Identify specific social, economic, and environmental impacts associated with park and protected area tourism, how to measure them, and methods to minimize the negative and maximize the positive impacts. 3. Analyze domestic and international case studies of park and protected area tourism. 4. Critically evaluate park and protected area tourism services and effective management and planning. 5. Create elements of a business plan for park and protected area tourism operations that emphasize sustainability.

FNRM 5104. Forest Ecology. (4 cr.; A-F or Audit; Every Fall)

Form and function of forests as ecological systems. Characteristics and dynamics of species, populations, communities, landscapes, and ecosystem processes. Examples applying ecology to forest management. Weekly discussions on research topics, exercises, and current issues in forest resource management. Required weekend field trip. Introductory biology course recommended.

FNRM 5114. Hydrology and Watershed Management. (3 cr.; Student Option; Every Fall)

Hydrologic cycle and water processes in upland/riparian systems. Applications of hydrological concepts to evaluate impacts of forest and land management activities on water yield, streamflow, groundwater
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

**FNRM 5131. Geographical Information Systems (GIS) for Natural Resources.** (4 cr.; A-F or Audit; Every Fall)  
Geographical information systems (GIS), focusing on spatial data development and analysis in the science and management of natural resources. Basic data structures, sources, collection, and quality; geodesy and map projections; spatial and tabular data analyses; digital elevation data and terrain analyses; cartographic modeling and layout. Lab exercises provide practical experiences complementing theory covered in lecture.  
prereq: Grad student or instr consent

**FNRM 5153. Forest Hydrology & Watershed Biogeochemistry.** (3 cr.; Student Option; Spring Odd Year)  
This rigorous course examines hydrology and biogeochemical cycling in forested watersheds. Topics include role of forests in hydrologic processes (precipitation, runoff generation, and streamflow) and exports (sediment, carbon, and nitrogen). Readings from primary literature, active discussion participation, research/review paper. prereq: [Basic hydrology course, one course in ecology, and one course in chemistry [upper div or grad student]] or instr consent

**FNRM 5161. Northern Forest Field Course.** (2 cr.; A-F or Audit; Every Summer)  
Field identification of common trees, shrubs, and nonwoody vascular plants. Plant communities and soil site relationships, wildlife values. Natural history of northern/boreal forests in terms of soils, ecological characteristics of trees, community-environment relationships, stand development, succession, and regeneration ecology. Land survey, tree/forest stand measurement, forest sampling techniques. Taught at the Cloquet Forestry Center.

**FNRM 5201. Introduction to Travel and Tourism.** (3 cr.; A-F only; Every Spring)  
Travel and tourism is called one of the largest industries in the world today. This course introduces students to the nature, structure and complexity of the travel and tourism system. Specific focus is placed on understanding the tourism system and its impact globally on economies, environments and people. Using a lens of sustainability, students will examine the functions and interconnectedness of the various sectors within the tourism system and the role of diverse and sometimes competing priorities of stakeholders in the creation, delivery and integration of tourism. The course uses readings, case studies, discussion, and applied projects to develop students’ understanding of tourism and how communities, businesses, and government can maximize benefits associated with the demand for tourism while protecting the natural and human resources upon which it depends.

**FNRM 5203. Forest Fire and Disturbance Ecology.** (3 cr.; A-F or Audit; Every Spring)  
Ecology, history, management, control of fire, wind, insect infestation, deer browsing, other disturbances in forests, including disturbance regimes of boreal, northern hardwood, savannas of North America. Influence of disturbance on wildlife habitat, urban/wildland interfaces, forest measurement, stand/landscape dynamics. Tree mortality in fires, successional patterns created by fires, interactions of life history traits of plants with disturbances. prereq: Grad student or instr consent

**FNRM 5204. Landscape Ecology and Management.** (3 cr.; A-F or Audit; Every Fall)  
Introduction to landscape ecology at different scales in time/space. Development/implications of broad-scale patterns of ecological phenomena, role of disturbance in ecosystems. Characteristic spatial/temporal scales of ecological events. Principles of landscape ecology as framework for landscape research, analysis, conservation, and management. prereq: Grad student or instr consent

**FNRM 5205. Productivity and Ecology of Forest Soils.** (3 cr.; A-F only; Fall Even Year)  
Forest soils are fundamental to the development and function of forested ecosystems. This course will focus on soil-site factors affecting plant and wildlife communities, site quality estimation, site modification and enhancement, and the effects of forest management and other human-related disturbances on forest soil functions. Prior coursework in introductory soils, silviculture, forest hydrology, biogeochemistry, and applied forest ecology are strongly recommended. prereq: grad student or instructor consent

**FNRM 5206. Park and Protected Area Management Field Studies.** (2 cr. [max 3 cr.]; A-F only; Every Summer)  
Directed field study of park/protected areas. Recreation planning and management, cultural/natural resource management, nature-based tourism management, resource interpretation/communication across local, state, federal tribal park/protected areas in northern Minnesota. prereq: Sophomore status or higher

**FNRM 5216. Geodesy, Coordinate, and Surveying Calculations for GIS Professionals.** (1 cr.; Student Option No Audit; Every Fall)  
Where exactly are we? How do we define and refine geographic locations on a lumpy, spinning, unstable planet? On course completion students will understand concepts and practices that are at the very foundation of GIS: geodesy and geographic projections. They will have a working knowledge of geodetic datums and datum evolution, be able to make common geodetic and coordinate geometry calculations, and solve common problems that arise during datum and coordinate system conversions while engaged in the practice of GIS.

**FNRM 5218. Measuring and Modeling Forests.** (3 cr.; A-F or Audit; Every Spring)  
General sampling design and survey techniques to assess current resource conditions. Application of metrics/sampling methods to forest vegetation. Calculation of tree/stand volume, selection of modeling approaches. Case studies of modeling to project future growth. Landscape processes, characterization, and modeling.

**FNRM 5228. Advanced Topics in Assessment and Modeling of Forests.** (3 cr.; A-F or Audit; Fall Even Year)  
Application of recently developed mathematics, computer science, and statistics methodologies to natural resource functioning, management, and use problems. Specific topics, software, and methodologies vary. prereq: 3218, Math 1272, Stat 5021

**FNRM 5232. Managing Recreational Lands.** (4 cr.; A-F or Audit; Every Spring)  
Most of us participate in some form of outdoor recreation: hiking, hunting, riding all-terrain vehicles, or simply enjoying nature. Managing for outdoor recreation on public lands is mandated by federal law and an integral part of natural resource management. In this class, we’ll learn why and how agencies manage recreation at the federal level, the management frameworks that guide this work, and apply management principles to an actual federal property in Minnesota. This course is designed to provide students with an understanding of the principles and practices of outdoor recreation management. Specific objectives are: 1) Compare and contrast federal recreation land management policies and organizations, 2) Develop and demonstrate an understanding of conceptual frameworks for recreation resource and visitor use management, 3) Evaluate visitor caused impacts to resources and to visitor experiences, 4) Understand and apply management tools designed to reduce recreation-related impacts and conflicts, and 5) Demonstrate an understanding of course material through exams and applied assignments. prereq: Grad student or instr consent

**FNRM 5259. Visitor Behavior Analysis.** (3 cr.; Student Option; Every Fall)  
Recreation, leisure, and tourism are significant parts of the world, national, and state economies. Understanding visitor behavior is important and has significant implications for organizations, agencies, and businesses related to parks, tourism destinations, and museums. In this class, you will learn to apply both social science theory and methods to understand consumers, with an emphasis on visitors to parks and protected areas. You will immediately apply your learning of survey development, interviewing, observation and content analysis to real-world situations in class projects. This is an online course.

**FNRM 5262. Remote Sensing and Geospatial Analysis of Natural Resources and Environment.** (3 cr.; Student Option; Every Fall)  
Introductory principles and techniques of remote sensing and geospatial analysis applied to mapping and monitoring land and water resources from local to global scales. Examples of applications include: Land cover mapping and change detection, forest and natural resource inventory, water quality
FNRM 5264. Advanced Forest Management Planning. (3 cr.; Student Option; Every Fall) Modeling tools for forest planning to better integrate forest conditions/uses and better understand trade-offs and potential management strategies. Analyzing facets of forest management that add complexity including multi-market interactions, temporal detail, spatial objectives, planning under uncertainty, and recourse strategies. Optimization models, decomposition and heuristic techniques designed to capitalize on characteristics of forestry problems. Case studies involving recent or ongoing large-scale applications. Student projects with opportunity to tailor to student interests or expertise.

FNRM 5411. Managing Forest Ecosystems: Silviculture. (3 cr.; A-F only; Every Fall) Management of forest ecosystems for sustaining ecological integrity, soil productivity, water quality, wildlife habitat, biological diversity, commodity production in landscape context. Silvics, forest dynamics, disturbances, regeneration, restoration, silvicultural systems. Ramifications of management choices. Weekend field trip. EMC track students should take FNRM 5413 concurrently. prereq: grad student

FNRM 5412. Advanced Remote Sensing and Geospatial Analysis. (3 cr.; Student Option; Every Spring) This course builds on the introductory remote sensing class, FNRM 3262/5262. It provides a detailed overview of advanced remote sensing and geospatial theory and methods including biophysics of remote sensing, measurements and sensors, data transforms, data fusion, lidar processing and derivatives, advanced classification algorithms (including Object-Based Image Analysis), multi-temporal analysis, and empirical modeling. Independent lab activities will be used to apply the course topics to real-world problems. Prior coursework in Geographic Information Systems, remote sensing, and statistics is necessary. prereq: 3262 or grad student or instr consent

FNRM 5413. Managing Forest Ecosystems: Silviculture Lab. (1 cr.; A-F only; Every Fall) Development of silvicultural prescriptions to achieve various landowner objectives. Timber cruise, growth/yield simulations, stand density management diagrams, thinning schedules, use of forest vegetation simulator. Field trips, computer labs, lectures. prereq: FNRM major or minor or grad student; FNRM-FEMC track students should take FNRM 3411/5411 concurrently or instructor consent

FNRM 5431. Timber Harvesting and Road Planning. (2 cr.; Student Option; Every Spring) Forest operations. Terminology, engineering, equipment/harvesting system options, productivity/costs. Relationship to forest management and silviculture. Road planning, forest management guidelines. Mitigating potential impacts to soil/water resources. Environmental implications of methods/ equipment choices. Selling timber. Sale design, layout, and administration. Two all-day field trips.

FNRM 5471. Forest Management Planning. (3 cr.; A-F or Audit; Every Fall) Management science as applied to forest decision-making to help develop better forest management plans. Helps students develop a basic understanding of common analytical tools from operations research and how they are applied to forestry problems to help explore many potential solutions. Also reviews traditional approaches based on simulation. Emphasizes trade-off information, interpretation of model results, and linkages between stand-level economic analysis and forest-wide planning. Reviews recent modeling efforts in Minnesota. Includes synthesis of information from multiple natural resource disciplines. Guest speakers demonstrate value of analyses in planning. Emphasizes homework assignments with some group work. An individual project requires an informal class presentation. prereq: Grad student

FNRM 5480. Topics in Natural Resources. (1-3 cr.; Student Option; Periodic Fall & Spring) Lectures in special fields of natural resources given by visiting scholar or faculty member. Topics specified in Class Schedule.

FNRM 5501. Urban Forest Management: Managing Greenspaces for People. (3 cr.; Student Option; Every Spring) Management concepts for green infrastructure of cities, towns, and communities. Urban forest as social/physical resource. Emphasizes management of urban forest ecosystem to maximize benefits. Tree selection, risk assessment, cost-benefit analysis, landscape planning, values, perceptions. How urban forestry can be a tool to improve community infrastructure.

FNRM 5611. Field Silviculture. (1 cr.; A-F only; Every Summer) Collection of field data to prepare/write silvicultural prescriptions for regeneration, thinning, and harvesting in context of landscape, watershed, and wildlife habitat issues. Field exercises in forest entomology, pathology, tree improvement, and non-timber forest products. Tree planting. Marking stands for harvest. Taught at Cloquet Forestry Center. Field trips to forests managed by state/industry.

FNRM 5615. Field Remote Sensing and Resource Survey. (1 cr.; Student Option; Every Summer) Field applications of remote sensing, sampling/ measurement methods to inventory/mapping of forest and other natural resources. Offered at the Cloquet Forestry Center.


FNRM 8101. Research Problems: Physiological Ecology. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance. prereq: instr consent

FNRM 8102. Research Problems: Forest-Tree Genetics. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8103. Research Problems: Forest Hydrology. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8104. Research Problems: Forest Ecology. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8105. Research Problems: Silviculture. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8106. Research Problems: Urban Forestry-Biology and Management. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8108. Research Problems: Forest Ecosystem Health. (1-5 cr.; No Audit; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8201. Research Problems: Forest Economics. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8202. Research Problems: Forest Biometry and Measurements. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8203. Research Problems: Forest Recreation. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8204. Research Problems: Forest Policy. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance.

FNRM 8205. Research Problems: Spatial Data Analysis. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Independent research under faculty guidance. prereq: instr consent

FNRM 8206. Research Problems: Forest Management. (1-5 cr.; Student Option; Every Fall, Spring & Summer)
Independent research under faculty guidance.

**FNRM 8207. Economic Analysis of Natural Resource Projects.** (2 cr.; A-F or Audit; Every Fall, Spring & Summer)
Economics of public/private forestry/watershed management projects. Commercial profitability analysis, cost-benefit analysis, preparing feasibility studies. Case studies developed presented. prereq: instr consent

**FNRM 8208. Research Problems: Environmental Learning and Leadership.** (1-5 cr.; Student Option; Every Fall, Spring & Summer)
Independent research under faculty guidance. prereq: instr consent

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**French (FREN)**

**FREN 5301. Critical Issues in French Studies.** (3 cr.; Student Option; Spring Even Year)
Introduces the methods of interpretation and critical debates that have shaped and continue to define the discipline of French studies. Provides a practical introduction to graduate-level literary research. prereq: Grad or instr consent

**FREN 5350. Topics in Literature and Culture.** (3 cr.; max 12 cr.; Student Option; Every Fall & Spring)
Problem, period, author, or topic of interest. See Class Schedule. prereq: 3101 or equiv

**FREN 5470. Post/Colonial Francophone Literatures.** (3 cr.; max 9 cr.; Student Option; Periodic Fall)
Francophone literature from North Africa, Africa, and the Caribbean of the colonial and/or post-colonial eras in the light of relevant literary and cultural theories. prereq: 3111 or above

**FREN 5531. Sociolinguistics of French.** (3 cr.; Student Option; Periodic Fall)
Explores variation in the use of French associated with factors such as medium (oral/ written), style (formal/informal), region, social and economic groups. prereq: Graduate student status and advanced proficiency in French

**FREN 5541. Oral Discourse of French.** (3 cr.; Student Option; Periodic Fall)
Nature of contemporary spoken French discourse. Focuses on spontaneous, multi-speaker discourse. Readings include examples of various linguistic approaches to such discourse. Emphasizes syntactic analysis. Phonological/lexical particularities. ‘Macro’ level analyses such as discourse analysis and conversation analysis. prereq: 3015, grad student; Ling 5001 recommended

**FREN 5571. Old French in Action: Medieval French Language through Songs, Tales, and Plays.** (3 cr.; A-F or Audit; Periodic Fall)
This course introduces students to Old French grammar, vocabulary, and phonetics through language exercises and the reading and performance of original texts. Along the way, students will learn about the genres of medieval French literature, how these texts originally circulated, and how artists today work from medieval manuscripts to create new performances. Coursework will alternate between language lessons, oral and written exercises, the reading, translation, and discussion of Old French texts, and recitation and interpretive performance. French 5571 is designed for graduate students, honors undergraduates, and other high-achieving juniors and seniors with particular interest in medieval language, literature, and culture. It covers the same material as French 3571 and also how to read and edit texts from medieval manuscripts. Class is conducted in modern French. No prior experience of the medieval language is expected. prereq: French 3016.

**FREN 5995. Directed Teaching.** (1 cr.; S-N or Audit; Every Fall)
Directed teaching. prereq: instr consent

**FREN 8110. Topics in Early Medieval French Literature.** (3 cr.; max 9 cr.; Student Option; Periodic Spring)
Introduction to epic, romance, allegory, and theater in Old French readings (12th-13th centuries). Specific topics/texts studied vary. Taught in French.

**FREN 8111. Introduction to Old French.** (3 cr.; Student Option; Periodic Fall & Spring)
Studies in medieval French: instruction in reading Old French, sources of bibliography, and topics in medieval studies (language and literature). Taught in French.

**FREN 8114. Troubadour Lyric and Old Occitan Language.** (3 cr.; Student Option; Periodic Fall & Spring)
Language and literature of Old Occitan (Old Provençal), chiefly troubadours' songs. Some language instruction, reading of lyrics, consideration of social context, introduction to scholarly tradition. Knowledge of French, Spanish, Italian, or Latin desirable. Taught in English.

**FREN 8120. Topics in Later Medieval French Literature.** (3 cr.; max 9 cr.; Student Option; Fall Odd Year)
Problems presented by texts written in France ca. 1300-1500. Evolution of Middle French language. Specific topics/texts vary. Taught in French.

**FREN 8125. Short Narrative in the Middle Ages.** (3 cr.; A-F only; Fall Odd Year)
Short forms of medieval narrative. Examples from French literary production within context of socioeconomic history from ca. 1100 to ca. 1550. prereq: French 8110 or instr consent

**FREN 8190. Old French Workshop.** (1 cr.; max 3 cr.; A-F only; Periodic Fall)
Workshop runs concurrently with seminars on Old French literature. Advanced practicum in reading Old French, with discussions of the particularities of seminar texts and formal, aesthetic, and hermeneutic issues directly related to the original language. Students read portions of texts in Old French and prepare an original translation. The workshop is not an introduction to Old French Students planning to make medieval French literature their research field should register for the workshop each time it is offered. prereq: French 5571 or other prior course on Old French language, concurrent registration in the related Ph.D. seminar.

**FREN 8210. Narrative, History, and Memory: Topics.** (3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Significance of narrative paradigm in literature, history, and cultural memory. Specific topics/ texts treated vary. Taught in French.

**FREN 8220. Staging the Common.** (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)

**FREN 8230. Critical Issues: Criticism and Thought.** (3-9 cr. [max 27 cr.]; Student Option; Fall Odd Year)
Critical issues relating to works in criticism/thought related to French/Francophone literature, philosophy or culture.

**FREN 8240. Critical Issues: French and Francophone Cinema.** (3-9 cr. [max 27 cr.]; A-F only; Fall Odd Year)
Critical issues relating to French/Francophone cinema.

**FREN 8250. Critical Issues: Poetry.** (3 cr.; max 12 cr.; Student Option; Periodic Fall & Spring)
Significant critical issues relating to poetic writing of selected authors or periods.

**FREN 8260. Critical Issues: Theatre.** (3 cr.; max 12 cr.; Student Option; Periodic Spring)
Significant critical issues relating to dramatic writing of selected authors or periods.

**FREN 8270. Critical Issues: Prose.** (3 cr.; max 12 cr.; Student Option; Every Fall & Spring)
Significant critical issues relating to prose writing of selected authors or periods.

**FREN 8271. The Novel of the Ancien Regime.** (3 cr.; Student Option; Periodic Fall & Spring)
Considers major novels of the 17th and 18th centuries in connection with developments in such areas as esthetic theory, intellectual currents, social transformations, and reading practices.

**FREN 8280. Ethics and Aesthetics in French and Francophone Writing.** (3 cr.; A-F only; Periodic Spring)
Explores the question of philosophy's engagement with literature in the twentieth century. Traces this from Greek Antiquity (Plato, Aristotle), especially the moment of differentiation between logos and mythos, rational speech and fiction. Focuses on the breakdown of the borders between these two regimes of discourse in modernity. Explores the limits of the porosity between the two disciplines, especially by examining, instead of philosophy's blind acquiescence to the discourse of fiction, its modalities of resistance to figurative language.
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

FREN 8290. Critical Issues: Perspectives on an Author. (; 3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) In-depth study of major author's writing, critical tradition this writing has occasioned, and theoretical issues upon which this writing may be brought to bear.

FREN 8291. Jean Genet's Writings and French Institutions. (; 3 cr.; Student Option; Periodic Fall & Spring) Jean Genet's writings at the crossroads of several disciplines (politics, psychoanalysis, religion, and law). Genet's novels, dramas, and political essays explore the power of institutional settings and strategies imagined by individuals to short-circuit their impact.

FREN 8333. FTE: Master's. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

FREN 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France. (; 3 cr.; Student Option; Periodic Fall & Spring) Relationship between construction of reason and madness in philosophy, legitimation of political rule, and the institution of literature in early modern France.

FREN 8410. Topics in Quebecois Literature. (; 3 cr. [max 9 cr.]; Student Option; Periodic Spring) Quebecois in relation to other North American literatures and to Francophone literature produced elsewhere in the world. Specific topics/texts vary. Taught in French.

FREN 8420. Critical Issues: Francophone Literature. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall) Critical issues relating to literature of Francophone world. Specific topics/texts vary. Taught in French.

FREN 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

FREN 8521. History of the French Language. (; 3 cr.; Student Option; Periodic Fall & Spring) History of French from its origins in Latin to the present day. Aspects of diachronic phonology (sound change), morphology, syntax. Taught in French.

FREN 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

FREN 8777. Thesis Credits: Master's. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
GWSS 8103. Feminist Theories of Knowledge. (3 cr.; Student Option; Periodic Fall)
Interdisciplinary seminar. Feminist approaches to knowledge and to criticism of paradigms of knowledge operative in the disciplines. Feminist use of concepts of subjectivity, objectivity, and intersubjectivity. Feminist empiricism, standpoint theory, and contextualism. Postmodern and postcolonial theorizing.

GWSS 8107. Feminist Pedagogies. (3 cr.; Student Option; Spring Odd Year)
Explore feminist theories/critical approaches to pedagogy. Develop teaching philosophy statement, design syllabus, practice teach/learn problem-solving strategies for classroom. Prereq: Feminist Studies grad student [Major] or Minor or instr consent

GWSS 8108. Genealogies of Feminist Theory. (3 cr.; Student Option; Every Fall)
Two-semester seminar. First term: debates in gender theory; intersections of gender theory with critical race theory, post-colonial theory, sexuality theory, social class analysis. Second term: inter/multi-disciplinary feminist research methodologies from humanities/social sciences, Prereq: Feminist studies PhD or grad minor student or instr consent

GWSS 8109. Feminist Knowledge Production. (3 cr.; Student Option; Every Spring)
Two-semester interdisciplinary seminar. First term: debates in gender theory; gender theory, critical race theory, post-colonial theory, sexuality theory, social class analysis. Second term: inter/multi-disciplinary feminist research methods from humanities/social sciences. Prereq: Feminist studies PhD or grad minor student or instr consent

GWSS 8201. Feminist Theory and Methods in the Social Sciences. (3 cr.; Student Option; Periodic Fall & Spring)
Seminar on recent theories, including feminist versions of positivist, interpretivist, critical theoretical, and postmodernists models of social science knowledge. Methodologies congenial to feminist practices of inquiry, including use of narrative in theory, feminist ethnography, discourse analysis, and comparative methods in history.

GWSS 8210. Seminar: Feminist Theory & Practice. (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Topics in feminist theory.

GWSS 8220. Seminar: Science, Technology & Environmental Justice. (3 cr. [max 6 cr.]; Student Option; Periodic Spring)
Topics related to science, technology, environmental justice.

GWSS 8230. Seminar: Cultural Criticism and Media Studies. (3 cr. [max 6 cr.]; Student Option; Periodic Spring)
Topics in literature, film, art.

GWSS 8250. Seminar: Nation, State, and Citizenship. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Topics related to nation, state, citizenship.

GWSS 8260. Seminar: Race, Representation and Resistance. (3 cr. [max 6 cr.]; Student Option; Every Spring)
Race, racialization, racial justice as related to representation/struggles for social/economic justice. Intersectional analysis of power, politics, ideology/identity. Queer of color critique, women of color feminisms, critical sex/body positive approaches. Prereq: Grad student

GWSS 8270. Seminar: Theories of Body. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
How body is configured in many social arenas. Legal decisions, policy making, medical research, cultural customs. Examine how attitudes toward male/female bodies influence social myths/discourses about social policy/change.

GWSS 8301. Feminist Literary Criticism. (3 cr.; Student Option; Periodic Fall & Spring)
Recent developments and major issues in feminist studies of literature. Introduction to array of scholars and scholarship in field of feminist literary theory and criticism, emphasizing broad range of feminist textual analysis taking place in various University departments.

GWSS 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Master’s student, adviser and DGS consent

GWSS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Doctoral student, adviser and DGS consent

GWSS 8490. Seminar: Transnational, Postcolonial, Diaspora. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Graduate topics in comparative/global studies.

GWSS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD Prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

GWSS 8888. Thesis Credit: Doctoral. (1-24 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Max 18 cr per semester or summer; 24 cr required

GWSS 8993. Directed Study. (1-6 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer)
TBD

GWSS 8994. Directed Instruction. (1-8 cr. [max 36 cr.]; Student Option; Every Fall, Spring & Summer)
TBD

GWSS 8995. Directed Research. (1-8 cr.; No Grade Associated; Every Fall & Spring)
TBD

GWSS 8996. Feminist Studies Colloquium. (1 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring)
TBD Prereq: Grad major or minor in feminist studies

GWSS 8997. Dissertation Seminar. (1-3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Conceptualizing the research problem for the dissertation and structuring the process of writing a chapter of it. Prereq: AmSt doctoral student beginning dissertation work

GWSS 8998. Professional Development. (1-3 cr. [max 6 cr.]; S-N only; Every Spring)
Workshop addressing one of a variety of professional development issues including, but not limited to, grant writing, book reviewing, revising term papers for publication, course development, writing and presenting conference papers, preparing to enter the job market (writing a c.v./application letter, preparing for interviews, job talk). Prereq: Grad student.

GWSS 8999. Professional Development. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)

GWSS 9151. Advanced General Dentistry Seminar I. (5-10 cr.; S-N or Audit; Every Fall & Summer)
Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GWSS 9152. Advanced General Dentistry Seminar II. (5-10 cr.; S-N or Audit; Every Fall)
Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GWSS 9153. Advanced General Dentistry Seminar III. (2-10 cr.; S-N or Audit; Every Fall & Spring)
Clinical seminars with emphasis on treatment planning, case presentation, techniques and materials, comprehensive oral healthcare and maintenance, and issues in practice management. Correlated with concurrent clinical experiences.

GWSS 9254. Advanced General Dentistry Clinic I. (5-15 cr.; S-N or Audit; Every Fall & Summer)
Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GWSS 9255. Advanced General Dentistry Clinic II. (5-15 cr.; S-N or Audit; Every Fall)
Comprehensive oral health care delivered in a variety of settings, emphasizing complex
restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5256. Advanced General Dentistry Clinic III. (2-10 cr. : S-N or Audit; Every Fall & Spring) Comprehensice oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5261. Advanced General Dentistry Clinical Administration I. (5-10 cr. : S-N or Audit; Periodic Fall & Spring) Field experience in community dental clinic practice and administration.

GEND 5262. Advanced General Dentistry Clinical Administration II. (5-10 cr. : S-N or Audit; Every Fall) Field experience in community dental clinic practice and administration.

GEND 5263. Advanced General Dentistry Clinical Administration III. (1-10 cr. : S-N or Audit; Every Fall & Spring) Field experience in community dental clinic practice and administration.

GEND 5264. Advanced General Dentistry Clinic IV. (1-15 cr. : S-N or Audit; Every Summer) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5265. Advanced General Dentistry Clinic V. (1-15 cr. : S-N or Audit; Every Fall) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 5266. Advanced General Dentistry Clinic VI. (1-15 cr. : S-N or Audit; Every Fall & Spring) Comprehensive oral health care delivered in a variety of settings, emphasizing complex restorative care, coordinating care with dental and medical specialists, special needs patients, and advanced techniques.

GEND 6151. General Practice Seminar I. (3 cr. : S-N or Audit; Every Fall & Summer) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6152. General Practice Seminar II. (3 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6153. General Practice Seminar III. (3 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6154. General Practice Seminar IV. (3 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6251. General Practice Clinical Administration I. (2-10 cr. : S-N or Audit; Every Fall & Spring) Field experience in hospital dental clinic administration for residents.

GEND 6252. General Practice Clinical Administration II. (2-10 cr. : S-N or Audit; Every Fall & Spring) Field experience in hospital dental clinic administration for residents.

GEND 6253. General Practice Clinical Administration III. (2-10 cr. : S-N or Audit; Every Fall & Spring) Field experience in hospital dental clinic administration for residents.

GEND 6254. General Practice Clinic I. (2-10 cr. : S-N or Audit; Every Fall & Summer) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6255. General Practice Clinic II. (2-10 cr. : S-N or Audit; Every Fall & Summer) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6256. General Practice Clinic III. (2-10 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6257. General Practice Clinic IV. (2-10 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6261. General Practice Clinical Administration I. (5-10 cr. : S-N or Audit; Periodic Fall & Spring) Field experience in hospital dental clinic administration for residents.

GEND 6262. General Practice Clinical Administration II. (5-10 cr. : S-N or Audit; Every Fall) Field experience in hospital dental clinic administration for residents.

GEND 6263. General Practice Clinical Administration III. (5-10 cr. : S-N or Audit; Every Fall & Spring) Field experience in hospital dental clinic administration for residents.

GEND 6264. General Practice Clinic IV. (10-15 cr. : S-N or Audit; Periodic Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6265. General Practice Clinic V. (10-15 cr. : S-N or Audit; Every Fall) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

GEND 6266. General Practice Clinic VI. (10-15 cr. : S-N or Audit; Every Fall & Spring) A series of planned experiences in the clinical disciplines of dentistry, with emphasis on patient care.

Genetics, Cell Biol/Developmnt (GCD)

GCD 5005. Computer Programming for Biology. (3 cr. : Student Option; Every Fall) Computer programming skills with applications in biology. Design/build new computer programs for applications in cell/developmental biology, including modeling of biological processes, advanced data analysis, automated image analysis. prereq: BIOL 4003 or GCD 3033, general statistics course

GCD 5036. Molecular Cell Biology. (3 cr. : Student Option; Every Fall) Modern, integrative approaches combining cell/molecular biology, biochemistry, and genetics to investigate cell organization/function. Membranes, signaling, extracellular matrix, secretion, endocytosis, cytokkeleton, nucleus. Analysis of scientific papers to illustrate new concepts and experimental approaches to cell organization/function. prereq: Biol 4004 or instr consent; [sr or grad student] recommended

GCD 6103. Human Histology. (3-8 cr. : P-N or Audit; Every Fall) Human histology is a lecture and laboratory class covering light and electron microscopic anatomy of tissues and their organization into human organs. The emphasis is on integrating structure and its relationship to function at levels from molecules to organs. prereq: Enrolled as medical or dental student or instr consent

GCD 6110. Science of Medical Practice. (3-6 cr. : A-F or Audit; Every Fall) Combines Biochemistry/Medical Genetics aimed toward Medical/Geneic Counseling students. Biochemistry content covers genome organization, transcription, metabolism, nutrition, stem cell biology, cell signaling, cancer. Genetics content covers inheritance, genetic/genomic conditions, inborn errors of metabolism, cancer genetics, complex inheritance/genetic susceptibility to disease, birth defects. Meets with INMD 6802. prereq: Medical student or MCDB concurrent registration is required (or allowed) in G MS student with genetic counseling specialization or instr consent

GCD 8001. Genetic Counseling Clinical Internship I. (3 cr. [max 6 cr.] : A-F only; Every Summer) This is a 10-week clinical internship in genetic counseling practice. Students in this course will be assigned to an appropriate clinic affiliated with the graduate program of study in genetic counseling. Students must be enrolled in the program in order to take this course. Students will be expected to attend clinic and under the supervision of a board certified genetic counselor or medical geneticist, students are expected to log a minimum case load as defined by the Accreditation Council for Genetic Counseling (ACGC), the American Board of Genetic Counseling and the graduate program in genetic counseling at the University of Minnesota. The actual days and hours of the assigned clinic will be set by the clinical supervisor on site.

GCD 8002. Genetic Counseling Clinical Internship II. (5 cr. [max 10 cr.] : A-F only; Every Fall) This is a 15-week clinical internship course in genetic counseling practice. Students in this course will be assigned two appropriate clinics affiliated with the graduate program of study in genetic counseling. Students must be enrolled in the program in order to take this course. Students will be expected to attend clinic and will provide genetic counseling services under the supervision of a board certified genetic counselor or medical geneticist. Students are expected to log a minimum caseload that meets the criteria for clinical training by the Accreditation Council for Genetic Counseling (ACGC), the American Board of Genetic Counseling and the graduate program in genetic counseling at the University of Minnesota. The actual days and hours of the assigned clinics will be set by the clinical supervisor on site.
GCD 8003. Genetic Counseling Clinical Internship III. (5 cr. [max 10 cr.] ; A-F only; Every Spring) This is a 15-week clinical internship course in genetic counseling practice. Students in this course will be assigned two appropriate clients affiliated with the graduate program of study in genetic counseling. Students must be enrolled in the program in order to take this course. Students will be expected to attend clinic and will provide genetic counseling services under the supervision of a board certified genetic counselor or medical geneticist. Students are expected to log a minimum caseload that meets the criteria for clinical training by the Accreditation Council for Genetic Counseling (ACGC), the American Board of Genetic Counseling and the graduate program in genetic counseling at the University of Minnesota. The actual days and hours of the assigned clinics will be set by the clinical supervisor on site.

GCD 8008. Mammalian Gene Transfer and Genome Engineering. (2 cr.; A-F or Audit; Every Spring) Current gene transfer and genome engineering technology. Applications of genetic modifications in animals, particularly transgenic animals and human gene therapy. prereq: instr consent

GCD 8014. Small RNA Biology. (2 cr.; A-F or Audit; Every Spring) Small RNAs as major regulators of gene and protein expression. MicroRNAs and their potential use in diagnosis and prognosis of various disease conditions including cancers. Biology of small RNAs and their role in health and disease. prereq: MICA 8004 or BIOL 8002 or equiv or instr consent

GCD 8073. Genetics & Genomics in Human Health. (3 cr.; Student Option; Every Spring) Application of molecular, biochemical, chromosomal, and population genetics to human variation and disease. Abnormal chromosome number and structure; abnormal enzyme, structural protein, receptor, and transport; analysis of inheritance patterns; behavioral genetics; genetic basis of common disease. Current research articles in human genetics. prereq: 8131 or BIOL 4003 or MCRP 4034 or instr consent

GCD 8103. Human Histology. (5 cr.; Student Option; Every Fall) Light/electron microscopic anatomy of tissues and their organization into human organs. Emphasizes integrating structure, its relationship to function at levels from molecules to organs. Lecture, lab. prereq: Undergraduate biology, chemistry, math, and physics course; instr consent

GCD 8131. Advanced Molecular Genetics and Genomics. (3 cr.; Student Option; Every Fall & Spring) Literature-based course in modern molecular genetic and genomic analysis. Students will gain a deep understanding of the fundamental molecular mechanisms controlling inheritance in biological systems. Students will gain a facility in thinking critically and creatively about how genes work at cellular, organismal, and transgenerational levels. Course instruction emphasizes active-learning approaches, student presentations, and group projects. prereq: [3022 or BIOL 4003], [BIOL 3021 or BIOL 4331] or instr consent

GCD 8151. Cellular Biochemistry and Cell Biology. (2-4 cr.; A-F only; Every Fall) This course introduces graduate students to fundamental concepts of Biochemical Unity (Part 1) and Cell Theory (Part 2). For Part 1, we will discuss matter of life, equilibrium, entropy & law of mass action, two state systems, random walks & diffusion, rate equations of chemical reactions, and explore how they relate to regulation of biological networks (gene regulation and signal transduction). For Part 2 we will focus on properties of biological membranes, membrane trafficking, protein import & degradation, nuclear structures and their function, as well as molecular motors, cytoskeletal dynamics, and mitosis. The course assumes students have had previous undergraduate courses in cell biology, biochemistry and genetics. prereq: [[4034 or 8121 or BIOC 8002], Biol 4004] or BMBB or MCDGB grad student or instr consent

GCD 8161. Advanced Cell Biology and Development. (3 cr.; A-F only; Every Spring) The advanced cell and developmental biology of embryos, taught through in-depth, comparative analysis of historical and current primary research articles that illustrate developmental mechanisms and experimental approaches in key invertebrate and vertebrate model organisms. prereq: [BMBB or MCDGB grad student] or [GCD 4161, [GCD 8131 or Biol 4003], Biol 4004, and GCD 4034] or instr consent

GCD 8171. Literature Analysis. (1-2 cr.; A-F only; Every Fall) Critical reading and evaluation of current literature. May include evaluation of both excellent and flawed papers. Intensive and in-depth discussions of selected papers in molecular biology, genetics, cell biology, and developmental biology. prereq: Grad MCDBG or BMBB major

GCD 8900. Seminar. (1-2 cr.; max 8 cr.;) S-N or Audit; Every Fall & Spring) Current scientific research. prereq: Grad MCDG major or instr consent

GCD 8911. Introduction to Genetic Counseling Skills and Practice. (3 cr.; A-F only; Every Fall) Course focuses on basic concepts used in clinical genetic counseling practice. Students learn the necessary skills to prepare for and implement a genetic counseling session. The class will cover a variety of areas in the genetic counseling sub-specialty of prenatal genetics as well as newborn screening. Students will practice communicating genetics and medical information in a patient-friendly manner. At the end of the semester, students will be equipped with tools to assess medical and family histories, present genetic cases, and role play genetic counseling sessions. prereq: This class is intended for Molecular, Cellular, Biology and Genetics M.S. students with genetic counseling specialization.

GCD 8912. Genetic Counseling in Practice. (4 cr.; A-F or Audit; Every Spring) Practical genetic counseling, communicating genetics and medical information to the family, helping families with decision making. prereq: MCDG MS student with genetic counseling specialization or instr consent

GCD 8913. Psychosocial Issues in Genetic Counseling I. (3 cr.; A-F only; Every Fall) This course is designed to introduce students to the psychosocial issues that commonly arise in genetic counseling, as well as develop their individual counseling skills to assist them in effectively counseling patients. prereq: MCDG MS student with genetic counseling specialization or instr consent

GCD 8914. Ethical and Legal Issues in Genetic Counseling. (3 cr.; A-F or Audit; Every Spring) Professional ethics; ethical and legal concerns with new genetic technologies. prereq: MCDG MS student with genetic counseling specialization or instr consent

GCD 8915. Psychosocial Issues in Genetic Counseling II. (3 cr. [max 5 cr.]; A-F only; Every Spring) This course is designed to introduce Genetic Counseling Masters students to the psychosocial issues that commonly arise in genetic counseling, as well as develop their individual counseling skills to assist them in effectively counseling patients.

GCD 8920. Special Topics. (1-4 cr.; Student Option; Every Fall & Spring) Special topic shell

GCD 8933. Directed Studies. (1-5 cr. [max 15 cr.]; Student Option; Every Fall, Spring & Summer) tbd prereq: MCDG MS student with genetic counseling specialization or instr consent

GCD 8994. Research. (1-5 cr. [max 20 cr.]; S-N or Audit; Every Fall, Spring & Summer) Independent research determined by student's interests, in consultation with faculty mentor. prereq: MCDG MS student with genetic counseling specialization or instr consent

Geographic Information Science (GIS)

GIS 5530. GIS Internship. (1-3 cr. [max 6 cr.]; S-N only; Every Fall & Spring) Practical hands-on experience using GIS to solve problems in a real-world work environment. prereq: instr consent, strong GIS/ mapping skills

GIS 5555. Basic Spatial Analysis. (3 cr.; Student Option; Every Fall) How to use spatial data to answer questions on a wide array of social, natural, and information science issues. Exploratory data analysis/ visualization. Spatial autocorrelation analysis/ regression. prereq: [STAT 3001 or equiv, MGIS student] or instr consent
GIS 5571. ArcGIS I. (3 cr.; Student Option; Every Fall)
First of a two-course series focusing on ArcGIS Desktop. Overview of ArcGIS system and its use for spatial data processing. Data capture, editing, geometric transformations, map projections, topology, Python scripting, and map production. prereq: [GEOG 5561 or equiv, status in MGIS program, familiarity with computer operating systems] or instr consent

GIS 5572. ArcGIS II. (3 cr.; Student Option; Every Spring)
Continues GIS 5571. Raster analysis, dynamic segmentation, geometric networks, geocoding, Python scripting, and data interoperability. Substantial projects include map and poster design and production. prereq: [GEOG 5561 or equiv, in MGIS program] or instr consent

GIS 5573. Introduction to Digital Mapping: ArcGIS Basics. (2 cr.; A-F only; Every Fall)
Desktop mapping functions using ArcGIS software. Application of systems to display/analyse geographical data. prereq: [GEOG 5561 or equiv, in MGIS program] or instr consent

GIS 5574. Web GIS and Services. (3 cr.; Student Option; Every Fall)
Plan, design, develop, publish web-based GIS solution. Build websites, prepare data for web. Commercial software, Open Source software, volunteer geographic information, open GIS standards/developing web GIS application. Hands-on experience with variety of web GIS technologies/software. prereq: [GEOG 5561 or equiv, in MGIS program] or instr consent

GIS 5575. Practical Surveying for GIS. (2 cr.; Student Option; Every Spring)
Surveying techniques/relationship of GPS to GIS professionals. Geodesy, data adjustment, datums, ellipsoids, coordinate systems, transformations. prereq: GEOG 5561 or equiv in MGIS program or instr consent

GIS 5576. Spatial Digital Humanities. (3 cr.; Student Option; Every Spring)
Introduction to Spatial Digital Humanities GIS 5576 is a basic overview of desktop GIS (both Esri and open source), as well as an introduction to a number of other mapping techniques (such as Esri Maps for Office, ArcGIS Online, web mapping basics, georeferencing historical maps, etc) in addition to digital scholarship techniques. Course objectives include: understanding the basics of mapping and geospatial information using GIS; documenting and managing spatial data using coherent/standardized methods; understanding several spatial analysis methods that are relevant to student research area; and applying spatial research methods into student research.

GIS 5577. Spatial Database Design and Administration. (3 cr.; Student Option; Every Spring)
Spatial database design, development planning/management, maintenance, security, access/distribution, and documentation. prereq: instr consent

GIS 5578. GIS Programming. (3 cr.; Student Option; Every Spring)
Programming techniques using Python and other languages specifically relating to GIS technologies. prereq: instr consent

GIS 5590. Special Topics in GIS. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall, Spring & Summer)
Topics vary according to curricular needs, technological developments in field.

GIS 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall & Spring)
(No description) prereq: Master's student, adviser and DGS consent

GIS 8501. GIS Project Management and Professional Development. (3 cr.; A-F only; Every Fall)
Project management/professional development. Portfolio creation, career exploration, degree program planning. GIS project management through lectures, class exercises, guest speakers. prereq: MGIS student or instr consent

GIS 8990. Research Problems in GIS. (1-6 cr.; A-F only; Every Fall, Spring & Summer)
Project of sufficient scope/complexity to document student's ability to apply spatial analysis and visualization techniques to real-world problems. Supervised by faculty member. prereq: MGIS student, instr consent

Geography (GEOG)

GEOG 5361. Geography and Real Estate. (4 cr.; Student Option; Every Spring)
Origins and evolution of land ownership in the United States.

GEOG 5374. The City in Film. (WI; 4 cr.; Student Option; Every Spring)
Cinematic portrayal of changes in 20th-century cities worldwide. Social/cultural conflict, political/economic processes, changing gender relationships, rural versus urban areas, population/development issues (especially as they affect women/children). Meets concurrently with 3374. Additional weekly meeting discusses films, readings. Project on a topic selected in consultation with instructor. prereq: grad student or instr consent

GEOG 5385. Globalization and Development: Political Economy. (4 cr.; Student Option; Periodic Fall & Spring)
Nature/scope of modern world system (capitalism), its impact on regional development processes. Roles of state and of international financial institutions. prereq: Sr or grad or instr consent

GEOG 5393. Rural Landscapes and Environments. (4 cr.; Student Option; Every Spring)
Analysis of three principal components of rural landscape (form of land surface, plant life that cloaks it, structures that people have placed upon it). Structures associated with agriculture, including mining, forestry, resort areas, and small towns.

GEOG 5401. Geography of Environmental Systems and Global Change. (4 cr.; Student Option; Periodic Fall)
Processes that create/change the spatial patterns of climate, vegetation, and soils. Potential of humans to alter climate, vegetation, and soil processes. Possible impacts of human-altered environmental conditions. prereq: grad student or instr consent

GEOG 5426. Climatic Variations. (3 cr.; Student Option; Periodic Fall)
Theories of climatic fluctuations and change at decadal to centuries time scales; analysis of temporal and spatial fluctuations especially during the period of instrumental record. prereq: 1425 or 3401 or instr consent

GEOG 5431. Plant and Animal Geography. (3 cr.; Student Option; Periodic Fall)
Introduction to biogeography. Focuses on patterns of plant/animal distributions at different scales over time/space. Evolutionary, ecological, and applied biogeography. Paleoecobiogeography, vegetation-environment relationships, vegetation dynamics/disturbance ecology, human impact on plants/animals, nature conservation. Discussions, group/individual projects, local field trips.

GEOG 5511. Principles of Cartography. (4 cr.; Student Option; Every Spring)

GEOG 5530. Cartography Internship. (2-7 cr. [max 10 cr.]; S-N or Audit; Every Fall & Spring)
Provides intensive hands-on experience in contemporary map production and design, ranging from GIS applications to digital prepress. Strong computer skills essential. prereq: instr consent

GEOG 5531. Numerical Spatial Analysis. (4 cr.; Student Option; Every Fall)
Applied/theoretical aspects of geographical quantitative methods for spatial analysis. Emphasizes analysis of geographical data for spatial problem solving in human/physical areas.

GEOG 5541. Principles of Geocomputing. (3 cr.; A-F or Audit; Every Spring)
The availability of computing infrastructures such as high-performance and cloud computing, high-speed networks, and rich data has led to a new scientific paradigm using computational science. Geocomputation is the "application of a computational science paradigm to study a wide range of problems in geographical and earth systems (the geo) contexts" (Openshaw, 2014). This course will introduce students to geocomputation as well as related areas including big spatial data, and cyberinfrastructure. Students will engage in hands-on-exercises learning principles and best-practices in geocomputing. The ability to program is an essential skill for GIScientists. Learning to program takes time and a lost program is an essential skill for GIScientists. The ability to program is an essential skill for GIScientists.
Programming language to solve geospatial problems.

**GEOG 5543. Advanced Geocomputing.** (3 cr.; Student Option; Every Fall)

The availability of computing infrastructures such as high-performance and cloud computing, high-speed networks, and rich data has led to a new scientific paradigm using computational approaches, termed computational science. Geocomputation is the 'application of a computational science paradigm to study a wide range of problems in geographical and earth systems (the geo contexts’ (Odenhaw, 2014). This course will delve into advanced topics in geocomputation as well as related areas ranging from geographic information and spatial big data to cyberinfrastructure and parallel computation. Students will engage in hands-on exercises learning principles and best practices in geocomputing while using cutting-edge computational infrastructures.

**GEOG 5561. Principles of Geographic Information Science.** (4 cr.; Student Option; Every Fall & Spring)

Introduction to the study of geographic information systems (GIS) for geography and non-geography students. Topics include GIS application domains, data models and sources, analysis methods and output techniques. Lectures, reading, and hands-on experience with GIS software. prereq: grad

**GEOG 5562. GIS Development Practicum.** (3 cr.; Student Option; Periodic Fall)

Algorithms/data structures for digital cartographic data, topological relationships, surface modeling, and interpolation. Map projections, geometric transformations, numerical generalization, raster/vector processing. Hands-on experience with software packages. prereq: GIS 5571 or instr consent

**GEOG 5563. Advanced Geographic Information Science.** (3 cr.; Student Option; Every Fall & Spring)

Advanced study of geographic information systems (GIS). Topics include spatial data models, topology, data encoding, data quality, database management, spatial analysis tools and visualization techniques. Hands-on experience using an advanced vector GIS package. prereq: B or better in 3561 or 5561 or instr consent

**GEOG 5564. Urban Geographic Information Science and Analysis.** (3 cr.; Student Option; Periodic Fall)

Core concepts in urban geographic information science including sources for urban geographical and attribute data (including census data), urban data structures (focusing on the TIGER data structure), urban spatial analyses (including location-allocation models), geodemographic analysis, network analysis, and the display of urban data. prereq: 3561 or 5561

**GEOG 5588. Advanced Geovisualization.** (3 cr.; Student Option; Every Fall)

The generation and use of geographic information has become an integral part of our daily life, science, and technology. This has led to increasing interest in the design and development of interactive maps and dynamic geographic visualizations in 2D, 3D, and Web environments. The Advanced Geovisualization course intends to equip students with the knowledge and advanced technical skills needed to design and implement effective maps and create dynamic and interactive visualizations using geospatial data sets.

**GEOG 5589. Introduction to Dendrochronology.** (3 cr.; Student Option; Every Fall)

Introduction to dendrochronology, including the application of tree-ring data to investigate environmental change and past cultures. prereq: [1403, [BIOL 1001 or BIOL 1009 or equiv]] or instr consent

**GEOG 5900. Topics in Geography.** (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)

Special topics and regions. Course offered by visiting professors in their research fields.

**GEOG 8001. Problems in Geographic Thought.** (3 cr.; A-F or Audit; Periodic Fall)

Currents of geographic thought in biophysical, GIS, human, cultural, and urban-environment subfields. Focuses on concepts/paradigms through which geographers have attempted to unify/codify the discipline, around which debate has flourished, and about which interdisciplinary histories can be traced.

**GEOG 8002. Research Methods in Geography.** (3 cr.; Student Option; Every Spring)

Seminar. Overview of research designs/methods in geography. Relationships between different research paradigms (modes of inquiry), research designs, and methods. Critical readings. Analyses of research projects.

**GEOG 8005. Proseminar: Population Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world. prereq: instr consent

**GEOG 8006. Proseminar: Research Methods in Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Introduction to research design, strategies, methods of data collection, analysis, interpretation, and representation in contemporary geographic research. prereq: instr consent

**GEOG 8007. Proseminar: Theories of Development and Change.** (3 cr.; Student Option; Periodic Fall & Spring)

Recent research themes and questions in geography and related social sciences on Third World development; development theories, conceptually grounded case studies, and grassroots-based research. prereq: instr consent

**GEOG 8020. Research Seminar: Economic Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Contemporary research. Advanced topics, which vary with interests of faculty offering course. prereq: instr consent

**GEOG 8010. Proseminar: Nature and Society.** (3 cr.; Student Option; Periodic Fall & Spring)

Interconnectedness of environment and people, nature and society. Conceptual literature and empirical studies in human/cultural/political ecology. prereq: instr consent

**GEOG 8012. Proseminar: The State, the Economy, and Spatial Development.** (3 cr.; Student Option; Periodic Fall & Spring)

Introduction to research in economic, political, and urban geography: conceptual research addressing interrelationship between political and economic processes and spatial dynamics of urban and regional development; empirical research documenting nature and extent of this interrelationship at different spatial scales. prereq: instr consent

**GEOG 8013. Proseminar: Physical Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Historical development of research in physical geography, current research trends, and transfer of current research to undergraduate education. prereq: instr consent

**GEOG 8105. Proseminar: Historical Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Introduction to conceptual research and empirical studies. prereq: instr consent

**GEOG 8106. Seminar: Social and Cultural Geography.** (3 cr.; Student Option; Periodic Fall & Spring)

Role of space and place in constitution of social and cultural life, social relations, and social identities; class, space, and place; geography of race and racism; environmental racism; geography of gender and sexuality; nationalism, national identity, and territory. prereq: instr consent

**GEOG 8107. Geographic Writing.** (3 cr.; S-N or Audit; Every Fall)

Analysis of organization and presentation of geographic research. Critiques of selected examples of geographic writing. prereq: instr consent

**GEOG 8200. Seminar: Urban Geography.** (2-3 cr.; A-F or Audit; Periodic Spring)

Contemporary research. Topics vary with the interests of faculty.

**GEOG 8201. Explorations in the Geography of Minnesota.** (3 cr.; S-N or Audit; Periodic Fall & Spring)

Physical environment, agriculture, forestry, mining, land survey, population, recreation, cities/towns, transportation. Sources of information about the state. Students make short oral/written reports. Might provide springboard for a Plan B paper, thesis, or dissertation. Two or three Saturday field trips. prereq: instr consent

**GEOG 8211. Federal Policy Research.** (3 cr.; Student Option; Every Fall)

U.S. environmental policies at federal/state level. Policy formulation, implementation, and
evaluation. This seminar provides students with the necessary information to carry out independent research into public policy and will add unfamiliar sources to their research bibliographies. Descriptive and analytical rather than theoretical, and illustrative rather than comprehensive, it gives both social scientists and biophysical scientists additional perspective to their personal research and adds an important dimension to their analysis. It will allow them to find, describe, critically review, and communicate those aspects of federal policy of concern. Students are encouraged to choose areas of policy coinciding with their areas of research. prereq: instr consent

GEOG 8290. Seminar in GIS and Cartography. (3 cr.; Student Option; Periodic Fall & Spring)
Selected concepts/methods. Topics, which vary yearly, include spatial analysis methods in GIS; advanced visualization methods; data quality and error propagation in GIS; generalization methods in GIS and cartography; role of time in GIS; interactive/animated cartography; incorporation of uncertainty. prereq: instr consent

GEOG 8291. Seminar in GIS, Technology, and Society. (3 cr.; Student Option; Periodic Fall & Spring)

GEOG 8292. Seminar in GIS: Spatial Analysis and Modeling. (3 cr.; Student Option; Spring Every Year)
Overview of Geographic Information Systems (GIS) and spatial analysis/modeling of human/environmental systems. Spatial statistics, modeling spatiotemporal processes, simulation techniques, visualization, complex systems/complexity. Guidance in thesis/dissertation research. prereq: 3511 or equiv statistics course, or 5561 or equiv intro GIS course or instr consent

GEOG 8293. CyberGIS. (3 cr.; Student Option; Every Spring)
Just as physical infrastructure provides services such as electricity, plumbing, and road networks to communities across the world, cyberinfrastructure has emerged to provide computational services and capabilities to scientific communities. Cyberinfrastructure integrates high-performance computing, digital sensors, virtual organizations, and software tools and services to facilitate computationally-intensive and collaborative scientific research. CyberGIS, broadly defined as cyberinfrastructure-based geographic information systems, integrates cyberinfrastructure, geographic information systems (GIS), and spatial analysis to enable collaborative geographic problem solving. This course will delve into advanced topics within the context of cyberGIS and related technologies. Particular emphasis will be placed on raster data processing including a broad introduction to raster data, cartographic modeling, and raster data manipulation. We will situate raster data processing in the broader context of advanced information science and cyberGIS focusing on the how synthesizing computational thinking and spatial thinking influence methodological approaches. Students will be expected to draw on their own experiences and backgrounds to enhance discussions, labs, and research projects. Students will gain hands-on experience developing methods to analyze and manipulate raster data.

GEOG 8294. Spatiotemporal Modeling and Simulation. (3 cr.; Student Option; Periodic Spring)
Many geographic, societal, and environmental phenomena as well as biological and ecological systems involve dynamic processes that are changing in space and time. Examples include hurricanes, animal migrations, spread of diseases, human mobility and population dynamics. Movement is a key to understanding the underlying mechanisms of these dynamic processes. Today, the availability of an unprecedented amount of movement observations at ne spatial and temporal granularities has resulted in substantial advances in GIScience approaches for the analysis, modeling, and simulation of movement and its patterns. Spatiotemporal models and simulation techniques are often used to analyze and better understand the patterns of spatiotemporal processes, and to assess their behavioral responses in varying environmental conditions. This seminar introduces students to the concepts of spatiotemporal processes and patterns. We review existing methods for modeling and simulation of spatiotemporal phenomena, especially movement. Students will develop computational skills to model a phenomena of their choice and create simulations.

GEOG 8301. Advanced Qualitative Methods. (3 cr.; A-F or Audit; Periodic Fall & Spring)

GEOG 8302. Research Development. (3 cr.; S-N or Audit; Periodic Fall)
Students in geography and related social sciences are guided in key steps to effective research proposal writing. prereq: instr consent

GEOG 8333. FTE: Masters. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent.

GEOG 8336. Development Theory and the State. (3 cr.; A-F or Audit; Every Spring)
Why certain interventionist states in third world countries have been able to guide their economies to overcome legacy of underdevelopment while most have failed to induce development. Internal/external conditions that facilitated such departure from underdevelopment. Comparative national/provincial case studies: Taiwan, South Korea, Botswana, Brazil, India. Applying theoretical approaches to policy issues.

GEOG 8350. Seminar: World Population. (3 cr.; Student Option; Periodic Fall & Spring)
Contemporary research in world population development and problems. Topics vary with interests of faculty offering course. prereq: instr consent

GEOG 8405. Seminar: Graduate Student Professional Development. (1 cr.; S-N or Audit; Periodic Fall & Spring)
Strategies for success in graduate program. Preparation for a career as a geographer.
Completing/defending the dissertation. Publishing, job search, tenure process, oral presentations, non-academic career paths. prereq: Geography grad student

** GEOG 8420. Teaching Practicum. ** (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Teaching methodologies, learning objectives, course content, classroom techniques, student/ course evaluation. Specific application to instruction in Geography. prereq: [Geog or MGIS] grad student or inst consent

** GEOG 8444. FTE: Doctoral. ** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

** GEOG 8666. Doctoral Pre-Thesis Credits. ** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

** GEOG 8777. Thesis Credits: Master’s. ** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

** GEOG 8800. Seminar: Development of Geographic Thought. ** (3 cr.; Student Option; Periodic Fall & Spring) Topics vary with interests of faculty offering course. prereq: inst consent

** GEOG 8888. Thesis Credit: Doctoral. ** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

** GEOG 8970. Directed Readings. ** (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) tbd prereq: dept consent

** GEOG 8980. Topics in Geography. ** (1-3 cr. [max 30 cr.]; Student Option; Every Fall & Spring) Seminar offered by visiting or regular faculty. Topics vary with interests of faculty. prereq: instr consent

** GEOG 8990. Research Problems in Geography. ** (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Individual research projects. prereq: dept consent

** Geriatrics (GER) **

** GERI 7100. Oral Health Services for Older Adults Seminar. ** (2 cr.; Student Option; Every Fall & Spring) A seminar for graduate students on a broad variety of topics related to aging, oral health of older adults, and delivery of oral health services to older adults. Students present articles, complex clinical cases, and ongoing research projects for group discussion.

** GERI 7200. Advanced Clinical Geriatric Dentistry. ** (1-10 cr.; A-F or Audit; Every Fall, Spring & Summer) Practical clinical experience in examination, diagnosis, treatment planning, and treatment of older adult patients in the dental clinic at the Amherst H. Wilder Senior Health Center.

** GERI 7210. Geriatric Hospital Dentistry. ** (1-6 cr.; Student Option; Every Fall, Spring & Summer) Rotations at University of Minnesota Hospital Dental Clinic and/or Minneapolis V.A. Medical Center Dental Clinic. Management of elderly patients in acute care settings. Dental management of patients compromised by medical therapies such as radiation treatment or chemotherapy, as well as those with acute illnesses.

** German (GER) **

** GER 5011. Advanced Conversation and Composition. ** (3 cr.; Student Option; Fall Odd Year) Achieving high proficiency in writing/speaking professional/academic German, prereq: 3012; [grad student or adv undergrad]

** GER 5410. Topics in German Literature. ** (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule.

** GER 5610. German Literature in Translation. ** (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Study in depth of authors or topics from various periods in German literature. Requires no knowledge of German, prereq: No knowledge of German required; or toward major or minor requires reading in German

** GER 5630. Topics in German Cinema. ** (3 cr. [max 9 cr.]; Student Option; Periodic Spring) Topics chosen may focus on specific directors, genres, film production or reception, and/or other formal, theoretical, historical, or political issues. prereq: 3xxx film course or instr consent

** GER 5651. Thinking Environment: Green Culture, German Literature and Global Debates. ** (ENV,LITR; 3 cr.; Student Option; Fall Odd, Spring Even Year) How environmental thinking became social-political force through German literature/ culture, with comparisons to global or U.S. developments. Authors include Goethe, Christa Wolf, Enzensberger.

** GER 5711. History of the German Language I. ** (3 cr.; Student Option; Fall Even Year) Historical development of German, from beginnings to 1450; prereq: 3011

** GER 5712. History of the German Language II. ** (3 cr.; Student Option; Spring Odd Year) Historical development of German from 1450 to 2000; prereq: 5711

** GER 5721. Introduction to Middle High German. ** (3 cr.; Student Option; Fall Odd Year) Introduction to Middle High German language and literature. Study of grammar through formal description of Middle High German phonology, morphology, and syntax. Normalized MHG texts read.

** GER 5722. Middle High German: Advanced Readings. ** (3 cr.; Student Option; Spring Even Year) Acquisition of fluency in reading Middle High German normalized as well as non-normalized texts, both poetry and prose. prereq: 5721

** GER 5734. Old Saxon. ** (3 cr.; Student Option; Periodic Fall) Study of the poetry of Old Saxon. Detailed investigation of Old Saxon in comparison with the other Old Germanic languages.

** GER 5740. Topics in Germanic Medieval Studies. ** (3 cr. [max 9 cr.] ; Student Option; Periodic Spring) Topics specified in Class Schedule.

** GER 5993. Directed Studies. ** (1-4 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. Prereq inst consent, dept consent, college consent.

** GER 8010. Current Debates in Literary and Cultural Theory. ** (3 cr. [max 12 cr.]; Student Option; Every Spring) Seminar. Close readings of theoretical constellations in texts. Topic such as text/image, history/memory/time, oral culture/literacy, public/private, authority/crisis. Draws on literary, philosophical, and theoretical work.

** GER 8020. Problems in Literary and Cultural History. ** (3 cr. [max 12 cr.]; Student Option; Every Spring) Historiographic texts as literature and literary or filmic texts as historical documents. Homogenizing/constructive elements in historiography. Strategies of writing historical syntheses.

** GER 8200. Seminar in Medieval German Literature and Culture. ** (3 cr. [max 9 cr.]; Student Option; Spring Even Year) Topics on specific author, group of authors, genre, or subject matter in German literature, ca. 800-1450. prereq: 5721

** GER 8210. Seminar in Early Modern German Literature and Culture. ** (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topics on specific author, group of authors, genre, or subject matter in German literature, 1450-1750.

** GER 8220. Seminar in 18th-Century German Literature and Culture. ** (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Literary, philosophical, and aesthetic texts emerging from major 18th-century literary trends, 1720-1810. Cultural and historical contexts of Enlightenment and Weimar Classicism.
GER 8230. Seminar in 19th-Century German Literature and Culture. (.3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Examination of an author, issue, or movement, using a variety of critical approaches.

GER 8240. Seminar in 20th-Century German Literature and Culture. (.3 cr. [max 9 cr.]; A-F or Audit; Periodic Fall & Spring) Topics on literature, film, or other forms of "high" and popular culture.

GER 8300. Topics in Literature and Cultural Theory. (.3 cr. [max 18 cr.]; Student Option; Periodic Fall & Spring) Authors, themes, movements, and social issues from 1700 to present. Focus varies each semester.

GER 8741. Gothic and Methods of Comparative Reconstruction I. (.3 cr.; Student Option) The oldest extant Germanic language and the prehistory of Germanic group of languages.

GER 8742. Gothic and Methods of Comparative Reconstruction II. (.3 cr.; Student Option; Periodic Fall) Continuation of study of the oldest extant Germanic language and the prehistory of Germanic group of languages. prereq: 8741

GER 8751. Paleography: Medieval Manuscript Readings. (.3 cr.; A-F or Audit; Periodic Spring) Introduction to techniques of reading and transcribing medieval German and Latin manuscripts.

GER 8752. Medieval Text Editing. (.3 cr.; Student Option; Periodic Spring) Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

GER 8820. Seminar: Advanced Theory. (.3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topic in critical thought, e.g., the Frankfurt School, hermeneutics, reception theory.

GER 8994. Directed Research. (.1-3 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Tbd prereq: instr consent, dept consent; may be taken as tutorial with instr consent

GER 5100. Topics in Gerontology. (.0.5-4 cr. [max 10 cr.]; Student Option; Periodic Fall, Spring & Summer) Timely topics related to the biology, sociology, and psychology of aging and applied aging services.

GER 5102. Hot Topics in the Biology of Aging. (.1 cr.; S-N only; Fall Even Year) The goals of the course include providing the students with an essential understanding of the contemporary issues in biogerontology, including analysis of ethics issues in the field. This course is open to graduate students and post-doctoral fellows involved in the NIA training grant Functional Proteomics of Aging. others may enroll with instr permission.

GER 5103. Aging and Society. (.2 cr.; Student Option; Every Fall) An examination of the broad range of topics and issues related to aging. Consideration of how the processes of aging affect individuals, groups, cohorts, and societies by drawing from research in sociology, psychology, gerontology, and health sciences. Comparisons are made of the processes of aging in US and other countries.

GER 5111. Studying Aging and Chronic Illness. (.2 cr.; Student Option; Every Fall) Methodological issues unique to studies of older populations. Focuses on measurement of epidemiological characteristics. Health conditions/disorders of older Americans. prereq: Introductory course in epidemiology or inst consent

GER 5125. Gerontology Service Learning. (.3 cr.; Student Option; Every Fall, Spring & Summer) At least 100 hours of service to seniors or organizations serving seniors required. Longitudinal one-on-one relationship with at least two seniors. Service activities may include: friendly visiting, escorting seniors to medical appointments, chore services, teaching health education to groups of seniors and staff, participating in social or recreational activities with seniors, assisting with immunization and screening programs, assisting seniors with selection of health plans, or providing volunteer home health aide or nursing assistant services or emergency non-medical response under the supervision of a nurse. Students may use up to 25 percent of their service time for project that benefits the campus as a whole. Reading, monthly class discussions, a term paper and weekly self-reflection.

GER 5191. Independent Study: Gerontology. (.1-4 cr. [max 16 cr.]; Student Option; No Audit; Periodic Fall, Spring & Summer) Independent study: gerontology. prereq: Approval of [adviser, DGS] for gerontology minor

GER 8020. Seminar in Gerontology. (.2 cr.; Student Option; Every Fall & Spring) Meets weekly. Students present and discuss new or completed research projects on aging; conduct formal reviews using NIH formats; critique published papers using formal review criteria employed by gerontologic journals; become familiar with large database in aging and describe how that database has been used in research for secondary analyses. prereq: instr consent

GER 8021. Application of Proteomics to Aging. (.1 cr.; Student Option; Fall Odd Year) Proteomic technology in aging research. Faculty/students led discussions on topics relevant to proteomics research. Overview of special techniques/analytical approaches complementary to proteomics, hands-on experience with data analysis, discussion of literature. prereq: [Grad students, post-doctoral fellows involved in National Institutes on Aging training grant Functional Proteomics of Aging] or grad students or post-doctoral fellows with instr consent

GER 8022. Fostering a Career in Aging Research. (.1 cr.; Student Option; Spring Odd Year)
The course will mainly elaborate on the relationship between politics and economic development in Chinese and World history. Instruction will focus on the implications of historical events and received wisdom on modern management, and the evaluation skills needed to manage complex organizations. The course combines both Western thought and Chinese traditional philosophy to help students develop a deeper understanding of history and its implications for modern business administration.

GDBA 7107. Sinology Wisdom and Management Innovation. (2 cr.; A-F only; Every Fall, Spring & Summer)

This course provides an introduction to the research and theory of management, leadership, logical thinking, and governance within organizations based on the wisdom and knowledge learned from classic historical events and modern management cases in China. The course will improve students' abilities in theoretical thinking and historical and cultural knowledge accumulation. The course is intended to sharpen their strategic vision, decision-making methods and leadership, based on a comprehensive understanding of Chinese and global historical management wisdom.

GDBA 7108. The Macroeconomic Situation and Policy. (2 cr.; A-F only; Every Fall, Spring & Summer)

This course uses the perspectives and methods of modern economics to analyze problems and systematically investigate the process of China's economic reform, opening-up, and development since 1979. It draws lessons from other countries and regions through comparison, so as to obtain an overall understanding of China's economic achievements in the past, its current problems, and its challenges for the future.

GDBA 7201. Global Strategic Alliances. (2 cr.; A-F only; Every Fall, Spring & Summer)

This course helps the students understand the strategic rationale for strategic alliances, how to choose the right alliance partner, structure and negotiate alliances, how alliances can be best managed, and learn alliance termination and restructuring, and understand alliances in the Chinese context.
GDBA 7202. Innovation through Emerging Technologies. (2 cr.; A-F only; Every Fall, Spring & Summer)  
This course helps top executives and leaders become tech savvy and prepare their organizations for the rapidly changing technological and social environments. The course covers current IT trends such as social media, business analytics, sharing economy, mobile, and platform economy. It also covers next generation technologies that will define and shape our future such as Internet of things, 3D printing, artificial intelligence, and augmented reality. Students will learn about the technical principles, benefits, and tools of each technology, collectively envision the implications of these technologies for business operations and innovations.

GDBA 7203. Marketing Strategies for Firms in the Era of Globalization. (1 cr.; A-F only; Every Fall, Spring & Summer)  
The course focuses on and explores the marketing strategies for firms in the new era of globalization. During the past decades, firms of western countries have been very successful in expanding their business in the global market, including in the emerging markets such as Brazil, Russia, India, China, and South Africa (BRICS) that hold great potentials. For instance, China’s economy has been growing rapidly to become the world’s second largest economy by nominal GDP, and many western firms have successfully gained a foothold in it. One key factor that helps the western firms to be successful in the global market is the long-term accumulated wisdom of business administration, both academically and practically. Examples include Coca-Cola and Apple that have been using brilliant branding management and other marketing tactics to help boom their business across continents.

GDBA 7204. Qualitative Research Methods. (1 cr.; A-F only; Every Fall, Spring & Summer)  
The course focuses on important methodologies that are helpful for students to do qualitative research in business administration. The course will focus on problem formulation and building theories for your study, designing appropriate case studies, collecting and analyzing primary data, and obtaining managerial insights to help improve your business decisions. In addition, the course will expose students to a new and useful research method—field experiments for studying business decision making in the field.

GDBA 7205. Global Accounting. (1 cr.; A-F only; Every Fall, Spring & Summer)  
This course aims to enhance students’ understanding of contemporary issues in accounting and corporate disclosures, with particular emphasis on issues arising in the process of globalization. Building on discussions of practical reporting issues, this course also exposes students to scholarly accounting research in the context of agency and contracting theory that has practical implications. Topics addressed include the role of accounting in capital markets and contracting, real effects of accounting, recent development in accounting in the global market place, cross-country comparisons of regulatory frameworks, corporate governance and accounting, and transfer pricing in multinational corporations.

GDBA 7206. Mergers and Acquisitions. (1 cr.; A-F only; Every Fall, Spring & Summer)  
Mergers and acquisitions (M&A) is an important way to achieve corporate growth. In this course, we will explore various means for corporate managers to achieve growth through M&A. The objective of the course is to help students develop a good understanding of the four principal areas related to M&A transactions (our four “learning pillars”): fit and strategy, M&A process, valuation, and post-merger integration. For each “learning pillar”, we not only discuss the general principles and practices, but also emphasize the advantages and challenges of acquiring a business in a foreign country. This course uses a balanced mix of lectures and case studies to deliver key insights from theories and real-world practices.

GDBA 7207. Family Wealth Management. (1 cr.; A-F only; Every Fall, Spring & Summer)  
This course offers an integrated and strategic approach to family wealth management. Wealthy individuals or families wish to protect and grow the wealth, enjoy financial security, and build a lasting legacy. Effective wealth management is critical to achieve these goals. A successful wealth management is an integrated and strategic discipline that includes investment strategy, risk management, taxes, financial planning, philanthropy, governance, and family culture. This course will help wealthy families to understand fundamentals of family wealth management, importance of diversification and risk management in family wealth, strategies that can help to achieve tax-efficient and cost-effective diversification, comprehensive family financial planning, and effective oversight of the wealth management process.

GDBA 7208. Management of Headquarters. (1 cr.; A-F only; Every Fall)  
This course is experiential in that it provides an opportunity for the students to visit multinational companies whose headquarters are based in the Twin Cities. During the visits the students will learn about the processes and structures in place, which enable global outreach. They will also observe a variety of managerial practices that facilitate these companies’ success on the world stage. Each visit will be followed by a content-driven reflection session during which the students will process their observations within established frameworks from the International business literature.

GDBA 7209. Service Operations Management. (1 cr.; A-F only; Every Fall, Spring & Summer)  
Services represent the largest segment of most industrial economies and an important growing segment of most global regions. China is experiencing tremendous growth in its service economy, with a near doubling in its service economy during the past two decades. The focus of executive attention is strongly shifting toward services, with increasing importance of service industries such as travel, finance, health care, media, and publishing. Despite its importance in the economy, service sector productivity growth generally lags that of manufacturing. A stronger focus on managing service operations is necessary to maintain local and globally competitive businesses. In addition, the effects of increasingly sophisticated consumers, deregulation, technology changes, and expanding global services combine to create new challenges. To succeed, business executives must have the skills to lead their service managers to allocate resources, design effective processes, analyze and improve operating practices, and apply new technologies. This course examines these opportunities.

GDBA 7210. Fundamental Data Analysis. (1 cr.; A-F only; Every Fall, Spring & Summer)  
The course begins with an overview of descriptive statistics, which includes both graphical and numerical methods for summarizing data. Then we provide a review of essential steps of inferential statistics, which include random variables, estimation, and hypothesis testing. The second half of the course is devoted to predictive analytics, including simple linear regression, multiple linear regression, and a brief introduction of experimental design. Throughout, we focus on basic concepts and the practical use of these methods in management environments. This course provides the background in statistical methods that is required for conducting research in a doctoral program in business.

GDBA 7211. Global Branding. (2 cr.; A-F only; Every Fall, Spring & Summer)  
This course will combine critical current perspectives from information economics, psychology, sociology, behavioral decision theory and neuro-science to inform students about how brand information is acquired, processed and employed in decision-making, across segments and cultures. Students are expected to be familiar with basic marketing concepts to allow for a discussion of strategic issues related to global branding. The course will involve multiple pedagogies including lecture, case discussion and class exercises.

GDBA 7212. Global Talent Management. (2 cr.; A-F only; Every Fall, Spring & Summer)  
Global talent challenges are increasingly prevalent as organizations increasingly compete on a worldwide stage. Global talent management reflects an individual’s and/or organizations capacity to influence others and work with people from other countries and manage international operations and to the use of human resource practices designed to ensure needed access to talent for multinational enterprises competing in a global environment. In this course, we will put particular attention on the development of global competencies and a “global mindset” in individuals and organizations. We will also explore how to effectively manage talent in the context of increasing globalization. In the course, we will focus upon identifying best practices for recruiting, developing and retaining global talent and managing high performance global work systems. More
specifically, we will consider how one should organize the processes and systems of hiring, rewarding, evaluating, developing, and motivating talent in today's global context.

**GDBA 7888. Thesis.** (12 cr. [max 24 cr.]: S-N only; Every Fall, Spring & Summer) Students have to complete and defend a thesis in order to be granted with the DBA degree.

**Global Studies (GLOS)**

**GLOS 5104. Crime and Human Rights.** (3 cr. : A-F or Audit; Periodic Fall & Spring) This course addresses serious violations of humanitarian and human rights law, efforts to criminalize those violations (laws and institutions), and consequences of these efforts. Special attention will be paid to the impact interventions have on representations and memories of atrocities on responses and the future of cycles of violence. Case studies on Holocaust, Balkan wars, Darfur, My Lai massacre, etc. Criminal justice, truth commissions, vetting, compensation programs. prereq; at least one 3xxx SOC or GLOS course recommended

**GLOS 5152. Global Avant-Gardes: Theatre, Music, Modernity.** (HIS; 3 cr. ; Student Option; Every Spring) What does it mean to be an avant-garde artist in the Global South? In postcolonial Africa and Asia, where arts were linked to national modernization projects, artists have played a key role in shaping citizens' identity, alongside schools and universities. While participating in modernizing projects, avant-garde artists maintained independence from state institutions and voiced criticism of dictators. This course examines avant-garde performances in several locations of the Global South, analyzing dramas of national history, modernist music, activist theater, cosmopolitan dance, transnational cultural circuits, and politically radical performances. Reading historical, social, and performance studies, we will develop methods for analyzing performances that aim to make transformative social interventions. These include textual analysis, ethnography, performance analysis, and tracking transnational cultural exchange. You will apply select methods in your final research paper, which centers on an artist in the Global South.

**GLOS 5104. Other Worlds: Globality and Culture.** (3 cr. : A-F or Audit; Periodic Fall) Interconnectedness of world. Considering not one world, but many. Colonialism, consumption, diasporic conditions, global media, nationalism, supra-national governance. How globality is experienced/contested locally/spatially. prereq: [3101, 3144, grad student] or instr consent

**GLOS 5900. Topics in Global Studies.** (1-4 cr. [max 12 cr.]: Student Option; Every Fall, Spring & Summer) Proseminar. Selected issues in global studies. Topics specified in Class Schedule.

**GLOS 5993. Directed Studies.** (1-4 cr. [max 12 cr.]: Student Option; Every Fall & Spring) Guided individual reading or study. Open to qualified students for one or more semesters.

**GLOS 5994. Directed Research.** (1-4 cr. [max 12 cr.]: Student Option; Every Fall & Spring) Qualified students work on a tutorial basis. Prereq instr consent, dept consent, college consent.

**Graduate School (GRAD)**

**GRAD 5102. Preparation for University Teaching for Nonnative English Speakers.** (2 cr. : S-N or Audit; Every Fall & Spring) Theory/practice of teaching in higher education in the United States. Emphasizes clear oral classroom communication and development of presentation skills. Skills practice in a simulated instructional setting. prereq; English Language Proficiency Rating of 4; Contact instructor for permission number.

**GRAD 5105. Practicum in University Teaching for Nonnative English Speakers.** (1-2 cr. : S-N or Audit; Every Fall & Spring) Theory, advanced practice in teaching in higher education for nonnative speakers of English. Emphasizes interactive teaching strategies, awareness of cross-cultural classroom issues, oral classroom presentation skills, and legal/policy issues. prereq: 5102 or English Language Proficiency Rating of 2; Contact instructor for permission number.

**GRAD 8101. Teaching in Higher Education.** (3 cr. : Student Option No Audit; Every Fall, Spring & Summer) Teaching methods/techniques. Active learning, critical thinking, practice teaching, and preparing a portfolio to document/reflect upon teaching. Readings, discussion, peer teaching, e-mail dialog, reflective writing, co-facilitation of course. prereq: Non-Degree Students: contact pfcollege consentumn.edu with questions about registration. If adding a section after first class meeting, contact your instructor as soon as you enroll.

**GRAD 8102. Practicum for Future Faculty.** (3 cr. : Student Option No Audit; Every Fall & Spring) Collegial support for teaching, faculty mentorship at regional college or university. Faculty role at various institutions. Classroom observation/feedback, preparation for academic job search. prereq: [8101 or equiv], [native English speaker or [ibt TOEFL score of 27-30] or [ELP score of 1 from CTL]]

**GRAD 8200. Teaching and Learning Topics in Higher Education.** (1-3 cr. [max 4 cr.]: A-F only; Every Fall & Spring) Create course materials for context/discipline. Assess student learning. Write action plan. Topics may include active learning in sciences, teaching with technology, multicultural education, teaching in clinical settings, learning-community course design.

**GRAD 8400. Interdisciplinary Dissertation Writing Seminar.** (1-3 cr. [max 6 cr.]: Student Option; Every Fall & Spring) Led by graduate faculty. For course description, see sponsoring program(s). prereq; PhD student, instr consent

**GRAD 8401. Dissertation Proposal Development Seminar.** (3 cr. : S-N only; Every Fall) This seminar is the culminating component of intensive work on dissertation proposal development. The program involves a five-day spring workshop, independent summer research, a five-day fall workshop, and opportunities for on-going interactions with the cohort and with faculty instructors. The work is designed to help participants develop cogent and fundable dissertation research proposals. The main goal of the spring workshop is to help clarify students’ research questions and scope as well as to better prepare them for a productive dissertation summer research experience. The fall workshop is intended to help students build on their spring workshop efforts and summer research experiences to prepare full dissertation research proposals. These proposals are intended to serve as the foundation for department prospectus requirements and for internal and external dissertation research and completion grants. All components of the program are required

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
though registration is only for the fall seminar. Admission will be based on application in the prior year and requires a commitment to participate in all components of the program. A grade of D or better will be awarded upon attendance at and satisfactory performance in all of the spring and fall workshops, demonstrated completion of independent research over the summer, and the submission of a dissertation research proposal as part of the fall workshop. Students must be enrolled in a doctoral degree program, must be pre-ABD (may not have passed the prelim oral exam), and have advisor approval. prerequisite: PhD student who has not passed prelim oral exams

Grand Challenge Curriculum (GCC)

GCC 5001. Can We Feed the World Without Destroying It?. (ENV; 3 cr.; A-F only; Periodic Fall)
In this course, we will seek solutions to the challenge of achieving global food security and sustainability. Together, we will work to answer the question, "Can we feed the world without destroying it?" The course begins with lectures and skills workshops, followed by a series of interactive panels with guest experts. We will also prepare group projects that are focused on finding innovative solutions to this grand challenge. We will learn about the fundamental changes occurring in the global food system, the environment, and our civilization as a whole. We will explore how to approach inherently interdisciplinary problems, how to identify solutions that are truly sustainable in the long term, and how science and technology can inform decision-making.

GCC 5003. Seeking Solutions to Global Health Issues. (GP; 3 cr.; A-F only; Periodic Fall)
Complex global health problems can often only be addressed through approaches that go beyond traditional health science disciplines. Whether responding to emerging pandemics, food insecurity, maternal mortality, or civil society collapse during conflict, solutions often lie at the interface of animal, environmental, and human health. In this course, students will examine the fundamental challenges to addressing complex global health problems in the world's poorest countries. Together, we will seek practical solutions at the nexus of human, animal, and ecological health. While there isn't a single "right" solution to grand challenges, progress can be made through an interdisciplinary perspective with emphasis on ethical and cultural sensitivity, and on understanding their complexities. This exploration will help students propose realistic actions that could be taken to resolve these issues. This course will help students gain the understanding and skills necessary for beginning to develop solutions to this grand challenge.

GCC 5005. Global Venture Design: What Impact Will You Make?. (GP; 3 cr.; A-F only; Periodic Fall)
Students will work in teams developing sustainable business and technical solutions to address an environmental or social challenge in India. Teams may address a challenge related to water supply, energy availability, food/agriculture production, waste management, public health or a topic mutually agreed upon by the instructor and student teams. During the semester, a product or service must be designed, and a sustainable business model must be created around it. Technical and business development professionals based in the US and India will act as mentors to provide advice to each team. Each team will have one US-based mentor and one India-based mentor. The teams are expected to use a discovery process, design thinking, ideation and input from field research in solving the challenge. A primary focus of the course is up-front work to identify the "right" problem to solve. The model should be built around the customer's needs and wants, as they will need to pay for the product or service to achieve a scalable model. prerequisite: sophomore, junior, senior, graduate student

GCC 5007. Toward Conquest of Disease. (ENV; 3 cr.; A-F only; Every Spring)
Since the rise of civilization, the large predators of humans have been subdued and the most dangerous predators remaining are those unseen--vastly smaller than our bodies. They are the microbial predators that cause disease. Infectious disease has devastated human populations and even caused global population declines. Subduing and managing disease is one of the grand challenges of our time. Through an enormous global effort, we have driven smallpox in humans and Rinderpest in livestock extinct from the natural world, and guinea worm is expected to follow. Other infectious diseases are in continual decline. In this course we will combine ecological thought and ecological models with historical and future perspectives to understand the fundamental dynamics of our miniscule predators, and relate this to similar miniscule predators of wild and domestic animals, to crops, and to other plants. prerequisite: sophomore, junior, senior, graduate student

GCC 5008. Policy and Science of Global Environmental Change. (ENV; 3 cr.; A-F only; Periodic Spring)
Through readings, lectures, discussions, written assignments, and presentations this course introduces the critical issues underpinning global change and its environmental and social implications. The course examines current literature in exploring evidence for human-induced global change and its potential effects on a wide range of biological processes and examines the social and economic drivers, social and economic consequences, and political processes at local, national, and international scales related to global change.

GCC 5010. Grand Challenge: The Global Climate Challenge: Creating an Empowered Movement for Change. (CIV; 3 cr.; A-F only; Periodic Spring)
Students will explore ecological and human health consequences of climate change, the psychology of climate inaction, and will be invited to join us in the radical work of discovering not only their own leadership potential but that of others. We will unpack the old story of domination and hierarchy and invite the class to become part of a vibrant new story of human partnership that will not only help humanity deal with the physical threat of climate change but will help us create a world where we have the necessary skills and attitudes to engage the many other grand challenges facing us. Using a strategy of grassroots empowerment, the course will be organized to help us connect to the heart of what we really value; to understand the threat of climate change; to examine how we feel in the light of that threat; and to take powerful action together. Students will work in groups throughout the course to assess the global ecological threat posed by climate change, and they will be part of designing and executing an activity where they empower a community to take action. For:so,jr, sr, grad

GCC 5011. Pathways to Renewable Energy. (TS; 3 cr.; A-F only; Periodic Spring)
This interdisciplinary course will examine obstacles to energy transitions at different scales. It will explore the role of energy in society, the physics of energy, how energy systems were created and how they function, and how the markets, policies, and regulatory frameworks for energy systems in the US developed. The course will closely examine the Realpolitik of energy and the technical, legal, regulatory, and policy underpinnings of renewable energy in the US and Minnesota. Students will learn the drivers that can lead global systems to change despite powerful constraints and how local and institutional action enables broader reform. Students will put their learning into action by developing proposals for addressing a particular challenge: What would it take to get the University of Minnesota to invest significantly in solar energy?

GCC 5012. Structural Violence & The Medication Experience. (DSJ; 3 cr.; A-F only; Periodic Fall)
The course will use a social justice framework for learning and communicating about structural violence and the intersection of culture, the medication experience, and community health. Utilizing principles of community engagement, we will focus on examining how broader Community Health and the individual Medication Experience are impacted by the overcoming of structural violence experienced by communities locally as well as globally. Using Critical Race Theory and Social Ecological frameworks, we will come to a more complex understanding of our own social locations and the interplay of power and privilege while exploring the root causes of health disparities and the development of solutions that address inequities in health education, housing, employment, and access to respectful health care. Students will learn to critically analyze these lived experiences while developing interactive storytelling, digital documentaries, digital essays and narratives to advance knowledge on health inequities in our community.
The overarching theme of the course is the role of artistic/humanistic ways of knowing as tools for making sense and meaning in the face of "grand challenges." Our culture tends to privilege science, and to isolate it from the "purposive" disciplines—arts and humanities—that help humanity ask and answer difficult questions about what should be done about our grand challenges. In this course, we will examine climate change science, with a particular focus on how climate change is expected to affect key ecological systems such as forests and farms and resources for vital biodiversity such as pollinators. We will study the work of artists who have responded to climate change through their artistic practice to make sense and meaning of climate change. Finally, students create collaborative public art projects that will become part of local community festivals/events late in the semester.

GCC 5014. The Future of Work and Life in the 21st Century. (TS; 3 cr.; A-F only; Periodic Fall) This course seeks solutions to the technological, demographic, and economic forces that challenge taken-for-granted mindsets and existing policies around work, careers, and life. Students will consider positive and negative impacts of the forces that render the conventional education/work/retirement lockstep obsolete. What do these changes mean for men and women of different ages and backgrounds? What are alternative, sustainable ways of working and living in the 21st century? These questions reflect global challenges that touch the lives of people everywhere. Students will work in teams to begin to address these realities and formulate innovative solutions to better transform learning, working, caring, and community-building in the 21st century.

GCC 5015. Bioinspired Approaches to Sustainability: Greening Technologies and Lives. (TS; 3 cr.; A-F only; Periodic Spring) How can we build a sustainable society? From designing cities and technologies that use green energy, to health care and agriculture that can sustain billions, the sustainability challenges that face us today are immense. The field of biomimicry seeks solutions to such problems by learning from the diverse ways in which organisms have adapted to varied and sometimes extreme environments. With over 1.3 million described species (and likely over 8 million in existence), chances are a species out there has evolved some solution to a particular problem. But how do we go about figuring out which species this might be? And which trait holds the adaptation to a particular problem. But how do we go about figuring out which species this might be? What might be some limitations associated with copying this adaptation? How might we build on it instead?

This course teaches bioinspired approaches to sustainability solutions. Throughout the course, students work in teams of complementary expertise to identify a sustainability problem, research a relevant biological system, and build a prototype bio-inspired solution to their focal problem.

GCC 5016. Grand Challenge: Science and Society: Working Together to Avoid the Antibiotic Resistance Apocalypse. (TS; 3 cr.; A-F only; Periodic Spring) Before the discovery of antibiotics, even a simple thorn prick could lead to life threatening infection. Antibiotics are truly miracle drugs, making most bacterial infections relatively easy to cure. However, this landscape is rapidly changing with the advent of microbes that are resistant to antibiotics. This course will provide an overview of how antibiotic use invoked antibiotic resistance, including in depth discussions of antibiotic resistant microorganisms and the impact of globalization on this exploding problem. Societal and ethical implications associated with antibiotic use and restriction in humans and animals will be discussed, along with global issues of antibiotic regulation and population surveillance. The class will conclude with discussions of alternative therapeutic approaches that are essential to avoid "antibiotic apocalypse."

The course will include lectures by world-renowned experts in various topics, and students will leverage this knowledge with their own presentations on important topics related to issues of personal freedom versus societal needs.

GCC 5017. World Food Problems: Agronomics, Economics and Hunger. (GP; 3 cr.; A-F only; Periodic Fall) This course provides a multi-disciplinary look at problems (and some of the possible solutions) affecting food production, distribution and requirements for the seven plus billion inhabitants of this planet. It is co-taught by an agronomist (Porter) and an economist (Runge) who together have worked on international food production and policy issues for the past 40 years. Historical context, the present situation and future scenarios related to the human population and food production are examined. Presentations and discussions cover sometimes conflicting views from multiple perspectives on population growth, use of technology, as well as the ethical and cultural values of people in various parts of the world. The global challenge perspective is reflected in attention to issues of poverty, inequality, gender, the legacy of colonialism, and racial and ethnic prejudice. Emphasis is placed on the needs of the environment, international assistance agencies, international research and extension centers, as well as the private sector to assist in solving the complex problems associated with malnutrition, undernutrition, obesity and sustainable food production. Through a better understanding of world food problems, this course enables students to reflect on the shared sense of responsibility that they might embrace for the environment, community and ourselves to build and maintain a stronger sense of our roles as historical agents. Throughout the semester students are exposed to issues related to world food problems through the lenses of two instructors from different disciplinary backgrounds. The core issues of malnutrition and food production are approached simultaneously from a production perspective as well as an economic and policy perspective throughout the semester.

GCC 5020. Ecosystem Health: Challenges at the interface of humans, animals and the environment. (ENV; 3 cr.; A-F only; Periodic Spring) What are the effects of climate change, disease emergence, food and water security, gender, conflict and poverty, and sustainability of ecosystem services on health? Unfortunately, these large-scale problems often become overwhelming, making single solution-based progress seem daunting and difficult to implement in policy. Fortunately, the emerging discipline of ecosystem health provides an approach to these problems grounded in trans-disciplinary science. Ecosystem health recognizes the interdependence of human, animal and environmental health, and merges theories and methods of ecological, health and political sciences. It poses that health threats can be prevented, monitored and controlled via a variety of approaches and technologies that guide management action as well as policy. Thus, balancing human and animal health with management of our ecosystems. In this class, we will focus on the emerging discipline of ecosystem health, and how these theories, methods and computational technologies set the stage for solutions to grand challenges of health at the interface of humans, animals and the environment. We will focus not only on the creation and evaluation of solutions, but on their feasibility and implementation in the real world through policy and real time decision making. This will be taught in the active learning style classroom, requiring pre class readings to support didactic theory and case-based learning in class. Participation and both individual and group projects (written and oral presentation) will comprise most of the student evaluation. These projects may reflect innovative solutions, discoveries about unknowns, or development of methods useful for ecosystem health challenges. We envision that some of them will lead to peer-review publications, technical reports or other forms of publication.

GCC 5022. The human experience of sensory loss: Seeking equitable and effective solutions. (TS; 3 cr.; A-F only; Periodic Spring) This course focuses on the visual, auditory, and other sensory pathways that convey information about the world to mind and brain. Millions of people worldwide experience deficits in sensory function that affect their quality of life. We will focus on the characteristics of healthy sensory functioning as well as how sensory disorders can affect personal identity, impede information processing, and alter brain structure and function. The course will address the demographics and risk factors for sensory disabilities, the implications of these disabilities for activities of daily living, the history of society’s response to sensory disability, as well as societal, ethical, and personal attitudes toward sensory disabilities. The course will also explore translational and applied approaches.
for addressing sensory disabilities. Each class session will be co-taught by a pair of instructors, representing multiple scientific and social perspectives. A major goal of the course is to view sensory function and impairment from multiple perspectives: cognitive science, neuroscience, medicine, engineering, society, consumers, ethics, and social justice. The course will combine lectures, discussions, and student-led presentations of research papers. The course will include hands-on demonstrations of assistive technology and panel discussions with people with visual and hearing disabilities. During the semester, each student (or group of students) will develop a mini research proposal to address a real-world issue related to sensory impairment. The proposal must be translational in nature, and must include consultation with consumers of the proposed project. The final class session will be devoted to poster presentations of the mini proposals. The proposal report must include consideration of potentially opposing viewpoints about the proposed research. This course addresses two of our University’s grand challenges: Advancing Health Through Tailored Solutions, and Just and Equitable Communities.

GCC 5023. Grand Challenge: Leading Across Sectors to Address Grand Challenges. (CIV; 3 cr.; A-F only; Periodic Spring)

“The critical challenges society faces, such as water scarcity, access to education, and the rising cost of healthcare, increasingly require the involvement and collaboration of government and nonprofit sectors to work together to create lasting solutions.” - Nick Lovegrove and Matthew Thomas, “Why the World Needs Cross-Sector Leaders,” Harvard Business Review, February 13, 2013 Numerous universities, including the University of Minnesota; business leaders; non-profit organizations and policy makers have increasingly emphasized the value and necessity of multisector leadership to address current scientific challenges. Such collaborative initiatives take place in broader social contexts; have key individual and organizational inputs; and can take many forms, from community task forces to organized collective impact initiatives to social enterprise organizations that blend private-sector incentives with public-service goals. Because they involve a conscious focus on what we pursue, and operate largely apart from well-established processes or mission statements, they force us to examine civic life through a new lens and to (re)consider ethical questions related to it. This course explores multisector leadership from a variety of perspectives and provides an opportunity for students to work together to apply what they are learning individually and in teams through in-class exercises, peer coaching, and a final team grant proposal project. After an introductory session where students analyze and present answers related to specific case studies, we begin with an overview of relevant shared leadership theories and practice fields — including collective, participatory and integrative leadership and an overview of relevant ethical questions and themes. We then consider relevant individual inputs into multisector leadership, including through having students assess their own leadership strengths, what they bring to the collaborative table, and contract with assigned interdisciplinary teams for peer coaching throughout the semester. The lens of the course moves to the collaboration itself after this focus on the individual, looking at techniques and qualities of successful teams, including those composed of diverse individuals or organizations. Finally, we move to considering different contexts, forms and specific examples of multisector leadership before concluding with an external panel of each student team’s grant proposal for a particular multisectoral initiative of their choosing that they believe will enable transformative action to tackle a significant societal issue and achieve lasting change. Throughout the course, we consider the ethical questions that arise from focusing on multisector leadership. These questions relate, for example, to the role of trust and truth-telling in individual efforts to lead and collaborate, how and when it is appropriate to engage with others to address challenges that extend beyond the communities to which we belong; who defines priority problems to be addressed, and why; the role and potential of business to contribute to broader efforts to achieve public good; how equity and justice relate to collective leadership; and whether and how society is better off from the joining of organizational efforts across sectors.

GCC 5024. 1 Billion People: How long can the planet sustain humanity?. (ENV; 3 cr.; A-F only; Every Fall)

As an evolved animal, humanity has always interacted with its environment, both through the ecology of its food web and through its modification of its geological surroundings. Yet the human ecological niche, and the breadth of its impact on the environment, has changed enormously through the biological and cultural evolution of our lineage, from our first two-legged ancestor; to the appearance of our own species, Homo sapiens; to the diversification of the hunter-gatherer adaptation at the end of the Pleistocene; to the invention of agriculture and animal husbandry in the Holocene; to the rise of craft specialization, social inequalities, and urbanism with the first state-level societies; and now the globalization of our food, diseases, and culture. Students in this course will explore how the cumulative effects of our biocultural evolution are putting the sustainability of our current population, now approaching 11 billion, at risk, mostly due to the unprecedented scale of humanity’s impact on the Earth’s ecosystems. This course investigates the origins, development, and predictions for humanity’s ecological niche on the planet through a novel interdisciplinary fusion of the social and environmental sciences. To sociologists, students i) the ability to see the environmental context of the present in an evolutionary light, as well as ii) the tools to evaluate possible remediation and sustainability approaches to control these problems at the local and global scale. The course provides an interdisciplinary immersion in these issues through combined instruction by anthropologists, archaeologists, historians, environmental scientists, ecologists, toxicologists, and sociologists. By focusing on multiple vectors of inquiry (i.e., society, economy, technology, environment) which can be considered at different scales (i.e., from past to present, local to global, individual to societal, temporary to long term), students’ progress through the course will give them powerful tools to confront the Grand Challenges of our age, the Anthropocene.

GCC 5501. Knowledge to Impact: Creating Action with Your Grand Challenge Project Idea. (3 cr.; A-F only; Periodic Spring)

Do you want to learn how to design viable solutions to address a complex social or environmental challenge? Are you interested in taking a course with other motivated students from across the university who care about being changemakers and being mentored by 15 UMN faculty who will be supporting the students in the course? This hands-on course will help you learn the skills to develop solutions to a specific problem that you have worked on in a previous GCC course or a similar project-based class. By the end of the course, you will work with a team of students to create a design and implementation plan for a solution that could take many forms, depending on student interest and the nature of the problem (business or nonprofit plans, policy and advocacy plans, media and awareness campaigns and activism plans are all possible). Resources (funding, training and mentors) will be available for students who wish to pursue their project beyond the classroom into implementation. Learn more at gcc.umn.edu. Students should enroll in a class with a problem statement that is broadly defined Grand Challenge; examples of applicable areas include water, immigration and refugees, energy, housing, achievement gap, public health, food and sustainable agriculture. While it is important to have a broad idea to be placed into the appropriate COP, the first part of the class is an examination of student ideas and possible modification of ideas and possible student teams. By the end of class, students will create a plausable design and implementation plan for a solution that addresses their self-created Grand Challenge problem statement. This solution or intervention could take many forms, depending on student interest and problem statement. Business or non-profit plans, policy and advocacy plans, media and awareness, activism plans are all possible. Determining the correct path(s) is part of the learning objectives for the course. preq: Prior completion of a GCC course.

GDES 5193. Directed Study in Graphic Design. (1-4 cr. [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer)
Experience in Graphic Design research strategies and methods. Applied, theoretical, and human-centered aspects directed at project development. Design prototyping, testing, analysis. prereq: Graphic design major or grad student or instr consent

GDES 8170. Topics in Graphic Design. (. ; 1-3 cr. ; max 6 cr. ; A-F or Audit; Every Fall & Spring)
In-depth investigation of topic, announced in advance.

GDES 8180. Professional Seminar. (. ; 1-2 cr. ; max 4 cr. ; A-F or Audit; Every Fall & Spring)
Professional development issues/trends.

GDES 8192. Readings in Graphic Design. (. ; 1-3 cr. ; max 8 cr. ; A-F or Audit; Every Fall, Spring & Summer)
Independent study, review of books/periodicals under tutorial guidance. prereq: instr consent

GDES 8193. Directed Study. (. ; 1-3 cr. ; max 8 cr. ; A-F or Audit; Every Fall, Spring & Summer)
Directed study in graphic design. prereq: instr consent

GDES 8222. Plan B Master's Project. (. ; 3 cr. ; S-N or Audit; Every Fall & Spring)
Plan B master's project. prereq: [Design or DHA master's student], instr consent

GDES 8361. Color, Design, and Human Perception. (. ; 3 cr. ; A-F or Audit; Periodic Fall & Spring)
Perceptual and psychological aspects of color and design. Human factors of color variables and design strategies that can enhance human experience of, and interaction with, color. prereq: Basic color theory course or instr consent

GDES 8362. The Nature of Representation in Visual Communication. (. ; 3 cr. ; A-F or Audit; Periodic Fall & Spring)
Theories of representation and studio production (digital, non-digital) centered around representation in culture. MFA project. prereq: Completed coursework requirements for MFA in DHA w/multimedia emphasis, instr consent

GDES 8390. MFA Creative Thesis. (. ; 6 cr. ; max 12 cr. ; A-F or Audit; Every Fall, Spring & Summer)
MFA project. prereq: Completed coursework requirements for MFA in DHA w/multimedia emphasis, instr consent

GDES 8888. Graphic Design Research. (. ; 3 cr. ; A-F or Audit; Periodic Spring)

Introduction to Greek epic poetry. Readings of selections from Homer's Iliad and Odyssey. Quantitative meter and poetic devices. Discussion of major themes and issues as developed in Homer's poetry. prereq: dept consent

GRK 5100. Advanced Reading. (. ; 3 cr. ; max 18 cr. ; Student Option; Every Fall & Spring)
Reading in Greek texts/authors. Texts/authors vary. prereq: [GRK 3004 or equiv], at least two yrs of college level Greek. Must contact Classical and Near Eastern Studies department for permission to register.

GRK 5200. Biblical Greek. (. ; 3 cr. ; max 6 cr. ; Student Option; Fall Even Year)
Readings from Gospels, epistles of Paul, related literature. Emphasizes proficiency in reading Greek New Testament. Selections vary, prereq: [GRK 3004 or equiv], at least two yrs of college level Greek. Must contact Classical and Near Eastern Studies department for permission to register.

GRK 5701. Prose Composition. (. ; 3 cr. ; Student Option; Spring Odd Year)
Moving step by step through Ancient Greek grammar, starting with simple sentences and progressing to complex ones. Course ends with students translating short passages of modern English prose into Greek. prereq: Grad student or instr consent

GRK 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin. (. ; 3 cr. ; Student Option; Periodic Fall & Spring)
Historical/comparative grammar of Greek and Latin from their Proto-Indo-European origins to classical norms.

GRK 5800. Sight Reading for Graduate Students. (. ; 1 cr. ; max 6 cr. ; S-N only; Every Fall & Spring)
Practice in reading Greek texts at sight. prereq: Enrollment in a grad program in Department of Classical/Near Eastern Studies

GRK 5993. Directed Studies. (. ; 1-4 cr. ; max 18 cr. ; Student Option; Every Fall, Spring & Summer)
Guided individual reading or study. Prereq Grad student or instr consent

GRK 5994. Directed Research. (. ; 1-12 cr. ; max 18 cr. ; Student Option; Every Fall & Spring)
Supervised original research on topic chosen by student. Prereq Grad student or instr consent

GRK 5996. Directed Instruction. (. ; 1-12 cr. ; max 20 cr. ; Student Option; Every Fall & Spring)
Supervised teaching internship. Prereq Grad student or instr consent.

GRK 8100. Readings in Greek Prose. (. ; 3 cr. ; max 18 cr. ; Student Option; Every Fall & Spring)
Reading and discussion of ancient Greek prose texts. prereq: Advanced grad student

GRK 8120. Greek Text Course. (. ; 3 cr. ; max 15 cr. ; Student Option; Every Fall & Spring)
Students attend 3xxx Greek courses. Supplementary work at discretion of instructor.
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

An introductory survey of health informatics, focusing on applications of informatics concepts and technologies. Topics covered include: health informatics research, literature, and evaluation; precision medicine; decision models; computerized decision support systems; data mining, natural language processing, social media, rule-based system, and other emerging technologies for supporting ‘Big Data’ applications; security for health care information handling. Lectures, readings, and exercises highlight the intersections of these topics with current information technology for clinical care and research. prereq: Junior, senior, grad student, professional student, or instr consent

Final opportunity to apply newly acquired knowledge/skills to project involving practical problem in health informatics. Submit written project report in lieu of final examination. prereq: second semester MHI student or instr consent

HINF 5501. US Health Care System: Information Challenges in Clinical Care. (1 cr.; S-N or Audit; Every Fall & Spring) Health care system/its unique interaction between key health system stakeholders. Relationship between patients, providers, payers, regulatory bodies. Role of information management/challenges of information standardization/exchange. prereq: Junior or senior or professional student or grad student or instr consent

HINF 5502. Python Programming Essentials for the Health Sciences. (1 cr.; S-N or Audit; Every Fall & Spring) Computer programming essentials for health sciences/health care applications using Python 3. Intended for students with limited programming background, or students wishing to obtain proficiency in Python programming language. prereq: Junior or senior or grad student or professional student or instr consent

HINF 5510. Applied Health Care Databases: Database Principles and Data Evaluation. (3 cr.; A-F or Audit; Every Fall) Principles of database theory, modeling, design, and manipulation of databases will be introduced, taught with a healthcare applications emphasis. Students will gain experience using a relational database management system (RDBMS), and database manipulation will be explored using Structured Query Language (SQL) to compose and execute queries. Students will be able to critically evaluate database query methods and results, and understand their implications for health care. prereq: Junior or senior or grad student or professional student or instr consent

HINF 5520. Informatics Methods for Health Care Quality, Outcomes, and Patient Safety. (2 cr.; A-F or Audit; Every Fall & Spring) Application/operation of clinical information systems, electronic health records, decision support/application in health care system. Use of clinical information systems/association with health care delivery, payment, quality, outcomes. prereq: Junior or senior or grad student or professional student or instr consent

HINF 5530. Health Care Software Management. (2 cr.; A-F or Audit; Every Spring) Health care software and unique interaction between key stakeholders in health care software development and implementation. Systems analysis, software development, and software life cycle management for health care applications. prereq: HINF student or instr consent

HINF 5531. Health Data Analytics and Data Science. (3 cr.; A-F or Audit; Every Spring) Data science methods and techniques for the extraction, preparation, and use of health data in decision making. prereq: Junior or senior or
HINF 5540. Interprofessional Health Informatics. (2 cr.; A-F only; Every Spring) Informatics applications in various healthcare professions. Clinical specialties. Informatics tools to improve healthcare services/outcomes through lectures/presentations.

HINF 5610. Foundations of Biomedical Natural Language Processing. (3 cr.; Student Option; Periodic Fall) The course will provide a systematic introduction to basic knowledge and methods used in natural language processing (NLP) research. It will introduce biomedical NLP tasks and methods as well as their resources and applications in the biomedical domain. The course will also provide hands-on experience with existing NLP tools and systems. Students will gain basic knowledge and skills in handling with main biomedical NLP tasks. Prerequisites graduate student or instructor consent; Experience with at least one programming language (Python or Perl preferred) Recommended: basic understanding of data mining concepts, basic knowledge of computational linguistics.

HINF 5620. Data Visualization for the Health Sciences. (3 cr.; A-F or Audit; Periodic Spring) An advanced health informatics course, focusing on theoretical and practical aspects of data and information visualization for health care and the health sciences. Topics include classic and novel visualization types; models of human visual perception and cognition; color, text and typography; maps and diagrams; evaluation and testing; and the aesthetic and cultural aspects of visualization. Examples emphasize health sciences applications for clinicians, patients, researchers, and analysts. Modern programming and commercial tools are discussed, including D3, ggplot2, and Tableau. Students will report on and discuss visualization methods, published studies and books, culminating in a final visualization project of the student's choosing.

HINF 5630. Clinical Data Mining. (3 cr.; A-F or Audit; Every Fall) This is a hands-on introductory data mining course specifically focusing on health care applications. Analogously to the relationship between biostatistics and statistics, the data and computational challenges, the experiment design and the model performance requirements towards data mining in the clinical domain differ from those in general applications. This course aims to teach the students the most common data mining techniques and elaborate on the differences between general and clinical data mining. Specifically, the course will focus on (i) clinical data challenges and preprocessing; (ii) survey of the most common techniques in the clinical domain; (iii) clinical application touching up on experimental design and collaborations with physicians. The class will meet twice a week, one day dedicated to lectures and one day to a hands-on lab component, where students are expected to apply the techniques to health-related data. Some of the models will be evaluated with the involvement of a physician collaborator. Prerequisites: Basic linear algebra (matrix notation), basic optimization (gradient descent) Graduate level introductory statistics (e.g. STAT 5101-5102) or equivalent or instructor consent.

HINF 5640. Advanced Translational Bioinformatics Methods. (3 cr.; A-F or Audit; Every Fall) This course is designed to introduce the high throughput platforms to students who are interested in the genomics research and genomics data analysis in the basic and clinical medical science field. The course covers history of the genomics platforms, its revolution and the specifics of the data generated by all existing different platforms. The course will also introduce all existing sequencing platforms and applications to biological science, as well the current trends in this field.

HINF 5650. Integrative Genomics and Computational Methods. (3 cr.; A-F or Audit; Every Spring) Genome-scale high throughput data sets are a central feature of modern biological research and translational clinical study. Experimental, computational biologists and clinical researchers who want to get the most from their data sets need to have a firm grasp and understanding of genomic data structure characteristics, analytical methodology and the intrinsic connection to integrate. This course is designed to build competence in quantitative methods for the analysis of high-throughput genomic data and data integration.

HINF 6220. Computational Causal Analytics. (3 cr.; A-F or Audit; Every Fall) Identifying causal relationships and mechanisms is the ultimate goal of natural sciences. This course will introduce concepts and techniques underlying computational causal discovery and causal inference utilizing both observational and experimental data. Example applications of the above mentioned techniques in the domain of health sciences include reconstructing the molecular pathways underlying a particular disease, identifying the complex and interacting factors influencing a mental health disorder, and evaluating the potential impact of a public health policy. The course emphasizes both on the theoretical foundations and the practical aspects of causal discovery and causal inference. Students will gain hands-on experience with applying major causal discovery algorithms on simulated and real data.

HINF 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

HINF 8405. Advanced Topics in Health Informatics I. (1-4 cr. [max 12 cr.]; Student Option; Every Fall) Topics may include computer systems design for health sciences, small computer concepts/use, computers for clinical services, computer-aided medical decision making, biomedical image processing, pattern recognition, data mining. Case studies from health sciences. prereq: Professional student or grad student or instr consent

HINF 8406. Advanced Topics in Health Informatics II. (1-4 cr. [max 12 cr.]; Student Option; Every Spring) This is a topics course. Topics may include, computational causal discovery for health sciences, computer systems design for health sciences, small computer concepts and use, computers for clinical services, computer-aided medical decision making, biomedical image processing, and pattern recognition. Case studies from health sciences.

HINF 8430. Foundations of Health Informatics I Lab. (2 cr.; A-F or Audit; Every Fall) The PhD-level lab complement for an introductory survey of health informatics, focusing on foundational concepts. Topics covered include: conceptualizations of data, information, and knowledge; current terminologies, coding, and classification systems for medical information; ethics, privacy, and security; systems analysis, process and data modeling; human-computer interaction and data visualization. Lectures, readings, and exercises highlight the intersections of these topics with electronic health record systems and other health information technology.

HINF 8431. Foundations of Health Informatics II Lab. (2 cr.; Student Option; Every Spring) The PhD-level lab complement for an introductory survey of health informatics, focusing on applications of informatics concepts and technologies. Topics covered include: health informatics research, literature, and evaluation; precision medicine; decision models; computerized decision support systems; data mining, natural language processing, social media, rule-based system, and other emerging technologies for supporting ‘Big Data’ applications; security for health care information handling. Lectures, readings, and exercises highlight the intersections of these topics with current information technology for clinical care and research.

HINF 8434. Medical Decision Support Techniques. (3 cr.; A-F or Audit; Every Fall & Spring) Examines systems based on statistical and logical approaches to decision making that include statistical prediction, rule-based systems, case-based reasoning, quantitative reasoning, and neural networks, and issues related to their use. prereq: 5432 or instr consent

HINF 8440. Foundations of Translational Bioinformatics Lab. (2 cr.; A-F or Audit; Every Fall) Translational bioinformatics deals with the assaying, computational analysis and knowledge-based interpretation of complex molecular data to better understand, prevent, diagnose and treat disease. This course emphasizes deep DNA sequencing methods that have persistent impact on research related to disease diagnosis and treatment.
The course covers sequence analysis, applications to genome sequences, and sequence-function analysis, analysis of modern genomic data, sequence analysis for gene expression/transitional genomics analysis, and gene mapping/applied population genetics. Prerequisites: MS, PhD, or MD/PhD student interested in translational bioinformatics

HINF 8444. FTE: Doctoral. ([1-1 cr. ; No Grade Associated; Every Fall, Spring & Summer] (No description) prereq: Doctoral student, adviser and DGS consent

HINF 8446. Professional Studies in Health Informatics. ([1-2 cr. ; A-F or Audit; Every Fall & Spring) Health informatics as a profession, including discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities. prereq: 5431, PubH 5452 or instr consent, grad hist int major

HINF 8492. Advanced Readings or Research in Health Informatics. ([1-6 cr. ; max 24 cr. ; Student Option No Audit; Every Fall, Spring & Summer) Directed readings or research in topics of current or theoretical interest in health informatics. prereq: HINF student or instr consent

HINF 8494. Research in Health Informatics. ([1-6 cr. ; A-F or Audit; Every Fall, Spring & Summer) Directed research under faculty guidance. prereq: instr consent

HINF 8525. Health Informatics Teaching. ([2 cr. ; A-F only; Spring Even Year) Use selected teaching techniques to assist in the delivery of course content in health informatics curriculum. Work with a professor who is the course director. From evaluation and feedback on their teaching technique, students develop a teaching philosophy as a final course project. prereq: HINF student or instr consent prereq: HINF student or instr consent

HINF 8535. Advanced Health Informatics Research Methods. ([3 cr. ; A-F only; Spring Even Year) Application of research methods, evaluation. Design, data collection, and data analysis in the context of health informatics, including computational and health data challenges. prereq: HINF student or instr consent

HINF 8666. Doctoral Pre-Thesis Credits. ([1-6 cr. ; max 12 cr. ; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

HINF 8770. Plan B Project. ([4 cr. ; No Grade Associated; Every Fall, Spring & Summer) Research project. Topic arranged between student/instructor. Written report required. prereq: Advanced plan B MS student

HINF 8777. Thesis Credits: Master's. ([1-18 cr. ; max 50 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

HINF 8888. Thesis Credit: Doctoral. ([1-24 cr. ; max 100 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: PhD candidate or department consent. Max 18 credits per semester; 24 credits required

**Hebrew (HEBR)**

**HEBR 5090. Advanced Modern Hebrew.** ([3 cr. ; A-F only; Student Option; Every Fall) Various authentic Hebrew texts. Comprehension/speaking. Conducted entirely in Hebrew, Emphasizes Modern Israeli Hebrew. Grammar, widening vocabulary. Contemporary short fiction, essays, articles on cultural topics, films, Hebrew Internet sites, TV.

**HEBR 5200. Advanced Classical Hebrew.** ([3 cr. ; max 12 cr. ; Student Option; Periodic Fall & Spring) In-depth reading, analysis, and discussion of classical Hebrew texts. Grammar, syntax. Introduction to text-criticism, history of scholarship, and scholarly tools. Format varies between survey of themes (e.g., law, wisdom, poetry) and extended concentration upon specific classical texts.

**HEBR 5300. Post-Biblical Hebrew: Second Temple Period.** ([3 cr. ; max 18 cr. ; Student Option; Periodic Spring) Readings in late-/post-biblical Hebrew literature of Persian, Hellenistic, and early Roman periods (e.g., Chronicles, Ezra-Nehemiah, Ecclesiastes, Daniel, Dead Sea Scrolls, apocrypha, pseudepigrapha). Focuses on historical development of Hebrew language and literature in relation to earlier biblical sources. prereq: Grad student or instr consent

**HEBR 5990. Topics in Hebrew Studies.** ([1-4 cr. ; max 12 cr. ; Student Option; Periodic Fall) Historical, linguistic, literary, religious, or humanistic study of Hebrew society/culture. Approach/method of study varies with topic. prereq: Grad student or instr consent

**HEBR 5992. Directed Readings.** ([1-4 cr. ; max 12 cr. ; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. Prereq instr consent, dept consent, college consent

**Heritage Studies & Public Hist (HSPH)**

**HSPH 8001. Who Owns the Past? Common Concerns and Big Questions in Heritage and Public History.** ([3 cr. ; A-F or Audit; Every Fall) Course offers a survey through case studies of the common concerns, concepts and ethics of heritage and public history. Students will learn about the history and social contexts of heritage studies and public history, the stakes and stakeholders, and the conflicts and positive interventions that can be made through the work of these affiliated professions.

**HSPH 8002. Core Practices in Heritage Studies and Public History.** ([3 cr. ; A-F or Audit; Every Fall) Course is open to all Heritage Studies and Public History (HSPH) graduate students. DGS or Instructor permission required for others. Course offers a survey of how heritage and public history concern and ethics are embedded into practice. Through illustrated lectures, case studies, field trips, readings and class discussion, students will learn about the professional practice of heritage studies and public history, how approaches to practice are aligned to institutional mission, customization of programs for diverse audiences, and professional evaluation and management of financial resources.

**HSPH 8003. Race and Indigeneity in Heritage Representation.** ([3 cr. ; A-F or Audit; Every Spring) This seminar will explore the changes in how diversity has been represented in historical interpretations in the past, and how practice is changing in response to the contemporary and anticipated social context of the United States. “Diversity” has historically been assumed to derive from categories such as race or culture, concepts constructed in the discipline of anthropology but taken up as the foundation for typologies in other arenas such as art history, architectural history, museums, and public policy. What is problematic in such an approach? What happens to communities defined by shared history, political sovereignty, and disenfranchisement? What are the implications beyond museums for those communities? Finally, how can we think differently about diversity without re-inscribing harmful constructions of difference?

**HSPH 8004. Capstone in Heritage Studies and Public History.** ([3 cr. ; A-F or Audit; Every Spring) This course will operate as a workshop, drawing together a cohort of students, working individually or as part of a team, to craft independent heritage studies and public history research projects under the supervision of a faculty instructor. Projects may be based in archival research, public exhibitions, archaeology, material culture studies and preservation, architecture and preservation, or landscape studies. Consistent with the values of the program, projects shall have multidisciplinary perspectives, broadly consider aspects of diversity, and will be accountable to some stakeholder(s) identified by the students.

**HSPH 8005. Leadership and Future of Historical Organizations.** ([1 cr. ; max 5 cr. ; S-N only; Every Fall & Spring) This course will operate as a series of lectures and discussions in which leaders of historical organizations explain how they are navigating major changes and challenges associated with their professional practice. Speakers in this course will be invited and organized by the

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
instructor in coordination with HSPH faculty and colleagues at the Minnesota Historical Society. Topics to be presented by speakers may include: making history accessible and meaningful to increasingly diverse audiences; interpreting difficult or traumatic histories; gathering, storing, and providing access to physical collections in a digital age; engaging the public in historical research and interpretation; the financial management and leadership of historical organizations. The course has several objectives: students will learn from and have the opportunity to meet, leaders of historical organizations located throughout Minnesota and the United States; it will also be a cohort-building opportunity as students in the first and second years of the program meet regularly in this course to hear from professional practitioners and discuss presentations and readings.

HSPH 8006. Digital Methods for Heritage Studies & Public History. (3 cr.; Student Option; Every Fall) Digital technologies are significantly altering the speed and scale of the foundational methodologies of archeology, history, and preservation. Moreover, they are shifting the way the public engages with the past in cultural institutions and across the myriad screens that pervade their daily life. In this course, students will not only learn how emerging digital technologies can enhance their research, but also how those technologies are fundamentally transforming the possibilities for the public presentation of that research. This course privileges hands-on learning and balances deeping essential methodological skills with exposure to a breadth of field-altering technologies. It is structured around five core methodologies—excavation, documentation, reconstruction, interpretation, and exhibition. In each unit, students will be first be tasked with identifying the underlying principles of these methodological approaches. They will then use class time to explore technologies that extend those methods such as high-resolution imaging, relational databases, text mining programs, virtual environments, and content management systems for website building. Bookending the course is a focus on effective management systems for website building. It is structured around five core methodologies—excavation, documentation, reconstruction, interpretation, and exhibition. In each unit, students will be first be tasked with identifying the underlying principles of these methodological approaches. They will then use class time to explore technologies that extend those methods such as high-resolution imaging, relational databases, text mining programs, virtual environments, and content management systems for website building. Bookending the course is a focus on effective management systems for website building.

Hindi (HNDI)

HNDI 5040. Readings in Hindi Texts. (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Read authentic materials of various types to improve reading/speaking ability.

Hindi-Urdu (HNUR)

HNUR 5993. Directed Readings. (1-5 cr.; max 15 cr.; Student Option; Every Fall & Spring) Guided individual reading or study of modern Hindi-Urdu texts. Prereq instr consent, dept consent, college consent.

History (HIST)

HIST 5011. Measuring the Past: Quantitative Methods for Historical Research. (4 cr.; Student Option; Periodic Fall & Spring) Basics of quantitative historical data collection, measurement, and analysis. Prereq: Primarily for 1st-yr grad students

HIST 5053. Doing Roman History: Sources, Methods, and Trends. (3 cr.; Student Option; Fall Even, Spring Odd Year) Survey of major scholarship in field of Roman history since Mommsen. Political, cultural, social, military, and economic history. Focuses on methodological problems posed by evidence. Wys in which these issues shape research. Prereq: Grad student or instr consent

HIST 5111. Proseminar in the History of Medieval Europe. (3 cr.; A-F or Audit; Periodic Fall & Spring) Examination of basic scholarly bibliography for medieval Western European history. Aim is to help students to prepare for M.A. and Ph.D. examinations. Prereq: Advanced undergrads of exceptional ability or grads, instr consent

HIST 5115. Medieval Latin Historians. (3 cr.; Student Option; Periodic Fall & Spring) Writing of history in Western Europe during the Middle Ages. Focus on idea of history, philosophy of various historians, techniques of research by medieval historians and chroniclers, history as literature, and value of medieval histories to modern research scholars. Latin texts only. Prereq: Reading knowledge of Latin

HIST 5264. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3 cr. [max 4 cr.]; Student Option; Every Fall & Spring) Interaction with Europe and Asia; attempts at modernization and reform; emancipation of the serfs and rise of revolutionary movements.

HIST 5265. 20th-Century Russia: The Collapse of Imperial Russia, the Revolutions, and the Soviet Regime. (3 cr.; Student Option; Every Spring) Analysis of the factors that led to the collapse of the tsarist regime; discussion of the 1917 revolution, the evolution of the Soviet regime and the collapse of Soviet communism. Emphasis on the role of nationalities and the rise of the Commonwealth of independent states.

HIST 5271. The Viking World: Story, History, and Archaeology. (3 cr.; A-F or Audit; Periodic Fall & Spring) Viking society and expansion of Viking influence abroad. Viking impact on Western Europe, interactions with Slavic lands, settlement of North Atlantic islands, Western Europe's impact on Scandinavian lands. Analyzes archaeological, historical, linguistic, and numismatic evidence.

HIST 5281. European Intellectual History: The Early Modern Period, Antiquity to 1750. (3 cr.; A-F or Audit; Periodic Fall) First of a two-semester course. European thought in its historical/cultural context. Emphasizes development of philosophical/scientific thought, its relation to thinking about the individual and the community. Readings from original sources. Prereq: Grad student or instr consent

HIST 5282. European Intellectual History: The Modern Period, 1750-Present. (3 cr.; A-F or Audit; Periodic Spring) Second of a two-semester course. European thought in its historical/cultural context. Emphasizes development of philosophical/scientific thought, its relation to thinking about the individual and the community. Readings are from original sources. Prereq: Grad student or instr consent

HIST 5283. Marx, Capital and History: An Introduction to Marxist Theory and History. (3 cr.; Student Option; Spring Even Year) Explore Marx's understanding of capitalism and its history. Marx's argument regarding historical specificity of capitalism as economic/social condition

HIST 5286. Galileo and the Beginnings of Modern Science. (3 cr.; A-F only; Periodic Fall) The life and work of Galileo Galilei (1564-1642), often called the ?founder of modern science.? Topics: the Renaissance Italian context for Galileo's work; the arrangements of authoritative knowledge that prevailed in 16th-century Tuscany and Venice; the role that universities, the Catholic church, learned academicians, and the state played in disciplining knowledge. We consider the episodes of Galileo's career and read his seminal texts with secondary commentaries upon them. His telescopic observations of 1609-10; his battles with Aristotelian natural philosophy; his experiments and arguments on behalf of experimental and mathematical physics; his defense of Copernican heliocentric cosmology and his trial and condemnation by the Roman Catholic Church for heresy; and his work in mathematics and mathematical physics that paved the way for Newton and Einstein. The goal will be to understand the achievements of Galileo in their specific historical and cultural context and to use these reflections for thinking
about the nature of the modern science that he helped to initiate.

**HIST 5295. Social History of Russia and Eastern Europe From the Late 19th Century to the Present.** (3 cr.; Student Option; Periodic Fall & Spring)
Social movements (revolutionary, nationalist, women's); communist and post-communist societies.

**HIST 5379. Problems in Early American History.** (3 cr.; Student Option; Periodic Fall & Spring)
Intensive consideration of topics in early American history. Topics may include readings in race, class, and gender; comparative colonialism; slavery; demography; economic history; religion; and regions in the colonial world.

**HIST 5381. Minnesota History Workshop.** (3 cr.; Student Option; Periodic Fall & Spring)
A case study and seminar approach to historical research and interpretation. It offers teachers and other scholars a chance to survey a particular topic in Minnesota history and to write their own historical narrative based on primary source research. prereq: 1301, 1302

**HIST 5439. Environment and Society in Africa.** (3 cr.; Student Option; Periodic Fall & Spring)
Major historiographical, theoretical, and methodological debates concerning people-environment relations in Africa, from rise of human societies to present. Environment and the rise of civilizations. Demography, colonial environmental policies, conservation, disease, indigenous knowledge, water management, food. prereq: instr consent

**HIST 5468. Social Change in Modern China.** (3 cr.; Student Option; Every Fall)
Opium War and opening of Treaty Ports in 19th century; missionary activity and cultural influence; changes in education system; women's movement; early industrialization; socialism and collectivization after 1949; industrialization of Taiwan; PRC's entry into the world trading system.

**HIST 5469. Historiographies of China, 1000-1700.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Important recent English-language work on Chinese culture during the Song, Yuan, and Ming dynasties. Topics include religion, family structure, ethnicity, commerce/ economics, and political structures/events. prereq: Grad student or instr consent

**HIST 5478. Tigers and Dragons: The Rise of the East Asian Economies, 1930-Present.** (3 cr.; Student Option; Spring Odd Year)
Rise of East Asian Economies, 1930-Present. prereq: Grad student

**HIST 5479. History of Chinese Cities and Urban Life.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Introduction to traditional Chinese cities, their modern transformation. Ideal city plan in Confucian classics compared with physical layout of some major cities. Models about Chinese cities, influence of the models on our understanding of Chinese history/society.

**HIST 5513. North Africa since 1500: Islam, Colonialism, and Independence.** (3 cr.; Student Option; Spring Odd Year)
History of the Maghrib (Morocco, Algeria, Tunisia, Libya and disputed territories of Western Sahara from time of Ottoman expansion/Sharifian dynasties [Saidan/Alawid] in 16th/17th Centuries to end of 20th century. Focus on encounter of Islamic cultures/societies of Maghrib and Africa/Europe

**HIST 5540. Topics in Mediterranean Studies.** (1-4 cr. [max 15 cr.]; A-F or Audit; Every Fall & Spring)
Medieval history, from Middle Ages to present. Taught as staffing permits. prereq: Grad student or advanced undergrad with instr consent

**HIST 5547. Empire and Nations in the Middle East.** (3 cr.; Student Option; Periodic Fall & Spring)
Modernity in non-Western imperial context. Identity, ideology, economy, environment, language. prereq: Grad student or instr consent

**HIST 5611. New Directions in the Middle Ages, ca. 300-1100.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Basic scholarly bibliography for medieval Western European history during early Middle Ages. Foundation for teaching courses in medieval history, preparing for general doctoral exam. prereq: Grad student or instr consent

**HIST 5612. New Directions in the Middle Ages, ca. 1100-1500.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Basic scholarly bibliography for medieval Western European history during central/late Middle Ages. Foundation for teaching courses in medieval history, preparing for general doctoral exam. prereq: [5611, grad student] or instr consent

**HIST 5614. The Medieval Church.** (3 cr.; Student Option; Periodic Fall & Spring)
Introduction to history of western church in Middle Ages. Emphasizes church teachings and institutional structures, beliefs/practices of lay people, medieval Christian encounter with non-Christian world. prereq: Grad student or instr consent

**HIST 5615. Readings in European Women's History: 1450-1750.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Selected themes in modern European women's history. Topics include historical approaches to class/gender relations, state formation as social/political process, family history, evolution of public life, popular culture.

**HIST 5715. Readings in European Women's History: 1450-1750.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Introduction to current historical research on European women's history, 1450-1750. Topics include gender roles and form of family structure, women's participation in religious movements, legal status of women.

**HIST 5720. Society/Politics: Modern Europe.** (3 cr.; A-F or Audit; Every Fall & Spring)
Introduction to literature in English on problems of modern European social, cultural, political history. Thematic/geographic focus varies year to year. Topics include historical approaches to class/gender relations, state formation as social/political process, family history, evolution of public life, popular culture.

**HIST 5777. Proseminar in Habsburg Central Europe.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Central Europe under Habsburg rule from the reforms of Maria Theresa to imperial collapse. Continuity and change in society: economic and political modernization; the rise of national consciousness and anti-Semitism; politics and culture in the Fin de Siecle; the Empire and World War I. prereq: instr consent

**HIST 5797. Methods of Population History.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Standard methods of population analysis. Focuses on methods widely used for historical population research.

**HIST 5801. Seminar in Early American History.** (3 cr.; A-F or Audit; Periodic Fall & Spring)
Introduction to literature of early American history. Readings selected from some of best scholarship in field. Questions of colonial historians. Theories, methods, sources used in pursuit of those questions.

**HIST 5802. Readings in American History, 1848-Present.** (3 cr.; A-F or Audit; Every Fall & Spring)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
paper to become part of their portfolio, or a chapter of an MA thesis or dissertation). In either case, students will focus on the process of rigorously conceptualizing their research by writing a proposal using a format that is suggested by the Graduate School’s Doctoral Dissertation Fellowship application’s “Statement of Research” as a model.

HIST 8025. Politics of Historical Memory. (3 cr. ; A-F or Audit; Periodic Fall & Spring)

HIST 8031. Digital Methods for Heritage Studies & Public History. (3 cr.; Student Option; Every Fall)
Digital technologies are significantly altering the speed and scale of the foundational methodologies of archeology, history, and preservation. Moreover, they are shifting the way the public engages with the past in cultural institutions and across the myriad screens that pervade their daily life. In this course, students will not only learn how emerging digital technologies can enhance their research, but also how those technologies are fundamentally transforming the possibilities for the public presentation of that research. This course privileges hands-on learning and balances deepening essential methodological skills with exposure to a breadth of field-altering technologies. It is structured around five core methodologies—excavation, documentation, reconstruction, interpretation, and exhibition. In each unit, students will be first be tasked with identifying the underlying principles of these methodological approaches. They will then use class time to explore technologies that extend these methods such as high-resolution imaging, relics, text mining programs, virtual environments, and content management systems for website building. Bookending the course is a focus on effective collaboration—the foundation of successful digital projects—and public engagement in an increasingly connected yet fractured society.

HIST 8110. Medieval History: Research Seminar. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Research in medieval European history, using primary source material. prereq: instr consent, good reading knowledge of Latin, French, one other European language

HIST 8122. Public Histories. (3 cr.; A-F or Audit; Every Fall)
This seminar examines the variety of ways that “public history” is produced both within and outside the academy and explores interdisciplinary approaches to the making and critical analysis of public histories. Students will discuss recent scholarship by historians as well as scholars and practitioners in allied fields. Through discussion and collaborative project work, the seminar will also provide a hands-on introduction to the theory, methods, practice and politics of public history.

HIST 8232. Cultural Fallout: The Cold War and Its Legacy: Research. (3 cr.; A-F or Audit; Every Fall & Spring)
Student produce research paper on history/culture of Cold War era as it developed in United States after World War II. Research project builds upon readings from 8231.

HIST 8239. Readings in Gender, Race, Class, and/or Ethnicity in the United States. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Dynamics of gender, racial, and ethnic relations in U.S. history; intersections of these forces. prereq: instr consent

HIST 8240. Topics in Research in Gender, Race, Class, or Ethnicity in the United States. (3 cr.; max 6 cr.; A-F or Audit; Periodic Fall & Spring)
Dynamics of gender, racial, and ethnic relations in U.S. history. Intersections of these forces. Topics vary by instructor. prereq: instr consent

HIST 8245. Human Rights: A Global History. (3 cr.; A-F or Audit; Periodic Fall & Spring)
This course will focus on debates and social movements concerning human rights in the broadest sense, beginning with the seventeenth century and ending in the 1950s. Topics include colonization, slavery, torture, war crimes, rights to land, women's rights, sexual rights, and indigenous self-determination. The seminar will require a research or historiographical paper.

HIST 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master’s student, adviser and DGS consent

HIST 8390. Research in American Indian History. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Research/writing skills in American Indian history. Identify research questions, locate sources, conduct original research, produce substantial research paper.

HIST 8434. Health and Healing in African History. (3 cr.; Student Option; Periodic Fall & Spring)

HIST 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

HIST 8464. Research in Yuan, Ming, and Qing History. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Basic skills and resources for doing research in history of late imperial China. Bibliographic exercises; reading and translating primary documents. prereq: Good working knowledge of classical Chinese, background in history of late imperial China

HIST 8465. Research in Yuan, Ming, and Qing History. (3 cr.; Student Option; Periodic Fall & Spring)
Basic skills and resources for doing research in history of late imperial China. Students select, translate, and annotate texts appropriate to their research interests and write a research paper centering on these texts. prereq: Good working knowledge of classical Chinese, background in history of late imperial China

HIST 8540. Topics in Mediterranean Studies. (1-4 cr.; max 15 cr.; A-F or Audit; Every Fall & Spring)
Mediterranean history from Middle Ages to present. Taught as staffing permits. prereq: Grad student or advanced undergrad with instr consent

HIST 8630. Seminar in World History. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Critical examination of historical literature dealing with theoretical approaches to world history and teaching of world history. prereq: instr consent

HIST 8640. Topics in Legal History Research. (3 cr.; max 9 cr.; A-F or Audit; Periodic Fall & Spring)
Comparative, methodological, theoretical, and topical courses in legal historical research, from ancient world to present. Offerings rotate.

HIST 8644. Legal History Workshop. (3 cr.; A-F or Audit; Every Fall & Spring)
Introduction to legal history and professional socialization. Work-in-progress of leading scholars working in field of legal history. Students can undertake original research. prereq: instr consent

HIST 8645. American Legal History. (3 cr.; A-F only; Periodic Spring)
This course explores the interaction between law, politics, and culture in American society, concentrating on the period from the Revolution through the New Deal. Topics include: democracy and the rule of law; slavery; the public-private distinction; Civil War and Reconstruction; industrialization; expansion of the federal administrative state; law and the human sciences; crime and punishment; legal education and the role of the law in the American polity. Readings will include primary legal sources, such as treatises, statutes, constitutions, and landmark cases, as well as contemporary religious, scientific, and literary works, which will help to situate the legal materials in broader cultural context. Several secondary sources will also be considered, both for insights into the topics covered, and to illustrate various approaches to legal-historical analysis. The course will encourage critical examination of these sources with the aim of clarifying how law has figured in the history and historiography of the United States. No previous background in American history is assumed.

HIST 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr;
HIST 8709. Seminar: History of Sexuality. (3 cr.; A-F or Audit; Periodic Fall & Spring) Theories of sexuality (by, e.g., Foucault, Butler, deLauretis), their application in history. Topics may include: feminist critique of Foucault and the classics, psychoanalytic approaches to religious transformations such as the Reformation, varying forms of gender transgression, sexuality in colonial encounters, operation of sexual metaphors in political conflict, and AIDS and the writing of history.

HIST 8715. Research on European Women's History, 1450-1750. (3 cr.; Student Option; Periodic Fall & Spring) Research techniques for completing a major research paper based on primary sources. Prereq: P5715

HIST 8720. Research Seminar on Central European History. (1-4 cr. [max 16 cr.]; A-F or Audit; Every Fall, Spring & Summer) Broad research theme/problem: in most cases preparation for dissertation. Students identify primary/secondary sources, conduct research, write paper, and read/comment upon each other's drafts. Geographic focus varies with instructor, may include Germany or lands of former Habsburg Austrian empire.

HIST 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) No description) Prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

HIST 8801. Seminar in Early American History. (3 cr.; A-F or Audit; Periodic Fall & Spring) Introduction to literature of early American history. Readings selected from some of best scholarship in field. Questions of colonial historians. Theories, methods, sources used in pursuit of those questions.

HIST 8802. Readings in American History, 1848-Present. (3 cr.; A-F or Audit; Periodic Fall & Spring) Readings-intensive course. U.S. history from Mexican-American War to present.

HIST 8832. Cultural Fallout: The Cold War and Its Legacy: Research. (3 cr.; A-F or Audit; Every Fall & Spring) Introduction to the literature of the Cold War era. Readings selected from some of best scholarship in field. Questions of historians, including cultural historians. Theories, methods, sources used in pursuit of those questions.

HIST 8858. Research in Early American History. (3 cr.; A-F or Audit; Periodic Fall & Spring) Research and writing skills. With instructor and other participants, students identify their research questions, locate the sources with which to answer these questions, conduct original research, and produce a substantial research paper. Prereq: P5801 or instr consent

HIST 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) Prereq: Max 14 cr per semester or summer, 24 cr required

HIST 8900. Topics in European/Medieval History. (1-4 cr. [max 20 cr.]; A-F or Audit; Every Fall & Spring) Topics not covered in regular courses.

HIST 8905. Topics in European Medieval History. (1-4 cr. [max 16 cr.]; Student Option; Every Fall & Spring) Selected topics in Medieval European history, up to 1500ce.

HIST 8910. Topics in U.S. History. (1-4 cr. [max 16 cr.]; A-F or Audit; Every Fall & Spring) Topics not covered in regular courses.

HIST 8920. Topics in African History. (1-4 cr. [max 20 cr.]; A-F or Audit; Periodic Fall) Topics not covered in regular courses.

HIST 8930. Topics in Ancient History. (1-4 cr. [max 16 cr.]; A-F or Audit; Periodic Fall & Spring) Topics not covered in regular courses.

HIST 8940. Topics in Asian History. (1-4 cr. [max 16 cr.]; A-F or Audit; Periodic Fall) Topics not covered in regular courses.

HIST 8944. Research Seminar: New Directions in African Social History I. (3 cr.; A-F or Audit; Periodic Fall & Spring) First of two-part course. Radical transformation in field of African social history during past two decades. Students select major research topic and begin preliminary investigation. Prereq: instr consent

HIST 8945. Research Seminar: New Directions in African Social History II. (3 cr.; S-N or Audit; Periodic Fall & Spring) Second of two-part course. Students conceptualize and write major research paper. Prereq: 8944, instr consent

HIST 8950. Topics in Latin American History. (1-4 cr. [max 16 cr.]; A-F or Audit; Every Spring) Topics not covered in regular courses.

HIST 8960. Topics in History. (1-4 cr. [max 20 cr.]; A-F or Audit; Every Fall & Spring) Topics not covered in regular courses.

HIST 8961. Research Seminar: Intellectual History. (3 cr.; A-F or Audit; Periodic Fall & Spring) Approaches/methods. Readings on or exemplifying intellectual history. Intellectual history as something broader than history of philosophical thought: a set of approaches of broad cross-disciplinary applicability. Each student prepares a research paper on a topic of intellectual history and present it to class for critique.

HIST 8970. Advanced Research in Quantitative History. (3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring) Students carry out publishable-quality research on quantitative history topic. Prereq: Grad student

HIST 8990. Topics in Comparative History-Research. (3 cr. [max 15 cr.]; Student Option; Every Fall & Spring) Topics vary. Students read/discuss historical works from different geographic areas, develop proposals for comparative research, or pursue comparative research projects. Prereq: instr consent

HIST 8993. Directed Study. (1-16 cr.; A-F or Audit; Every Fall, Spring & Summer) Students work on tutorial basis. Guided individual reading or study. Prereq: Grad student, instr consent

HIST 8994. Directed Research. (1-16 cr.; A-F or Audit; Every Fall, Spring & Summer) Work on a tutorial basis. Prereq: instr consent

History of Medicine (HMED)

HMED 5075. Technology and Medicine in Modern America. (3 cr.; A-F or Audit; Fall Odd, Spring Even Year) How technology came to medicine's center-stage. Impact on medical practice, institutions, consumers; production of medical knowledge, professionalization, health policy, gender/race disparities in health care. Prereq: instr consent

HMED 7500. Historical Research for Medical Students. (4 cr. [max 8 cr.]; H-N only; Every Fall, Spring & Summer) This course is designed to acquaint third and fourth year medical students with the sources and the methods of historical research in medical topics and to allow them to undertake a short research project on a topic which they help design.

HMED 8001. Foundations in the History of Early Medicine. (3 cr.; A-F only; Every Fall) History of Western medicine, from professionalization of healing in Greco-Egyptian antiquity to association of postmortem pathology with disease and clinical movement of early 19th-century Paris.

HMED 8002. Foundations in the History of Modern Medicine, 1800-present. (3 cr.; A-F only; Every Spring) History of Western medicine in Europe and America, from the Paris School and pathological anatomy in early 19c France through germ theories of disease, bacteriological revolution, reform of medical education, pharmaceutical revolution, growth of biomed research establishment, and comparative health care delivery systems.

HMED 8112. Historiography of Science, Technology, and Medicine. (3 cr.; A-F only; Every Fall)
Changing conceptions of life and aims and methods of biology; changing relationships between biology and the physical and social sciences; broader intellectual and cultural dimensions of developments in biology.

HSCI 5242. Navigating a Darwinian World. (3 cr.; Student Option; Every Spring)
In this course we grapple with the impact of Darwin's theory of evolution in the scientific community and beyond. We'll examine and engage the controversies that have surrounded this theory from its inception in the 19th century through its applications in the 21st. What made Darwin a Victorian celebrity, a religious scourge, an economic sage and a scientific hero? We'll look closely at the early intellectual influences on theory development; study the changing and dynamic relationship between science and religion; and critically analyze the application of Darwin's theory to questions of human nature and behavior.

HSCI 5244. Nature's History: Science, Humans, and the Environment. (3 cr.; Student Option; Every Fall)
We examine environmental ideas, sustainability, conservation history; critique of the human impact on nature; empire and power in the Anthropocene; how the science of ecology has developed; and modern environmental movements around the globe. Case studies include repatriation of endangered species; ecology and evolutionary theory; ecology of disease; and climate change.

HSCI 5246. History of (Un)Natural Disasters. (3 cr.; Student Option; Periodic Spring)
Earthquakes, hurricanes, tsunamis, wildfires, epidemic disease, and technological failures. This course will examine large scale natural events in American and world history, the social, technological, and environmental conditions that underlie them, and their historical consequences. Human societies have long been embedded in physical landscapes where they are subject to specific environmental conditions and physical risks: eight thousand-year-old wall paintings in Turkey depict the eruption of Hasan Dag volcano over the city of Catal Huyuk, for example. But then and now, it takes a certain combination of social conditions and environmental events to create a natural disaster. In this course, we will use historical natural disasters to explore the interconnections between the structures and ideas of human society and environmental forces. Humans have not been simply the random victims of natural disasters; rather, and how they chose to live influenced the impact of any disastrous event. Examining these events in a historical context will help us see the social, technological, scientific, and environmental systems that have been constantly interacting, but which are normally taken for granted until they break down.

HSCI 5331. Technology and American Culture. (3 cr.; Student Option; Periodic Fall & Spring)

HSCI 5332. Science in the Shaping of America. (3 cr.; Student Option; Periodic Spring)
The British colonies of North America were founded in precisely the same centuries as a revolution in European's understanding of nature, transformed by the ideas of Galileo, Newton, and Linnaeus and by the technologies of the industrial revolution. Native Americans and African Americans had their own knowledge of nature, and their close understanding intersected with the increasingly scientific techniques brought with European settlers and enhanced the survival and intellectual capacities of the newcomers. By demonstrating the diversity of scientists in the ever changing demographics of an immigrant nation, the course argues that this diversity and the capacities of newcomers contributed to the national success in science and engineering. The engagement with science at points was used to try to limit access by women or African-Americans, but sciences was also used to discredit false theories through ever expanding emphasis on empiricism as well as attention to the social and economic consequences of innovation. The goal is to demonstrate those historical linkages in particular places and institutions as they influenced and reinforced specific scientific work, while, at the same time, being attentive to how scientific ideas and practices were shaped by American culture.

HSCI 5401. Ethics in Science and Technology. (3 cr.; Student Option; Periodic Fall & Spring)
Historical issues involving ethics in science. Ethical problems posed by modern science/technology, including nuclear energy, chemical industry, and information technologies.

HSCI 5421. Engineering Ethics. (3 cr.; Student Option; Every Fall & Spring)
Engineering ethics in historical context, including the rise of professional engineering societies; ethical problems in engineering research and engineers' public responsibility; ethical implications of advanced engineering systems such as the production of nuclear weapons; development of codes of ethics in engineering.

HSCI 5511. Biology and Culture in the 19th and 20th Centuries. (CIV: 3 cr.; Student Option; Every Fall & Spring)
Understanding the origins of our own culture of Modern Science in the Enlightenment of the eighteenth century. Newton's ambiguous legacy; science as wonder and spectacle; automata and monsters; early theories of sex and gender; empire and scientific expeditions; reshaping the environment; inventing human sciences; Franklinstein and the limits of science and reason.

HSCI 5877. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

HSCI 5880. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
HSCI 5994. Directed Research. (1-15 cr.; Student Option; Every Fall & Spring) TBD prereq; instr consent

HSCI 8112. Historiography of Science, Technology, and Medicine. (3 cr.; A-F only; Every Fall) Models of practice, different schools. Work of representative historians of science, technology, and medicine.

HSCI 8113. Research Methods in the History of Science, Technology, and Medicine. (3 cr.; A-F only; Every Spring) Introduction to sources, methods, and problems of research in history of science, technology, and medicine. Preparation of major research paper under faculty supervision.

HSCI 8124. Foundations for Research in Ancient Science. (3 cr.; A-F or Audit; Periodic Fall) Development of natural/mathematical science in ancient Near East and Classical Greece. prereq: Grad HSci major or minor or instr consent

HSCI 8125. Foundations for Research in the Scientific Revolution. (3 cr.; A-F or Audit; Fall Even, Spring Odd Year) Development of sciences/natural philosophy, 1500-1725. prereq: Grad HSci major or minor or instr consent

HSCI 8131. Industrial Revolutions. (3 cr.; A-F only; Spring Even Year) Development of industrial society, from 1700 through 1850. Emphasizes developments in mechanical/engineering sciences. Scientific, economic, political, and social dimensions of industrialization.

HSCI 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

HSCI 8421. Social and Cultural Studies of Science. (3 cr.; Student Option; Periodic Fall & Spring) Review of recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

HSCI 8441. Women in Science: Historical Perspectives. (3 cr.; Student Option; Periodic Fall & Spring) Key literature dealing with patterns of participation in science and medicine since the 18th century. The ways in which modern science is perceived to be gendered, particularly in its practice and in ways that seem to influence theory and applications. prereq: instr consent

HSCI 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

HSCI 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

HSCI 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only)

HSCI 8830. Topics in the History of Science, Technology, and Medicine. (3 cr. [max 9 cr.]; A-F or Audit; Periodic Fall & Spring) Historical literature of topics common to history of science, technology, and medicine. prereq: instr consent

HSCI 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

HSCI 8900. Seminar: History of Early Physical Science. (3 cr.; Student Option; Periodic Fall & Spring) For advanced graduate students; topics in development of natural and mathematical science before 1800. prereq: instr consent

HSCI 8910. Seminar: History of Modern Physical Sciences. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) For advanced graduate students; topics in development of physical sciences since 1800. prereq: instr consent

HSCI 8920. Seminar: History of Biological Sciences. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring) For advanced graduate students; topics in development of natural, biological, and medical sciences from Aristotle to the present. prereq: instr consent

HSCI 8930. Seminar: History of Technology. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) For advanced graduate students; topics in development of technology from ancient times to the present. prereq: instr consent

HSCI 8940. Seminar: History of Science and Technology in the Americas. (3 cr.; Student Option; Every Fall & Spring) For advanced graduate students; topics in development of science and technology, emphasizing the United States and Canada. prereq: instr consent

HSCI 8950. Seminar: Science and Technology in Cultural Settings. (3 cr.; Student Option; Every Fall) For advanced graduate students; topics in development of science and technology in or across specific geographic regions or particular cultures. prereq: instr consent

HSCI 8993. Directed Studies. (1-5 cr. [max 15 cr.]; Student Option; Every Fall, Spring & Summer) TBD prereq: instr consent

HSCI 8994. Directed Research. (1-5 cr. [max 15 cr.]; Student Option; Every Fall & Spring) TBD


Horticulural Science (HORT)


HORT 5011. Common Medicinal Plants: Classification, Identification, and Application. (3 cr.; Student Option; Fall Odd Year) More than 200 common medicinal plants from 80 plant families. Medicinal plant identification/classification. Methods/philosophy of applying herbs for health and disease prevention. Practice with about 90 herb samples.

HORT 5012. Common Medicinal Plants: Growing and Processing. (3 cr.; Student Option; Fall Even Year) How to grow, process, store 40 common herbs/herbal products.


HORT 5031. Fruit Production and Viticulture for Local and Organic Markets. (3 cr.; A-F or Audit; Fall Odd Year) Principles of fruit production. Temperature fruit crops. Integrated management of fruit cropping systems. Site selection, cultural management practices, taxonomic classification, physiological/environmental control of plant development. Writing. prereq: [1001, 3005] or instr consent

HORT 5032. Organic Vegetable Production. (3 cr.; A-F or Audit; Spring Odd Year) Integrated management of vegetable cropping. Site selection/environment, seed/stand establishment, cultural management, commodity use, handling. Types of vegetable cultivars. Breeding, physiological/environmental control.
COURSES LISTED IN THIS CATALOG ARE CURRENT AS OF 2018-08-30. FOR UP-TO-DATE INFORMATION, VISIT WWW.CATALOGS.umn.EDU.


HORT 5059. Plant Cytogenetics Lab. (1 cr.; Student Option; Spring Odd Year) Consolidate knowledge of plant cytogenetics by practicing series of microscopy/computational technologies. Examine number, movement, structure/structure modification of chromosomes. Application in plant improvement. prereq: [HORT/AGRO 4401, BIOL 4004] or instr consent

HORT 5061. Advanced Turfgrass Science. (2 cr.; Student Option; Every Spring) For advanced students in turf with career objectives in turf management. Emphasis on ecology, physiology, theory of turf population dynamics and specialized management situations such as golf course, commercial sod production, and fine turf athletic settings. prereq: 4061

HORT 5071. Ecological Restoration. (4 cr.; Student Option; Every Fall) Ecological/physiological concepts for revegetation of grasslands, wetlands, forests, and landscapes. Plant selection, stand establishment/evaluation. State/federal programs that administer restoration/reclamation. Field trips. prereq: [One college course in ecology, one college course in [plant science or botany]] or instr consent

HORT 5090. Directed Studies. (1-3 cr.; max 6 cr.; Student Option; Every Fall, Spring & Summer) In-depth exploration of concepts, technology, materials, or programs in specific area to expand professional competency/self-confidence. Planning, organizing, implementing, and evaluating knowledge obtained from formal education and from experience. prereq: 8 cr upper div Hort courses, instr consent

HORT 5131. Student Organic Farm Planning, Growing, and Marketing. (3 cr.; Student Option; Every Spring) Students plan/implement cropping/marketing strategies for organic produce/flowers from Student Organic Farm on St. Paul campus. prereq: 1001 or AGRO 1101 or AGRO 1103 or BIOL 1001 or BIOL 1009 or instr consent

HORT 6002. Problem Solving in Horticulture. (3 cr.; max 4 cr.; S-N only; Every Fall) Collaborative problem-solving experience designed/completed by students with guidance from faculty instructor. prereq: Completion of 18 cr in master of agriculture in horticulture program or instr consent

HORT 6003. Masters of Professional Studies in Horticulture Professional Experience Program: Internship. (1-3 cr.; max 6 cr.; S-N only; Every Fall, Spring & Summer) Professional experience in horticulture firms or government agencies attained through supervised practical experience. Students evaluate reports, consult with faculty advisers and with employers. prereq: Masters of professional studies in horticulture student, completed internship contract, instr consent

HORT 6011. Plant Propagation. (4 cr.; A-F only; Every Fall) Principles/techniques of propagating plants by seeds, cuttings, grafts, buds, layers, and division. Lectures on principles, labs on practice of various propagating techniques. Reading/discussion of related primary literature. prereq: Master of Professional Studies or instr consent

HORT 8005. Supervised Classroom or Extension Teaching Experience. (2 cr.; S-N or Audit; Fall Even Year) Classroom or extension teaching experience in one of the following departments: Agronomy and Plant Genetics; Biosystems and Agricultural Engineering; Horticultural Science; Plant Pathology; or Soil, Water, and Climate. Participation in discussions about effective teaching to strengthen skills and develop personal teaching philosophy. prereq: instr consent

HORT 8007. Extension Horticulture Practicum. (1-5 cr.; Student Option; Every Fall, Spring & Summer) Selected activities that may include development of an extension fact sheet, assistance in Dial-U Clinic, or preparation of a workshop or short course. prereq: 9 grad cr in [ag or bio] science, instr consent

HORT 8023. Evolution of Crop Plants. (3 cr.; A-F only; Spring Even Year) Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today. prereq: 9 grad cr in ag or bio sciences

HORT 8044. Manipulation of Plant Growth and Reproduction. (2 cr.; Student Option; Periodic Fall & Spring) Impact of environmental and genetic factors on crop growth, development, and reproduction. Emphasis on whole plant physiology and plant response to the environment as determined by genotype and its manipulation for the purpose of producing a crop. Lectures, discussion of current literature, and projects. prereq: PBio 5412

HORT 8090. Graduate Horticultural Research. (1-12 cr.; max 18 cr.; Student Option; Every Fall, Spring & Summer) Conduct literature, lab, and/or field research with horticultural plants and cropping systems. prereq: instr consent

HORT 8201. Advanced Plant Breeding. (3 cr.; A-F only; Fall Odd Year) Principles/methods in breeding agronomic/horticultural crops. Use of genotype/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, new approaches. prereq: STAT 5301 or equiv

HORT 8270. Graduate Seminar. (1 cr.; A-F or Audit; Every Fall & Spring) Reports/discussions on problems, investigation work. prereq: Grad major in [hort or applied plant sciences or ent or agro or plant bredg or pint path or soil] or instr consent

HORT 8280. Current Topics in Applied Plant Sciences. (1 cr.; S-N or Audit; Every Fall & Spring) Topics presented by faculty or visiting scientists. prereq: Grad major in [hort or applied plant sciences or ent or agro or plant bredg or pint path or soil] or instr consent

HORT 8900. Advanced Discussions. (1-3 cr.; max 36 cr.; Student Option; Every Fall & Spring) Special workshops or courses in applied plant sciences. prereq: instr consent

HOUSING STUDIES (HSG)

HSG 5170. Topics in Housing Studies. (1-4 cr.; max 32 cr.; A-F only; Every Fall, Spring & Summer) In-depth investigation of a single specific topic, announced in advance.

HSG 5193. Directed Study in Housing Studies. (1-4 cr.; max 8 cr.; A-F or Audit; Every Fall, Spring & Summer) Independent study in Housing Studies under tutorial guidance. prereq: Jr or sr or grad student

HSG 5463. Housing Policy. (3 cr.; A-F or Audit; Every Spring) Institutional/environmental settings that make up housing policy in the United States. Competing ideas about solving housing problems through public intervention in the market. Federal/local public sector responses to housing problems. prereq: [(2401 or DHA 2401), [2463 or DHA 2463]] or instr consent

HSG 5467. Housing and the Social Environment. (4 cr.; A-F or Audit; Every Fall) Housing choices in context of social environment. Emphasizes special needs of elderly, disabled, minorities, large families, female-headed households, and low-income households. Students conduct a post-occupancy evaluation of housing.

HSG 5471. Housing Studies Certificate Seminar. (2 cr.; A-F or Audit; Spring Odd Year) Integrative seminar and "capstone" to Certificate program. Students prepare an individual career plan that focuses on application of housing studies to community/workplace. prereq: Admitted to Housing Studies Certificate Program

HSG 5481. Promoting Independence in Housing and Community. (3 cr.; A-F or Audit; Fall Odd Year) Housing, work, and community environments as they relate to aging and managing disabilities. Principles of home modification, universal design, livable communities, and assistive technology to support individuals/families.
HSG 8170. Topics in Housing Studies. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring) In-depth investigation of topic announced in advance.

HSG 8180. Professional Seminar. (1-2 cr. [max 4 cr.]; A-F or Audit; Every Fall, Spring & Summer) Professional development issues/trends.

HSG 8192. Readings in Housing Studies. (1-3 cr. [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer) Independent study, review of books, and periodicals under tutorial guidance. prereq: instr consent

HSG 8193. Directed Study. (1-3 cr. [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer) Directed study in housing studies. prereq: instr consent

HSG 8222. Plan B Master's Project. (3 cr.; S-N or Audit; Every Fall & Spring) Plan B master's project. prereq: [DHA or design master's] student, instr consent

HSG 8463. Housing: Race and Class. (3 cr.; A-F or Audit, Fall Even Year) Intersections between housing, race, and class. How housing reflects and helps to constitute racial/class difference. Housing as spatial expression of race/class. Case studies.

HSG 8467. Theoretical Perspectives in Housing Studies. (3 cr.; A-F or Audit, Every Spring) Investigation/evaluation of theories applied to housing. Levels of analysis. Links between theory, research questions, and methodological approaches. prereq: 5467 or DHA 5467 or instr consent

Human Factors (HUMF)

HUMF 5001. Foundations of Human Factors/Ergonomics. (3 cr.; A-F or Audit; Periodic Fall) Variability in human performance influenced by interaction with designs of machines/tools, computers/software, complex technological systems, jobs/working conditions, organizations, sociotechnical institutions. Conceptual, empirical, practical aspects of human factors/ergonomics. prereq: Grad HumF major or minor or instr consent

HUMF 5193. Directed Study in Human Factors and Ergonomics. (1-4 cr. [max 8 cr.]; A-F only; Every Fall, Spring & Summer) Independent study in human factors/ergonomics under tutorial guidance. prereq: instr consent


HUMF 5874. Service Design: Designing complex systems to improve service delivery. (4 cr.; A-F only; Every Spring) Real world service delivery problems. Perceptual/cognitive strengths/weaknesses addressed when designing systems. prereq: Grad student or instr consent

HUMF 8001. Special Topics: Human Factors/Ergonomics. (2-3 cr.; Student Option; Every Fall & Spring) Survey course in human factors/ergonomics. Interaction of performance/behavior with design factors in performance environment. Concepts, methods, empirical findings, different systems applications, current research. Topics vary. prereq: Grad HumF major or minor or instr consent

HUMF 8002. Proseminar in Human Factors/Ergonomics. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring) Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interdisciplinary science concerned with interaction of performance/behavior with design factors in performance environment. prereq: Grad HumF major or minor or instr consent

HUMF 8333. FTE: Master's. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) FTE: master's. prereq: Master's student, adviser consent, DGS consent

HUMF 8444. FTE: Doctoral. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) FTE: doctoral, prereq: Doctoral student, adviser consent, DGS consent

HUMF 8541. Decision Support Systems. (4 cr.; A-F or Audit; Every Fall & Spring) Students build a decision support system for a problem of their choice. How to identify appropriate problems. Styles of DSSs, evaluating their effectiveness. prereq: Undergrad-level computer programming course or instr consent; programming skills recommended

HUMF 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr

HUMF 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) Thesis credits: master's. prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

HUMF 8794. Human Factors Research. (1-4 cr.; S-N only; Every Fall, Spring & Summer) Human factors research.

HUMF 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) Thesis credit: doctoral. prereq: Max 18 cr per semester or summer; 24 cr required

Human Resources/Indus Rel (HRIR)

HRIR 5000. Topics in HRIR. (2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Topics in human resources/industrial relations.

HRIR 5222. Managing Diversity. (2 cr.; Student Option; Every Fall & Spring) How to manage diverse workforce. Human resource practices examined with respect to diversity. How to incorporate diversity into decision making to enhance organizational performance. prereq: HRIR MA student must register A-F, 3021. [CSOM or HRD junior or senior or dept consent]

HRIR 5252. Employment and Labor Law for the HRIR Professional. (2 cr.; Student Option; Every Fall & Spring) Application of statutes/case law to work settings. Civil rights/equal opportunity, Discrimination/harassment. Compensation/benefits. Employee protection/privacy. Labor relations. Emphasizes application/ability to recognize legal aspects of HRIR issues. prereq: HRIR MA student must register A-F, 3021. [CSOM or HRD junior or senior or dept consent]

HRIR 5442. Employee Performance Management: Strategies, Systems, and Skills. (2 cr.; Student Option; Every Fall) Performance management strategies. Components of effective performance management systems. Alignment with HR strategy. Integration with HR practices. Measurement/appraisal. Feedback, coaching. Legal issues. prereq: HRIR MA student must register A-F, 3021. [CSOM or HRD junior or senior or dept consent]

HRIR 5443. Principles of Effective Coaching. (2 cr.; Student Option; Every Fall) Skills/competencies required to coach, mentor, develop employees/leaders. Managing coaching process. Planning coaching relationship. Coaching as leadership development strategy. Coaching executives. prereq: HRIR MA student must register A-F, 3021. [CSOM or HRD junior or senior or dept consent]

HRIR 5555. Public Policies on Work and Pay. (3 cr.; Student Option; Every Spring) Analysis of public policies regarding employment, unions, labor markets. Public programs affecting wages, unemployment, training, worker mobility, security, quality of work life. Policy implications of changing nature of work. prereq: HRIR MA student must register A-F, ECON 1101, [CSOM or HRD junior or senior or dept consent]

HRIR 5662. Personnel Economics. (2 cr.; Student Option; Every Fall & Spring) Application of economic tools to issues in human resources/industrial relations. Incentives/imperfect information. Incentive-based pay. Promotions/tournaments. Human capital/training. Screening/signaling. Applications/limitations. prereq: Prereq-
HRIR MA student must register A-F, ECON 1101, [CSOM or HRD junior or senior or dept consent]

HRIR 5992. Independent Study in Human Resources and Industrial Relations. (1-8 cr.; Student Option; Every Fall, Spring & Summer)
Individual readings or research topics. prereq: dept consent or instr consent

HRIR 6000. Graduate Topics in Human Resources and Industrial Relations. (1-8 cr.; A-F only; Every Fall & Spring)
Selected graduate topics of current relevance to human resource management/industrial relations. prereq: HRIR MA student or dept consent

HRIR 6001. Business Principles for the HRIR Professional. (4 cr.; A-F only; Every Fall)

HRIR 6009. Introduction to Human Resources and Industrial Relations. (3 cr.; A-F only; Every Fall)

HRIR 6111. Using Data and Metrics in Human Resources and Industrial Relations. (4 cr.; A-F only; Every Fall & Spring)
Theory/applications of methods of data analysis for using data in HRIR decision-making. Descriptive/inferential statistics, especially hypothesis tests/confidence intervals. Regression analysis. Identification of appropriate techniques. Avoiding unreliable inferences. Introduction to HRIR metrics. prereq: HRIR MA student or dept consent

HRIR 6114. Human Resource Information Systems. (2 cr.; A-F only; Every Fall & Spring)
Integrating human resources practices with information technology to effectively support organizational needs. Determining HRIS needs. HRIS implementation/acceptance. HRIS applications in HR administration/operations, recruitment/selection, talent management, other HR areas. Emerging trends. prereq: HRIR MA student or dept consent

HRIR 6145. Organizational Development, HR Metrics, and the Balanced Scorecard. (2 cr.; A-F only; Every Spring)

HR professional as consultant. prereq: HRIR 6441 or dept consent

HRIR 6223. International Human Resource Management. (2 cr.; A-F only; Every Fall)
Strategies for effective management. Analysis of cross-cultural differences in values, norms, practices. How they affect organizational behavior/performance. Implications for designing HR practices in multinational organizations/international contexts. prereq: HRIR MA student or dept consent

HRIR 6301. Staffing, Training, and Development. (4 cr.; A-F only; Every Fall)
Developing plans for hiring to facilitate strategic goals, attracting talent, selecting best candidates, helping new employees onboard, developing knowledge/skills over time, keeping talented people. Evaluation of staffing, training, development effectiveness. prereq: HRIR MA student or dept consent

HRIR 6302. Staffing and Selection: Strategic and Operational Concerns. (2 cr.; A-F only; Every Fall & Spring)
Theory/practice related to staffing decisions. Recruitment, selection, promotion, transfer, dismissal, layoff, retirement in organizations. Legal environment in which staffing decisions are made. Staffing from strategic/organizational perspectives. prereq: HRIR 6301 or dept consent

HRIR 6303. Employee Training: Creating a Learning Organization. (2 cr.; A-F only; Every Fall)
Theory, research, practice related to design/implementation of employee training programs. Needs analysis. Training outcomes. Instructional design/training techniques. Program evaluation/costing. Role of employees, firm policies/practices in training. prereq: HRIR 6301 or dept consent

HRIR 6304. Employee Development: Creating a Competitive Advantage. (2 cr.; A-F only; Every Spring)
Career development/planning. Employee/management development techniques, organizational/employee concerns related to socialization, cross-cultural assignments, change, engagement, performance management. prereq: HRIR 6301 or dept consent

HRIR 6401. Organizational Theory Foundations of High-Impact HRIR. (2 cr.; A-F only; Every Fall & Spring)
Economic aspects of individual and group behavior in organizations. Individual and collective rationality, information, incentives, coordination problems, and contracts. Impacts on HRIR decisions and outcomes. Solutions and approaches to problems in organizations at micro and macro levels. prereq: dept consent

HRIR 6402. HR Practices, HRM Strategy, and Organizational Performance. (2 cr.; A-F only; Every Fall)
Analysis of how different organizational practices/combinations thereof affect organizations in competitiveness, profitability, workplace safety, employment stability, wages. Coherence/consistency of system of organizational practices in relation to various contingencies. prereq: HRIR 6401 or dept consent

HRIR 6403. Comparative Organizations and HRM Systems. (2 cr.; A-F only; Every Spring)
Variations in organizational practices related to variations in ownership. Profit, nonprofit, government, international, economic systems, culture, technology, market structure. Organizational practices. Employee empowerment, job enrichment, profit sharing, employee stock ownership, individual incentives, international comparisons. prereq: HRIR 6401 or dept consent

HRIR 6441. Organizational Behavior Foundations of High-Impact HRIR. (2 cr.; A-F only; Every Fall & Spring)
Psychological aspects of individual/group behavior in organizations. Individual motivation, attitudes/job satisfaction. Leadership. Organization design/culture. Impacts on HRIR decisions/outcomes. Solutions/approaches to problems in organizations at micro/macro levels. prereq: HRIR MA student or dept consent

HRIR 6444. Employee Motivation, Engagement, and Well-being. (2 cr.; A-F only; Every Spring)
Employee motivation, behavior, job attitudes. How they can be channeled into productive/unproductive behaviors/employee well-being. How work behavior is influenced by individuals, groups, features of organizations. prereq: HRIR 6441 or MBA 6110 or dept consent

HRIR 6465. Leadership and Personal Development. (2 cr.; A-F only; Every Fall & Spring)
Understanding effective leadership. Identifying personal leadership strengths/vulnerabilities through feedback. Developing leadership skills through practice as informed by theory/evidence. Exercises, role play. Creating customized leadership development plan. prereq: MBA or HRIR MA student or dept consent

HRIR 6484. Management of Groups. (2 cr.; A-F only; Every Fall, Spring & Summer)

HRIR 6501. Compensation and Benefits. (4 cr.; A-F only; Every Spring)
Pay/benefit determination by labor markets, internal structures, individual performance. Alignment of business strategies with HRIR decisions/compensation practices. Performance evaluation, technical skills, compensation analytics, pay negotiations. Illustrates concepts from labor economics, behavioral economics, psychology with routine interactive case studies. prereq: HRIR MA student or dept consent

HRIR 6502. Compensation Theory and Applications. (2 cr.; A-F only; Every Fall)
Relationship between economic/psychological theories, design/operation of compensation programs. Demographic influences on compensation program outcomes. Statistical
HRIR 6503. Employer-Sponsored Employee Benefit Programs. (2 cr.; A-F only: Every Spring)
Design, administration, management of non-mandatory compensation benefit programs, including health/dental care plans/insurance, retirement plans, disability benefits, paid time off, accommodation benefits. Effects of providing benefits on workers' incentives for performance. Psychological foundations of employee benefits. Role of benefits in employee recruitment/retention. prereq: 6501 or dept consent

HRIR 6504. Executive Compensation. (2 cr.; A-F only: Every Spring)
Course emphasizes understanding and appreciation of the complexities of executive compensation. Course will develop your knowledge of analysis and design of executive compensation, teach you to read and understand executive compensation disclosures, develop an awareness of trends, issues and challenges and give you an idea of how accounting, tax regulations, and other regulations shape executive compensation. Through the use of cases, class discussions and interactive experiential activities this course will develop your intellectual ability to critically examine, analyze, and deal with the complexity and ambiguity of executive compensation. prereq: A-F only; prereq MBA or HRIR MA student

HRIR 6664. Topics in Labor Market Analysis. (1-2 cr.; A-F only: Periodic Fall & Spring)
May include micro aspects of unemployment, implicit contracts/efficiency wages, investment in human capital, occupational choice, job search, job matching/turnover, migration, labor force participation, government program evaluation. prereq: 6001, 6111, [Business Admin PhD student or dept consent]

HRIR 6701. Labor Relations and Collective Bargaining. (4 cr.; A-F only; Every Spring)
Evolution of U.S. labor unions/public policy, bargaining environment/structure, goals/negotiations, contract administration/results. International comparisons, labor-management cooperation, newly emerging issues. prereq: HRIR MA student or dept consent

HRIR 6702. Contemporary Issues in Labor Relations. (2 cr.; A-F only; Every Fall)
Focused on the particular concern to various actors in contemporary labor relations. Topics vary. prereq: 6701 or dept consent

HRIR 6703. Dispute Resolution: Labor Arbitration. (2 cr.; A-F only; Every Fall)
Arbitration to resolve grievances/impasses arising out of collective bargaining agreement's administration/negotiation. Arbitration law/legal issues, procedures/practices, case presentation, management rights, discipline/discharge, evidence, contract language interpretation, remedies. Newly emerging approaches, prereq: 6701 or dept consent

HRIR 6801. HRIR in Practice: Strategy, Execution, and Ethics. (2 cr.; A-F only; Every Spring)
Types of strategies. Developing/executing HRIR strategies. Project management in HRIR. prereq: [6001, 6111, 6301, 6401, 6441, 6501, 6701] or dept consent

HRIR 6802. Capstone Project. (2 cr.; A-F only; Every Spring)
Application of related knowledge, concepts, methods to practical problem in human resources/industrial relations. Benchmarking of related best practices in research/practice. Full development, analysis, proposed recommendations for implementation or improvement of selected problem. prereq: [6001, 6111, 6301, 6401, 6441, 6501, 6701] or dept consent

HRIR 6822. Field Project. (4 cr.; Student Option; Every Fall & Spring)
Teams formulate/executes study of actual business problem faced by business, non-profit, or governmental organization, generally in Twin Cities. prereq: [6001, 6111, 6301, 6401, 6441, 6501, 6701] or dept consent

HRIR 6992. Independent Study in Applied Human Resources and Industrial Relations. (1-8 cr.; S-N only; Every Fall, Spring & Summer)
Individual readings, research projects, research in applied settings. prereq: dept consent

HRIR 8041. Design and Management of Organizations. (4 cr.; Student Option; Every Fall)
Introduction to micro through macro organizational issues at individual, dyadic, group, organizational, and environmental levels; their implications for organizational design, control, coordination, and development. prereq: Econ 1101, Econ 1102, Psy 1001 or instr consent, grad HRIR major or dept consent; grad majors must enroll A-F only

HRIR 8063. Human Resources and Organizational Performance. (4 cr.; Student Option; Every Fall)
Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness. prereq: 8061 or instr consent, grad HRIR major or dept consent; grad majors must enroll A-F only

HRIR 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: HRIR MA student, dept consent

HRIR 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

HRIR 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

HRIR 8801. Core Seminar: Fundamentals of Economic Analysis for Work and Organizations. (4 cr.; Student Option; Periodic Fall & Spring)
Theoretical/empirical approaches in labor/organizational economics. Labor supply/demand. Monopoly/institutional features of labor markets. Compensation, incentives, sorting, training. Approaching topics/questions in work/organizations from economic perspective. prereq: [Business Admin PhD student or dept consent], grad majors must enroll A-F

HRIR 8802. Core Seminar: Organizational Behavior. (4 cr.; Student Option; Periodic Fall)

HRIR 8803. Core Seminar: Fundamentals of HR Research. (4 cr.; Student Option; Periodic Fall & Spring)
Major theories/current research on human resources/industrial relations practices/institutions. Recruitment, selection, job performance. Training/development. Compensation. Other practices/institutions. prereq: [Business Admin PhD student or dept consent], grad majors must enroll A-F

HRIR 8812. Core Seminar: Research Methods in Work and Organizations. (4 cr.; Student Option; Periodic Spring)
Application in research projects. prereq: [Business Admin PhD student or dept consent], grad majors must enroll A-F

HRIR 8820. Seminar: Special Topics in Work and Organizations Research. (2 cr.; [max 12 cr.]; Student Option; Every Spring) Contemporary theories/research on specific topics in work/organizations. Topics vary. prereq: [Business Admin student or dept consent], grad majors must enroll A-F

HRIR 8825. Research Practicum/Workshop. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring)
Experience in conducting research/other doctoral student activities.

HRIR 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

HRIR 8891. Independent Study in Human Resources and Industrial Relations. (1-8 cr.; A-F or Audit; Every Fall, Spring & Summer)
Individual readings and/or research projects. prereq: instr consent

HSEX 6001. Foundations of Human Sexuality. (3 cr.; A-F or Audit; Every Fall)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

**Industrial Engineering (IE)**

IE 5080. Topics in Industrial Engineering. (1-4 cr.; Student Option; Periodic Fall & Spring) Topics vary each semester.

IE 5111. Systems Engineering I. (2 cr.; A-F or Audit; Every Fall) Overview of systems-level thinking/techniques in context of an integrated, design-oriented framework. Elements of systems engineering process, including lifecycle, concurrent, and global engineering. Framework for engineering large-scale, complex systems. How specific techniques fit into framework. prereq: CSE upper div or grad student

IE 5113. Systems Engineering II. (4 cr.; A-F or Audit; Every Spring) Systems engineering thinking/techniques presented in 5111. Hands-on techniques applied to specific problems. Topics pertinent to effectiveness of design process. Practices and organizational/reward structure to support collaborative, globally distributed design team.

IE 5441. Financial Decision Making. (4 cr.; A-F only; Every Fall, Spring & Summer) Cash flow streams, interest rates, fixed income securities. Evaluating investment alternatives, capital budgeting, dynamic cash flow process. Mean-variance portfolio selection, Capital Asset Pricing Model, utility maximization, risk aversion. Derivative securities, asset dynamics, basic option pricing theory. prereq: CSE upper div or grad student

IE 5511. Human Factors and Work Analysis. (4 cr.; A-F or Audit; Every Fall & Spring) Human factors engineering (ergonomics), methods engineering, and work measurement. Human-machine interface: displays, controls, instrument layout, and supervisory control. Anthropometry, work physiology and biomechanics. Work environmental factors: noise, illumination, toxicology. Methods engineering, including operations analysis, motion study, and time standards. prereq: Upper div CSE or grad student

IE 5513. Engineering Safety. (4 cr.; A-F or Audit; Every Fall & Spring) Occupational, health, and product safety. Standards, laws, and regulations. Hazards and their engineering control, including general principles, tools and machines, mechanics and structures, electrical safety, materials handling, fire safety, and chemicals. Human behavior and safety, procedures and training, warnings and instructions. prereq: Upper div CSE or grad student

IE 5522. Quality Engineering and Reliability. (4 cr.; Student Option; Periodic Fall & Spring) Quality engineering/management, economics of quality, statistical process control design of experiments, reliability, maintainability, availability. prereq: [4521 or equiv]. [upper div or grad student or CNR]

IE 5531. Engineering Optimization I. (4 cr.; Student Option; Every Fall) Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch and bound/dynamic programming. Emphasizes applications in production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning. prereq: Upper div or grad student or CNR

IE 5532. Stochastic Models. (4 cr.; Student Option; Every Fall) Introduction to stochastic modeling and stochastic processes. Probability review, random variables, discrete and continuous-time Markov chains, queueing systems, simulation. Applications to industrial and systems engineering including production and inventory control. prereq: Undergraduate probability and statistics. Familiarity with computer programming in a high level language.

IE 5541. Project Management. (4 cr.; A-F only; Every Fall & Spring) Introduction to engineering project management. Analytical methods of selecting, organizing, budgeting, scheduling, and controlling projects, including risk management, team leadership, and program management. prereq: Upper div or grad student

IE 5545. Decision Analysis. (4 cr.; Student Option; Periodic Fall & Spring) Single-person and group decision problems. Structuring of decision problems arising in personal, business, and public policy contexts. Decision-making under uncertainty, value of information, games of complete information and Nash equilibrium, Bayesian games, group decision-making and distributed consensus, basics of mechanism design. prereq: 3521 or equiv

IE 5551. Production Planning and Inventory Control. (4 cr.; Student Option; Every Fall & Spring) Inventory control, supply chain management, demand forecasting, capacity planning, aggregate production and material requirement planning, operations scheduling, and shop floor control. Quantitative models used to support decisions. Implications of emerging information technologies and of electronic commerce for supply chain management and factory operation. prereq: CNR or upper div or grad student

IE 5553. Simulation. (4 cr.; Student Option; Periodic Fall & Spring) Discrete event simulation. Using integrated simulation/animation environment to create, analyze, and evaluate realistic models for various industry settings, including manufacturing/service operations and systems engineering. Experimental design for simulation. Selecting input distributions, evaluating simulation output. prereq: Upper div or grad student; familiarity with probability/statistics recommended

IE 5561. Analytics and Data-Driven Decision Making. (4 cr.; Student Option; Every Spring) Hands-on experience with modern methods for analytics and data-driven decision making. Methodologies such as linear and integer optimization and supervised and unsupervised learning will be brought together to address problems in a variety of areas such as healthcare, agriculture, sports, energy, and finance. Students will learn how to manipulate data, build and solve models, and interpret and visualize results using a high-level, dynamic programming language. Prerequisites: IE 3521 or equivalent; IE 3011 or IE 5531 or equivalent; proficiency with a programming language such as R, Python, or C.

IE 5773. Practice-focused Seminar. (1 cr.; S-N or Audit; Every Fall) Industry and academic speakers, topics relevant to analytics practice.

IE 5801. Capstone Project. (4 cr.; A-F only; Every Fall)
Students work on ISYE Analytics Track capstone project in small teams of two or three. Projects are supervised by industry mentor and faculty advisor. Projects involve application and techniques from Analytics Track curriculum. Prerequisites: ISYE Analytics Track MS Student; IE 5531; IE 5561; Stat 5302; CSci 5521 or 5523.

IE 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

IE 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent


IE 8532. Stochastic Processes and Queuing Systems. (4 cr.; Student Option; Every Fall) Introduction to stochastic modeling and processes. Random variables, discrete and continuous Markov chains, renewal processes, queuing systems, Brownian motion, and elements of reliability and stochastic simulation. Applications to design, planning, and control of manufacturing and production systems. prereq: 4521 or equiv

IE 8533. Advanced Stochastic Processes and Queuing Systems. (4 cr.; Student Option; Periodic Spring) Renewal and generative processes, Markov and semi-Markov processes, martingales, queuing theory, queuing networks, computational methods, fluid models, Brownian motion, prereq: 8532 or instr consent

IE 8534. Advanced Topics in Operations Research. (4 cr.; [max 8 cr.]; Student Option; Every Fall & Spring) Special topics determined by instructor. Examples include Markov decision processes, stochastic programming, integer/combinatorial optimization, and queuing networks. prereq: 5531, 8532

IE 8536. Advanced Topics in Engineering Management. (4 cr.; [max 8 cr.]; A-F or Audit; Periodic Spring) Areas such as financial engineering, revenue management, management of health systems, service operations, management of technology, and public policy.


IE 8552. Advanced Topics in Production, Inventory, and Distribution Systems. (4 cr. [max 8 cr.]; Student Option; Periodic Fall & Spring) Cutting edge research issues in production, inventory, distribution systems. Stochastic models of manufacturing systems, stochastic inventory theory, multi-echelon inventory systems/supply chains, supplier-retailer/supplier-manufacturer coordination, supplier/warehouse networks, business logistics, transportation. prereq: 5551

IE 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

IE 8773. Graduate Seminar. (1 cr.; S-N or Audit; Every Fall & Spring) Recent developments.

IE 8774. Graduate Seminar. (1 cr.; S-N or Audit; Every Fall & Spring) Recent developments. prereq: 8773

IE 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only)

IE 8794. Industrial Engineering Research. (1-6 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Directed research. prereq: instr consent

IE 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

IE 8951. Plan B Course. (1 cr.; S-N or Audit; Every Fall) Structured environment in which students can complete M.S. Plan B project.

IE 8953. Plan B. (2 cr.; A-F or Audit; Every Spring) Structured environment in which students can complete M.S. Plan B project. prereq: 8951

IE 8991. Curricular Practical Training. (1-2 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) Industrial work assignment involving advanced mechanical engineering. Review/approval by faculty member/director of graduate studies. Final report covering work assignment.

Industry MBA (IMBA)

IMBA 6004. Negotiations. (3 cr.; A-F only; Every Fall) Art and science of securing agreements between two or more parties who are interdependent and seek to maximize their own outcomes. Individual, group, and organizational behavior. Theory and process of negotiations applied to problems faced by managers/professionals.

IMBA 6030. Financial Accounting. (3 cr.; A-F only; Every Summer) Students learn about the accounting system used by firms to measure and report their economic performance and financial position to external parties. Students analyze corporate financial reports to discover the impact of significant economic events. Discussions and cases focus on the role of financial reporting standards in informing financial intermediaries and contributing to the efficient allocation of capital in a modern economy.

IMBA 6110. Leading Others. (2 cr.; A-F only; Every Spring) Achieving organizational goals by leading in ways that create motivation, engagement, commitment, positive social interactions, and job performance. Understanding and managing the characteristics of organizations, work groups, and individuals. The role of group dynamics, decision making, cooperation, conflict, and power in leading others.

IMBA 6120. Data Analysis & Statistics. (3 cr.; A-F only; Every Summer) Concepts and principles of business statistics, data analysis and presentation of results. Topics: exploratory data analysis, basic inferential procedures, statistical process control, time series and regression analysis, and analysis of variance. These methods are selected for their relevance to managerial decision making and problem solving.

IMBA 6140. Managerial Economics. (3 cr.; A-F only; Every Summer) How markets work, how positive economic rents (profits) are made, and how strategic behavior affects profits. Four major topical areas include market micro-structure, industrial structure, uncertainty, and incentives and firm governance.

IMBA 6210. Marketing Management. (3 cr.; A-F only; Every Summer) Management of the marketing function; understanding the basic foundational marketing concepts and skills in strategy development and planning of operational and
strategic levels pertaining to product offering decisions, distribution channels, pricing and communication.

**IMBA 6220. Supply Chain Management.** (3 cr.; A-F only; Every Fall) An orientation to a supply chain paradigm. Domestic and global perspectives will be examined. Tools used in operations and optimization will be discussed in the context of linking consumers to technology providers and manufacturers on rapid and distributed global platforms.

**IMBA 6230. Financial Management.** (3 cr.; A-F only; Every Summer) Tools and concepts of financial management. Emphasizes use by financial and non-financial managers to measure creation of value within an organization. Evaluating businesses and business opportunities, identifying financial requirements and sources. Prereq: 6030

**IMBA 6240. Data Analytics.** (3 cr.; A-F only; Every Fall) It is critical for contemporary managers to understand how the convergence of mobility, analytics, social media, cloud computing, and embedded devices are transforming firms, industries, markets and society. Using the foundation of data-driven business analytics this course provides the tools and frameworks for competing in the digital age. Students will learn general state-of-the-art analytics skills in the context of new platform-based business models, digital search, big-data, social networks, social media, and open innovation that pervade competition in the digital age. Includes fundamentals of predictive modeling, large scale A/B testing, social networks analysis, and an exposure to the work-horse tools of data-driven classification and prediction to explore patterns in rich datasets (e.g., k-nearest neighbors, classification trees, design of recommendation systems). Using case studies in the digital domain, the methods taught have a wide range of applicability across functions and verticals in modern business environments. Prereq: IMBA student.

**IMBA 6300. Strategic Management.** (3 cr.; A-F only; Every Summer) Introduction to the concepts and techniques used to create and implement a sense of corporate direction; choices about products and markets that involve the integration of different functional areas; positioning a business to increase returns for shareholders and stakeholders; the skills involved in identifying issues, evaluating options, and implementing business plans.

**IMBA 6315. The Ethical Environment of Business.** (2 cr.; A-F only; Every Spring) Analysis of ethical dilemmas and development of appropriate responses; relationship of ethical management to the law; implications for corporate profitability; managing shareholders vs. managing stakeholders; issues such as protection of the environment, workplace safety, product liability, regulation, and fiduciary obligations.

**IMBA 6401. Industry Overview & Business Law.** (2 cr.; A-F only; Every Fall) A comprehensive survey of the major U.S.-regulated and highly profitable industries including but not exclusive to the technology, energy, finance and healthcare industries. The course will focus on the legislative and regulatory process that provide oversight to major verticals. Antitrust and competition policy enforced by the Department of Justice and the Federal Trade Commission will be explored. Prereq: Industry MBA Student

**IMBA 6402. Industry Vertical: Technology.** (2 cr.; max 3 cr.; A-F only; Every Fall) This course focuses on firms engaged in three major sub areas of technology including e-commerce, defense, and manufacturing subsectors. Cases and live case studies to focus on firms ranging from 3M, Lockheed, Amazon, and Google. Federal agency oversight focus includes the Departments of Defense, Transportation, Commerce, and Education.

**IMBA 6403. Industry Vertical: Energy.** (2 cr.; A-F only; Every Fall) Focus on firms engaged in three major sub areas of financial services including retail banking, investment, and international markets subsectors. Cases and live case studies to focus on firms ranging from Wells Fargo, Berkshire Hathaway, Cargill, and Piper Jaffray. Federal oversight focus includes the Security and Exchange Commission and the Department of Treasury.

**IMBA 6404. Industry Vertical: Finance.** (2 cr.; max 3 cr.; A-F only; Every Spring) Focus on firms engaged in three major sub areas of financial services including retail banking, investment, and international markets subsectors. Cases and live case studies to focus on firms ranging from Wells Fargo, Berkshire Hathaway, Cargill, and Piper Jaffray. Federal oversight focus includes the Security and Exchange Commission and the Department of Treasury.

**IMBA 6405. Industry Vertical: Health.** (2 cr.; max 3 cr.; A-F only; Every Spring) Focus on firms engaged in three major sub areas of health including health care delivery, medical technology, and health insurance. Cases and live case studies to focus on firms ranging from United Health Group, Pfizer, Medtronic, and the Mayo Clinic. Federal oversight focus includes the Department of Health and Human Services, the Veteran Administration, and Office of Personal Management.

**IMBA 6500. Virtual Team Project.** (4 cr.; A-F only; Every Spring) The Virtual Team Project (VTP) provides Carlson School MBA students with the unique opportunity to work in a collaborative team environment across professions, industries, and markets. As participants in the VTP, students develop advanced skills in teamwork, cross-cultural collaboration, and business plan development within a dynamic environment shaped by academic rigor and the demands of real-world international business.

**IMBA 6501. Industry MBA Capstone.** (4 cr.; A-F only; Every Spring) Tying together foundational concepts of business with deep knowledge of specific industry, students will collaborate across teams, faculty, and a selected corporate partner and enter in to ?War Games? scenarios. Teams will represent corporate decision makers and act as stakeholders for an all out, winner take all, strategic battle comprised within each of the industry verticals.

**Information and Decision Sci (IDSC)**


**IDSC 6040. Information Technology Management.** (2 cr.; A-F only; Every Fall, Spring & Summer) Management of information systems, information technology (IT) in global organization. Strategic uses of IT. Alignment of IT, organizational strategy, internet/Web technologies, e-commerce customer services. Integration of e-business applications, interorganizational systems, systems implementation. Management of information as resource. Lecture, case analysis, classroom discussion. Prereq MBA student.

**IDSC 6050. Information Technologies and Solutions.** (2 cr.; A-F only; Every Fall & Spring) Current/emerging technologies in modern Net-enhanced organizations. Internet/Web technologies, including Internet fundamentals, Web communications, Web 2.0/social media, information security, cloud computing, IT-driven innovation, emerging IT trends.


**IDSC 6423. Enterprise Systems.** (2 cr.; A-F only; Every Fall & Spring) Requirements of architectures of information systems that help integrate business processes and optimize performance across diverse organizations/divisions. Capabilities of information systems in enterprise integration and supply chain management. Linkages necessary between information systems and business processes.
IDSC 6442. E-Sourcing and E-Auctions. (2 cr.; A-F only; Every Fall & Spring)

IDSC 6444. Business Analytics for Managers I. (2 cr.; A-F only; Every Spring)
Use of information technologies to gather, store, analyze, and access data to help managers make decisions about their business and the way they serve customers. Data mining, personalization, recommender systems. prereq: [6040 or 6050 or MBA 6240], MBA student

IDSC 6446. Business Analytics for Managers II. (2 cr.; A-F only; Every Spring)

IDSC 6455. Web 2.0: The Business of Social Media. (2 cr.; A-F only; Every Fall)
Business use of social media. Web 2.0/driving forces, social media marketing/advertising, engaging customers, peer production/open innovation. Ways businesses can leverage social media to foster collaboration, engage customers, build brand loyalty. prereq: MBA student

IDSC 6465. Global Sourcing of IT and IT Enabled Services. (3 cr.; A-F only; Every Spring)
Outsourcing IT and IT enabled services. Sourcing business/knowledge processes: finance/accounting, human resources, engineering services, data analytics. Strategic global sourcing planning/implementation. Managing offshore service relationships. prereq: [6040 or 6050 or MBA 6240], MBA student

IDSC 6471. Knowledge Management. (2 cr.; A-F only; Every Fall)
Design, evaluation, use of knowledge in organizations. Leveraging knowledge in workers, structures, processes, Assessment of knowledge needs. Evaluation of key decision processes, information demands, usage patterns, content requirements. Behavioral/cultural barriers. Use of technology for knowledge management. prereq: MBA student

IDSC 6481. Managerial Decision Making. (2 cr.; A-F only; Every Fall)
Frameworks for making decisions as a manager, knowledge worker, or individual. How policies area adopted. Poor decision making. Learning from mistakes. Bounded rationality, system thinking, concepts of learning. prereq: MBA student

IDSC 6490. Advanced Topics in MIS. (3 cr. [max 15 cr.]; A-F only; Periodic Fall & Spring)
Discussion and analysis of topics and developments in managing information systems.

IDSC 6491. Independent Study in Information Systems. (1-4 cr. [max 8 cr.]; A-F only; Periodic Fall, Spring & Summer)
Independent study in Information Systems. prereq: instr consent

IDSC 8003. Accounting and Information Systems. (4 cr.; A-F only; Every Fall)

IDSC 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (3 cr.; Student Option; Every Fall)
Relationships to underlying disciplines; major research streams; seminal articles, survey literature, and major researchers. Provides framework for organizing knowledge about information and decision sciences. prereq: instr consent

IDSC 8521. System Development. (3 cr.; Student Option; Spring Even Year)
Why it is hard to develop efficient/effective information systems. What can be done to improve situation. Defining efficiency/effectiveness in development process and in systems. Producing/evaluating artifacts (constructs, models, methods, tools) that enable more efficient/effective information systems to be developed. prereq: Business admin PhD student or instr consent

IDSC 8531. Organizational Theory and Research in Information Systems. (3 cr.; A-F only; Spring Even Year)
Introduction, adoption, use/exploitation of information systems in organizations. Critically examine empirical work. Formulate research questions. Conduct research. prereq: PhD student in Business Administration

IDSC 8541. Introduction to Economics of Information Systems. (3 cr.; A-F only; Spring Odd Year)
Classical research questions. Methods/findings that form backbone of economics of IS. Online auctions, electronic markets, offshoring, human capital issues. prereq: PhD student in Business Administration or instr consent

IDSC 8620. Data Mining and Personalization. (3 cr.; A-F only; Spring Even Year)
Data mining is intended primarily for research-oriented graduate students who are interested in learning about current data mining / machine learning methodologies and how to use them in research. The course will provide a comprehensive overview of the exploratory and predictive analytics techniques, focusing on the fundamentals but covering a number of advanced issues as well, and will demonstrate how these techniques can be applied various application areas (including the increasingly important area of text analytics and recommender systems). The course puts significant emphasis on practical, hands-on experience applying data mining techniques in different settings using real-world datasets, but will also discuss the use and value of data mining in a variety of research contexts.

IDSC 8721. Behavioral Decision Theory. (3 cr.; Student Option; Periodic Fall & Spring)
Traditional/current research. Major models/methodologies. Issues of preference, judgment, and choice under conditions of certainty/uncertainty. Seminar format. prereq: Business admin PhD student or instr consent; offered alt yrs

IDSC 8722. Heuristic Decision Making. (2 cr.; Student Option; Periodic Fall)
How decisions are made, how knowledge is stored/used, how knowledge of variability/feedback influence decisions. Decisions at strategic, operational, individual level. Exceptional performance, pathologies of decision making. Basis for “best practice.” How knowledge is managed in decisions, decision failure. Folly, normal accidents, decision problems in which individuals manipulate information to influence/deceive others. prereq: Business Admin PhD student or instr consent; offered alt yrs

IDSC 8800. Research Seminar in Information and Decision Sciences. (4 cr. [max 20 cr.]; Student Option; Periodic Fall & Spring)
Topics, which vary by semester, are selected from new areas of research, research methods, and significant issues. prereq: Business admin PhD student or instr consent

IDSC 8801. Research Seminar in Information and Decision Sciences. (2 cr. [max 20 cr.]; Student Option; Every Spring)
New areas of research, research methods, issues. prereq: Business Admin PhD student or instr consent

IDSC 8892. Readings in Information and Decision Sciences. (1-8 cr. [max 16 cr.]; S-N only; Every Fall, Spring & Summer)
Readings useful to a student’s individual program and objectives that are not available through regular courses. prereq: Business admin PhD student or instr consent

IDSC 8894. Graduate Research in Information and Decision Sciences. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer)
Individual research on an approved topic appropriate to student’s program and objectives. prereq: Business admin PhD student or instr consent

Infrastructure Sys Mgmt Eng (ISME)

ISME 5101. Project Management. (3 cr.; A-F or Audit; Every Fall)

ISME 5105. Computer Applications II. (1 cr.; A-F or Audit; Periodic Fall) Application features in Excel, Visual Basic, and Web Authoring. Data reduction, data presentation, interactive Web calculations. Student projects. prereq: ISE grad student

ISME 5112. Infrastructure Systems Engineering Management. (2 cr.; A-F or Audit; Every Fall & Spring) Managing public works infrastructure. Case studies of decision making in environment of conflicting interests. prereq: Open to advanced master's students

ISME 5113. Computer Applications in Infrastructure Systems Engineering. (2 cr.; A-F or Audit; Every Fall & Spring) Advanced application of computer tools/methods in infrastructure engineering problems. Spreadsheet Visual Basic programming, HTML, JAVA script. prereq: ISE grad student


ISME 5302. Critical Infrastructure Security and Protection. (2 cr.; A-F only; Every Spring) Security challenges of protecting critical infrastructure, facilities, and built environment. Security, agility, and robustness survivability of large-scale critical infrastructure that face new threats and unanticipated conditions. Systems risk analysis, engineering, economics, and public policy approaches to infrastructure security. Design/content of complex civil infrastructure systems. prereq: ISE grad student or insr consent

ISME 5401. Water Distribution Systems. (1 cr.; A-F or Audit; Periodic Fall) Components/design of water distribution systems. Methods of evaluation/management. Maintenance/rehabilitation techniques. prereq: ISE grad student


ISME 5403. Water Treatment Systems. (2 cr.; A-F or Audit; Periodic Fall) Components/design of water treatment systems. Evaluation/management methods. Maintenance/rehabilitation techniques. prereq: ISE student

ISME 5500. Public Interactions. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall) Techniques for effective public communication. How to run public hearing. Resources for publishing public notices. Sequence course in three parts. prereq: Advanced grad student or open to general grad students with instr consent

ISME 5501. Geographic Information Systems. (2 cr.; A-F or Audit; Every Spring) Introduction to geographic information systems (GIS) for infrastructure. GIS application domains, data models/sources, analysis methods, and output techniques. Lectures, readings, hands-on experience with GIS software. prereq: ISE student


ISME 5504. Construction Law and Ethics. (2 cr.; A-F or Audit; Every Fall) Ethical framework for responsible management of public works projects. Moral leadership, trust in public/private organizations, quality control. prereq: ISE student

ISME 8105. Capstone Project. (1-2 cr. [max 3 cr.]; A-F or Audit; Every Fall & Spring) Integrates knowledge from courses in Master's program with job experience. Students prepare proposal, conduct project, and report results in written and oral form. Project involves aspect of design, management, or operation of some feature of infrastructure. prereq: ISE student


IBH 6022. Foundations of Psychological Assessment. (2 cr.; A-F only; Every Fall & Spring) Course focuses on major concepts and principles of educational and psychological assessment and the use of standardized instruments with differing populations.

IBH 6031. Methods and Models IV: Trauma and Anxiety, Assessment and Treatment Intervention. (2 cr.; A-F only; Every Fall & Summer) Basic/applied research on trauma/anxiety. Assessing/treating anxiety/post-trauma reactions in adults. Definition of anxiety, traumatic events. Assessment methods, PTSD assessment interview. Theory/techniques of evidence-based treatments. Field placement component. Note: This class is a required precursor to IBH 6041 Prolonged Exposure Therapy for PTSD.

IBH 6032. Advanced Multicultural Practice. (1 cr.; A-F only; Every Fall & Summer) Incorporate various sources of knowledge/content to provide deeper penetrating perspective on multiple layers of diversity/counseling individuals with substance use/co-occurring mental health disorders. Aspects of various cultural experiences (i.e., race/ethnicity, class status, sexual/affectional orientation, gender, religion) as they impinge upon client, counselor, counseling relationship. prereq: ADDS 5081 or equivalent

IBH 6041. Prolonged Exposure Therapy for PTSD. (2 cr.; A-F only; Every Spring)
Advanced practice methods and interventions for working with trauma and co-occurring disorders. Emerging and evidence-based practices presented, practiced, and applied.

IBH 6051. Advanced Group Practice. (2 cr.; A-F only; Every Fall, Spring & Summer) Trends/developments in group counseling. Evidence-based group processes/techniques for individuals with chronic/persistent mental illness, substance use disorders, co-occurring disorders. Field placement component.

IBH 6061. Applied Advanced Diagnostics I. (2 cr. [max 3 cr.]; A-F only; Every Fall & Spring) Diagnosing individuals with chronic/persistent mental health disorders, personality disorders, associated substance use disorders. Case studies, field placement with multidisciplinary team. Prerequisites: IBH student, ADDS 5091 and IBH 6011

IBH 6062. Applied Advanced Diagnostics II. (2 cr.; A-F only; Summer Even Year) Applied Advanced Diagnostics II. Prerequisites: 6061, must be admitted IBH student

IBH 6071. Advanced Professional Issues. (3 cr.; A-F only; Every Fall & Spring) Develop ethical decision model that incorporates five moral principles. ACA/NAADAC codes of ethics/statutes/regulations that apply to mental health/substance abuse counseling. Case studies.


IBH 6091. Intersection of Career and Mental Health. (2 cr.; A-F only; Every Fall, Spring & Summer) Vocational choice theory, lifestyle choices, occupational/educational information, career exploration, assessment tools. Diverse populations/ethical standards. Employment/career concerns for persons with mental health, substance use, previously incarcerated.

IBH 6101. Family Dynamics and Therapy. (3 cr.; A-F only; Every Fall & Spring) Family dynamics/life cycle, communication patterns, multi-generational patterns. Systems theory/interventions for appropriate use of family resources to enhance intervention, treatment, family/individual functioning/maintenance processes.

IBH 6111. Research and Evaluation Methods. (3 cr.; A-F only; Every Fall, Spring & Summer) Models of program evaluation. Use of research findings for program modification. Elements of research process, types of designs, program evaluation. Ethical considerations of research. Measurement concepts.

IBH 6112. Mental Health and Addiction Management and Administration. (2 cr.; A-F only; Periodic Summer) State/regulatory standards rules/statutes. Health care financing/reimbursement. Prerequisites: ADDS 5091 or ADDS 4001

IBH 6121. Professional Seminar 2. (1 cr.; S-N only; Every Fall, Spring & Summer) The purpose of this seminar is to provide the groundwork for the development of the professional portfolio and should be taken 1 to 2 semesters before you plan to register for the IBH 8002 portfolio. Discussion and practice will focus on the main components to be included in the student's professional portfolio such as professional statements and clinical competencies. IBH 6121 should be taken after completion of 50 credits.


IBH 6222. Adolescents and Co-occurring Substance Use and Mental Health Disorders. (1 cr.; A-F only; Every Fall) Adolescents differ from adults physiologically, cognitively, and emotionally. Therefore, it is important for professionals who come into regular contact with this population to be familiar with the developmental issues and current trends in adolescent substance use. It is also essential to be able to recognize the risk and protective factors, biopsychosocial effects, and signs of potential substance use problems in adolescents.

IBH 6227. Supervision Models and Methods in Integrated Behavioral Health. (3 cr.; A-F only; Every Spring & Summer) Supervision Models/Methods in Integrated Behavioral Health. Prerequisites: Must be admitted IBH student

IBH 6228. Mental Health and Addiction Program Administration. (2 cr.; A-F only; Periodic Spring) Most often, good employees or strong counselors are promoted into leadership positions with an assumption that a good clinician is a good leader. This course will review strategies to develop strong leaders along with understanding of the importance of regulations and accreditation standards in creating consistent practice and consistency across all treatment programs. Students will obtain an introductory understanding of leadership skills and begin using evidence-based leadership. Students will review and apply Department of Human Service Statutes and Joint Commission Standards. Students will learn how to read budgets and complete a review and analysis of assigned budgets.

IBH 6230. Clinical Application in Prolonged Exposure Therapy. (3 cr.; A-F only; Every Summer) Clinical Application in Prolonged Exposure Therapy. Prerequisites: 6031, 6041, must be admitted IBH student, dept consent

IBH 6232. Introduction to Navigating Issues of Sexual Health and Gender in the Therapy Session. (2 cr.; A-F only; Every Fall) This is a graduate level course that is meant to broaden your understanding of issues regarding sexual health and gender that you may encounter in the therapy session. A large part of this course is focused on increasing your comfort and competence in having conversations about sexual health and gender with your clients, as well as knowing when to intervene and when to refer. Additional attention will be given to developing and keeping appropriate boundaries with clients when addressing issues of sexual health and gender. Theoretical frameworks regarding human sexuality, sexual disorders, normative vs. non-normative sexual behavior, issues of gender identity and expression, and applicable therapeutic interventions will be discussed. Specific focus will also be given to the co-occurrence of sexual and gender concerns with mental health and substance use disorders, including discussions regarding prevalence and potential presentations. Please be aware that in the process of this course, you will be asked to engage in dialogue about and reflect upon your own beliefs and values around issues of sex, sexuality, relationships, gender identity, etc. It is expected that you be willing to challenge yourself to critically examine course discussions and materials, particularly as they may apply to your future work as a counselor. This course combines the use of lectures, group discourse, group presentations, clinical role-plays, readings, self-reflective activities, and additional experiential exercises to aid you in expanding your knowledge base and competence in managing these issues as they may arise in the therapy session.

IBH 6233. DBT Skills Training: Group Practices and Treatment Modalities. (2 cr.; A-F only; Every Summer) This course focuses on teaching the delivery of Dialectical Behavior Therapy (DBT) Treatment: Skills Training in a group format. This opportunity allows students to learn the skills taught in a DBT Program as well as learn how to incorporate these skills into a behavioral therapy orientation. Students will explore the core skill of mindfulness, behavioral therapy, dialectics and cognitive behavioral therapy in a group and experiential format. Students will be expected to participate in weekly group discussion and assignments. Discussion will assist students with learning how this treatment is delivered to clients. Weekly assignments will provide experiential learning of skills group and mindfulness, the foundation skill in a DBT Program.

IBH 6234. Counseling Grief and Loss. (2 cr.; A-F only; Every Fall & Summer) This course will provide students with an overview of current conceptualizations of grief and loss. It will prepare students with specialized knowledge and skills for understanding and identifying the process/progress of how people deal with loss. Special attention will be given to theoretical foundations of grief and loss, different types of loss, impact of loss, and cultural considerations. Additional
Interdisciplinary Medicine (INMD)

INMD 6001. Directed Study I. (1-6 cr.; max 12 cr.; P-N only; Every Fall, Spring & Summer) Directed study, directed readings and directed research courses are opportunities for students to work individually with a faculty member to earn credit for individually designed content. The Medical School Directed Study course is available only for medical students during their foundational curriculum (years 1 and 2). To register for a directed study course the student and faculty member must complete and sign this contract prior to submitting to the Medical School Registrar for processing.

INMD 6002. Directed Study II. (0-6 cr.; P-N or Audit; Every Fall, Spring & Summer) tbd

INMD 6120. Foundations of Preventive Medicine. (2 cr.; P-N or Audit; Every Summer) An introduction to the determinants and distribution of disease, the prevention of disease and promotion of health, medical research design and statistical analysis of data, and important aspects of health care delivery and public health. prereq; enroll med


INMD 6555. The Healer's Art: Awakening the Heart of Medicine. (1 cr.; P-N only; Every Spring) Developing a sense of personal/professional satisfaction from and ongoing commitment to the profession. prereq; Registered medical student

INMD 6755. Volunteer Community Outreach Experience. (0 cr.; No Grade Associated; Every Fall, Spring & Summer) The purpose of volunteer community outreach experiences are to provide medical trainees an opportunity to observe and/or assist in the provision of health care services to populations that are diverse in age, ethnicity, social environment, and need, as well as to experience unique clinical settings outside of the Medical School.

INMD 6802. Science of Medical Practice. (6 cr.; max 7 cr.; P-N only; Every Fall) Genetic and biochemistry workings of the human body as they relate to normal daily function, including nutritional aspects.

INMD 6803. Essentials of Clinical Medicine Part 1. (5 cr.; P-N only; Every Fall) Introduction to clinical medicine, including basic patient interview and hypothesis-driven physical exam. Basics of “doctoring.” Students’ first clinical experiences.

INMD 6804. Essentials of Clinical Medicine Part 2. (3 cr.; P-N only; Every Spring) Clinical medicine, including basic patient interview and hypothesis-driven physical exam. Basics of “doctoring.” Students’ first clinical experiences.

INMD 6805. Essentials of Clinical Medicine Part 3A. (5 cr.; P-N only; Every Summer) Clinical medicine, including basic patient interview and hypothesis-driven physical exam. Basics of “doctoring.” Students first clinical experiences.

INMD 6806. Essentials of Clinical Medicine Part 3B. (5 cr.; P-N only; Every Fall) Clinical medicine, including basic patient interview and hypothesis-driven physical exam. Basics of “doctoring.” Students first clinical experiences.

INMD 6807. Essentials of Clinical Medicine Part 3C. (5 cr.; P-N only; Every Spring) Clinical medicine, including basic patient interview and hypothesis-driven physical exam. Basics of “doctoring.” Students first clinical experiences.

INMD 6808. Human Health & Disease - Cardio & Resp. (4 cr.; P-N only; Every Fall) Pathophysiology of cardio-respiratory system, including infectious disease, pathologic/pharmacologic principles.

INMD 6809. Human Health & Disease - Rheum, Derm & Opth, Ortho & Otol. (4 cr.; P-N only; Every Spring) Pathophysiology of rheumatology, dermatology, ophthalmology, orthopaedics/otolaryngology disciplines, including infectious disease. Pathologic/pharmacologic principles.

INMD 6810. Human Health & Disease - Renal & Endo/Repro. (5 cr.; P-N only; Every Spring) Pathophysiology of endocrine/reproductive systems, including laboratory medicine/infectious disease. Pathologic/pharmacologic principles.

INMD 6811. Human Health & Disease - GI & Heme. (4 cr.; P-N only; Every Fall) Pathophysiology of circulatory/gastrointestinal systems, including laboratory medicine/infectious disease. Pathologic/pharmacologic principles.

INMD 6812. Micro Biology and Immunology. (5 cr.; P-N only; Every Spring) Major bacterial, viral, fungal, and parasitic diseases, including their life cycles and transmission, virulence factors, types of associated illnesses and diagnosis, general principles of treatment, and methods of prevention. Innate and acquired immunity, including cellular interactions, mechanisms, derangements, and serological use in diagnosis.

INMD 6813. Neuroscience. (3 cr.; P-N only; Every Spring) Human neuroscience. Survey of molecular cellular systems neuroscience as related to medicine.

INMD 6814. Physiology. (3 cr.; P-N only; Every Spring)

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
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INMD 6815. Human Behavior. (1 cr.; P-N only; Every Summer) Human activities, including those hidden from view such as cognition, feelings, and decision making. Focus on being a patient or a physician.

INMD 6816. Human Sexuality. (1 cr.; P-N only; Every Summer) Basic and clinical skills. Teaching students the process of how to help provide patients with information and helpful suggestions concerning sexuality and referring patients who require more specialized forms of health care.

INMD 6817. Principles of Pathology. (1 cr.; P-N only; Every Summer) General principles of human pathology.

INMD 6818. Principles of Pharmacology. (1 cr.; P-N only; Every Summer) General principles of pharmacology.

INMD 6819. Human Health & Disease - Neuro & Psych. (3 cr.; P-N only; Every Fall) Pathophysiology of neurology/psychiatry disciplines, including infectious disease, along with pathologic/pharmacologic principles.

INMD 6820. Medical Gross Anatomy & Embryology. (3 cr.; P-N only; Every Fall) This course is a study of human gross anatomy with emphasis upon the anatomical structure (and a bit of function) of the components of the human body. It relies heavily on laboratory dissection in the approach to learning anatomy.

INMD 6821. Human Histology. (2 cr. [max 3 cr.]; P-N only; Every Fall) Histology puts biochemistry, molecular biology and physiology in the context of cell structure and function. This lecture and laboratory course covers the microscopic structure of the body, using light and electron microscopic techniques, with an emphasis on the relationship of structure to function.

INMD 6822. Human Health & Disease - Dermatology, Orthopedics, Rheumatology. (3 cr.; P-N only; Every Fall) Pathophysiology of dermatology/orthopedics/rheumatology disciplines, including infectious disease, along with pathologic/pharmacologic principles.

INMD 6823. Human Health & Disease - Neurology, Psychiatry, Otolaryngology, Ophthalmology. (4 cr.; P-N only; Every Fall) Pathophysiology of neurology/psychiatry/otolaryngology/ophthalmology disciplines, including infectious disease, along with pathologic/pharmacologic principles.

INMD 6824. Foundations of Critical Thinking 1A. (1 cr.; P-N only; Every Fall) A case-based course that links clinical scenarios and scientific foundations components of the curriculum through small group, facilitator supported sessions. Students develop a patient-centered approach to analyzing clinical situations, one that is informed by the literature and considers multiple perspectives and issues across the biopsychosocial-cultural continuum. Students develop reflective practices and comfort with the ambiguity that exists in clinical practice. The course enhances students’ ability to work together in teams and highlights the importance of teamwork throughout their medical career.

INMD 7000. Interdisciplinary Research. (2-12 cr. [max 24 cr.]; H-N only; Every Fall, Spring & Summer) Clinical or basic science research.

INMD 7002. Interdisciplinary Research-3. (2-6 cr.; H-N only; Every Fall, Spring & Summer) Clinical or basic science research. prerequisite: 3rd or 4th year medical student

INMD 7050. Research in Health Care Management I. (4 cr.; P-N or Audit; Periodic Fall) Students select a topic of importance in health care management, formulate a problem, and carry out research. prerequisite: Registered in MD/MBA dual degree program

INMD 7051. Research in Health Care Management II. (2-4 cr. [max 2 cr.]; P-N or Audit; Periodic Fall) Students select a topic of importance in health care management, formulate a problem, and carry out research. prerequisite: Registered in MD/MBA dual degree program

INMD 7100. Development of Clinical Skills. (0-6 cr. [max 12 cr.]; H-N only; Every Fall, Spring & Summer) History, physical exam, assessment, and management skills related to patient care.

INMD 7101. Becoming a Doctor I. (1 cr.; P-N only; Every Fall) Opportunity to provide standard curriculum across school now grounded in substantial clinical experience (e.g., integrated basic science curriculum). Opportunity for new or existing institutional assessments to happen in short time frame for all students (not interfering with clinical rotations). Opportunity for co-curricular activities (Service Learning, FA group reflections, etc.) to become curricular and standard in timing, again, not interfering with clinical rotations. Transition into role of professional.

INMD 7103. Becoming a Doctor III. (1 cr.; P-N only; Every Fall) Opportunity to provide standard curriculum across school now grounded in substantial clinical experience (e.g., integrated basic science curriculum). Opportunity for new or existing institutional assessments to happen in short time frame for all students (not interfering with clinical rotations). Opportunity for co-curricular activities (Service Learning, FA group reflections, etc.) to become curricular and standard in timing, again, not interfering with clinical rotations. Transition into role of professional.

INMD 7104. Becoming a Doctor IV. (1 cr.; P-N only; Every Spring) Opportunity to provide standard curriculum across school now grounded in substantial clinical experience (e.g., integrated basic science curriculum). Opportunity for new or existing institutional assessments to happen in short time frame for all students (not interfering with clinical rotations). Opportunity for co-curricular activities (Service Learning, FA group reflections, etc.) to become curricular and standard in timing, again, not interfering with clinical rotations. Transition into role of professional.

INMD 7110. REACH LIC Medicine. (8 cr.; H-N only; Every Fall, Spring & Summer) Regions-based internal medicine clerkship with experiences in both inpatient and outpatient internal medicine. The course will emphasize diagnostic approaches to patient problems and acquisition of knowledge and skills while working with internal medicine hospitalists in the inpatient setting and attending physicians in the primary care clinics.

INMD 7111. REACH LIC Surgery. (8 cr.; H-N only; Every Fall, Spring & Summer) Regions-based General Surgery Clerkship in which students will work directly with attending physicians while learning various responsibilities of surgical care and achieve competency in core surgical areas.

INMD 7112. REACH LIC Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer) Regions-based psychiatry clerkship that will prepare medical students to recognize, diagnose and care for patients with psychiatric disorders encountered in most medical practices. Students will be working one-on-one with a psychiatrist in the outpatient setting and will follow patients to the inpatient setting.

INMD 7113. REACH LIC Neurology. (4 cr.; H-N only; Every Fall, Spring & Summer) Region-based neurology clerkship that will increase clinical skills in diagnosing and treating neurologic illnesses. This will occur in the clinic and on the inpatient neurology consult service.

INMD 7114. REACH LIC Ob/Gyn. (4 cr.; H-N only; Every Fall, Spring & Summer) Regions-based ob/gyn clerkship in which students will work with attending physicians while learning various responsibilities of ob/gyn care.

INMD 7116. REACH LIC Pediatrics. (0 cr.; H-N only; Every Fall, Spring & Summer)
INMD 7117. REACH LIC Emergency Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer)
Regions-based rotation provides first-hand experience in dealing with emergency problems in a Level I trauma center. Students work with emergency medicine residents under supervision by board certified attending staff.

INMD 7204. Rural Physician Associate Program (RPAP): Surgery. (8 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive primary care (surgery) experience in a rural setting. Student works with family physicians and local or visiting specialists. Problem-based learning, hands-on clinical experience, one-to-one teaching.

INMD 7205. Rural Physician Associate Program (RPAP): Obstetrics and Gynecology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive obstetrics/gynecology experience in a rural setting. Student works with family physicians and local or visiting specialists. Problem-based learning, hands-on clinical experience, one-to-one teaching.

INMD 7206. Rural Physician Associate Program (RPAP): Pediatrics. (4 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive pediatrics experience in a rural setting.

INMD 7208. RPAP: Emergency Medicine. (5 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive emergency medicine experience in a rural setting.

INMD 7213. MetroPAP: Surgery. (8 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive surgery experience in a metropolitan setting.

INMD 7214. MetroPAP: OB/Gyn. (4 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive obstetrics and gynecology experience in a metropolitan setting.

INMD 7217. MetroPAP: Emergency Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer)
Community-based required course with extensive emergency medicine experience in a metropolitan setting.

INMD 7218. MetroPAP: Psychiatry Externship. (4 cr.; H-N only; Every Fall, Spring & Summer)
To prepare the medical student to recognize, diagnose, and care for patients with psychiatric disorders encountered in most medical practices. This experience is set up in two parts: a 2-week experience of inpatient pediatric care at a site near the Duluth or Twin Cities campus prior to the MetroPAP orientation, and a 2-week experience in ambulatory behavioral health completed during the 9-mo LICexperience in a rural setting.

INMD 7219. Metropolitan Physician Associate Program: Pediatrics. (4 cr.; H-N only; Every Fall, Spring & Summer)
This experience is set up in two parts: a 2-week experience of inpatient pediatric care at a traditional Twin Cities or Duluth clinical site prior to the orientation, and a 2-week experience in ambulatory behavioral health completed during the 9-month LIC experience in an urban setting.

INMD 7220. MetroPAP Primary Care Introduction Clerkship. (5 cr.; P-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the first three months of MetroPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7221. MetroPAP Primary Care Intermediate Clerkship. (5 cr.; P-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the second three months of MetroPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7222. MetroPAP Primary Care Advanced Clerkship. (8 cr.; H-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the final three months of MetroPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7223. RPAP Primary Care Introduction Clerkship. (5 cr.; P-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the first 3 months of RPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7224. RPAP Primary Care Intermediate Clerkship. (5 cr.; P-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the second three months of RPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7225. RPAP Primary Care Advanced Clerkship. (8 cr.; H-N only; Every Fall, Spring & Summer)
This portion of the overall LIC curriculum occurs during the final three months of RPAP and is integrated with the other core disciplines encompassed within the LIC.

INMD 7228. Rural Physicians Associate Program: Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer)
To prepare the medical student to recognize, diagnose, and care for patients with psychiatric disorders encountered in most medical practices. This experience is set up in two parts: a 2-week experience of inpatient pediatric care at a site near the Duluth or Twin Cities campuses prior to the RPAP orientation, and a 2-week experience in ambulatory behavioral health completed during the 9-mo LIC experience in a rural setting.

INMD 7301. Medical Anthropology I: The Normal and the Pathological. (1 cr.; P-N or Audit)
Beliefs/practices concerning human affliction, health, and healing in cross cultural perspective. Body as biologically given and culturally/historically located. Meanings that individuals and social groups attach to health, sickness, suffering, and healing. The normal and the pathological in comparative perspective.

INMD 7302. Medical Anthropology II: International Health, Colonialism, and Emerging Diseases. (2 cr.; P-N or Audit)
Beliefs/practices concerning human affliction, health, and healing in cross cultural perspective. Body as biologically given and culturally/historically located. Meanings that individuals and social groups attach to health, sickness, suffering, and healing.

INMD 7303. Medical Anthropology III: Comprehending Human Affliction and Healing Cross Cultural Anthropology III. (4 cr.; P-N or Audit)
Beliefs/practices concerning human affliction, health, and healing in cross cultural perspective. Body as biologically given and culturally/historically located. Meanings that individuals and social groups attach to health, sickness, suffering, and healing. Ways in which diverse social groups cope with human affliction and seek to achieve health.

INMD 7310. VAMC LIC - Medicine I (VALUE). (8 cr.; H-N only; Every Fall, Spring & Summer)
VA based Internal Medicine clerkship with experiences in both inpatient and outpatient Internal Medicine. The course will emphasize diagnostic approaches to patient problems and acquisition of knowledge and skills while working with internal medicine hospitalists in the inpatient setting and attending physicians in the primary care clinics.

INMD 7311. VAMC LIC - Surgery (VALUE). (8 cr.; H-N only; Every Fall, Spring & Summer)
VA based General Surgery Clerkship in which students will work directly with attending physicians while learning various responsibilities of surgical care and achieve competency in core surgical areas.

INMD 7312. VAMC LIC - Psychiatry (VALUE). (4 cr.; H-N only; Every Fall, Spring & Summer)
VA based Psychiatry clerkship that will prepare medical students to recognize, diagnose and care for patients with psychiatric disorders encountered in most medical practices. Students will be working one-on-one with a psychiatrist in the outpatient setting and will follow patients in the inpatient setting.

INMD 7313. VAMC LIC - Neurology (VALUE). (4 cr.; H-N only; Every Fall, Spring & Summer)
VA based Neurology clerkship that will increase clinical skills in diagnosing and treating neurologic illnesses. This will occur in the clinic and on the inpatient neurology consult service.

INMD 7314. VAMC LIC - Primary Care Selective - Internal Medicine (VALUE). (4 cr.; H-N only; Every Fall, Spring & Summer)
Internal Medicine ambulatory setting based in VA Patient Aligned Care Teams (PACTs)
with students taking primary responsibility for care of a patient. Students will learn chronic disease management, population-based management of medical problems as well as routine preventive medicine.

INMD 7317. VAMC LIC - QU Interprofessional Patient Care (VALUE). (4-5 cr.; H-N only; Every Fall, Spring & Summer) VALUE elective that will train medical students in patient-centered and inter-professional care that will lead to improved patient care and satisfaction. The experience will prepare students to meet the contemporary requirements of residency programs and future practice in a rapidly changing health care environment.

INMD 7319. VAMC LIC Radiology. (2 cr.; H-N only; Every Fall, Spring & Summer) This clerkship presents an overview of the various imaging modalities and image interpretation. Lectures cover fundamentals of image interpretation, nuclear medicine, computerized tomography, ultrasound, and magnetic resonance imaging. This is an opportunity to observe the procedures and read films with staff and residents. Emphasis is on normal anatomy and basic pathologic patterns. There are also multiple opportunities to follow longitudinal patients through the radiology department. The clerkship will also focus on how radiology interfaces with other disciplines but attendance at multidisciplinary conferences; Morbidity and Mortality, Gastroenterology Multidisciplinary Conference, Pulmonary Tumor Board, ENT tumor Board, Liver Tumor Board, Breast Conference, and Vascular and Neurology/Neuroradiology conference.

INMD 7350. HCMC LIC Internal Medicine. (8 cr.; H-N only; Every Fall, Spring & Summer) HCMC based Internal Medicine clerkship with experiences in both inpatient and outpatient Internal Medicine. The course will emphasize diagnostic approaches to patient problems and acquisition of knowledge and skills while working with internal medicine hospitalists in the inpatient setting and attending physicians in the primary care clinics.

INMD 7351. HCMC LIC Surgery. (8 cr.; H-N only; Every Fall, Spring & Summer) HCMC based General Surgery Clerkship in which students will work directly with attending physicians while learning various responsibilities of surgical care and achieve competency in core surgical areas.

INMD 7352. HCMC LIC Psychiatry. (4 cr.; H-N only; Every Fall, Spring & Summer) HCMC based Psychiatry clerkship that will prepare medical students to recognize, diagnose and care for patients with psychiatric disorders encountered in most medical practices. Students will be working one-on-one with a psychiatrist in the outpatient setting and will follow patients to the inpatient setting.

INMD 7354. HCMC LIC Primary Care Selective - Internal Medicine. (4 cr.; P-N only; Every Fall, Spring & Summer) Internal Medicine ambulatory setting based HCMC with students taking primary responsibility for care of a panel of patients. Students will learn chronic disease management, population-based management of medical problems as well as routine preventative medicine.

INMD 7355. HCMC LIC Obstetrics & Gynecology. (4 cr.; H-N only; Every Fall, Spring & Summer) HCMC based Ob/Gyn clerkship in which students will work with attending physicians while learning various responsibilities of Ob/Gyn care.

INMD 7356. HCMC LIC Pediatrics. (4 cr.; H-N only; Every Fall, Spring & Summer) HCMC based Pediatric Clerkship which provides basic pediatric skills and knowledge necessary for each student, no matter what field of medicine they select.

INMD 7357. HCMC LIC Health Disparities/Social Determinants. (4 cr.; P-N only; Every Fall, Spring & Summer) Students will have didactic sessions which emphasize the underpinnings of health disparities, social determinants of health, and utilizing public policy to address those issues. In addition, students will participate in a multidisciplinary project addressing one specific issue/goal and present their work and results in some form (poster, publication, etc).

INMD 7358. HCMC LIC Emergency Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) HCMC based rotation provides first-hand experience in dealing with emergency problems in a Level I trauma center. Students work with emergency medicine residents under supervision by board certified attending staff. Students act as primary physician, including initial assessment, minor procedures, interpretation of lab/x-ray, and preparation for admission to inpatient services. Opportunities to observe critical resuscitation.

INMD 7401. Hospitalist Rotation. (1-8 cr.; max 12 cr.; P-N only; Every Fall, Spring & Summer) One on one clinical educational experience with an internal medicine or medicine/pediatric hospitalist.

INMD 7410. Education in Pediatrics Across the Continuum LIC - Medicine I. (8 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal Internal Medicine clerkship based at the University of Minnesota Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in general pediatric surgery while working with a continuity preceptor in outpatient surgery and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7411. Education in Pediatrics Across the Continuum LIC ? Surgery. (8 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal surgery clerkship based at the University of Minnesota Masonic Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in general pediatric surgery while working with a continuity preceptor in outpatient surgery and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7412. Education in Pediatrics Across the Continuum LIC ? Neurology. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal neurology clerkship based at the University of Minnesota Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in neurology while working with a continuity preceptor in outpatient neurology and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7413. Education in Pediatrics Across the Continuum LIC ? Psychology. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal psychology clerkship based at the University of Minnesota Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in psychology while working with a continuity preceptor in outpatient psychology and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7414. Education in Pediatrics Across the Continuum LIC ? Primary Care Selective. (4 cr.; P-N only; Every Fall, Spring & Summer) Through continuity clinics as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC) at the University of Minnesota Medical Center, as well as online curriculum and weekly EPAC team meetings, the learner will get clinical exposure to primary care and acquire knowledge, skills and attitudes in the process of care and how to improve it.

INMD 7415. Education in Pediatrics Across the Continuum LIC ? Family Medicine. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal Family Medicine clerkship based at Smiley?s Family Medicine Clinic/University of Minnesota Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in Family Medicine while working with a continuity preceptor in Family Medicine, tracking with them for both inpatient and outpatient experience, and by tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7416. Education in Pediatrics Across the Continuum LIC: Obstetrics/Gynecology. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal Obstetrics and Gynecology clerkship based at the University of Minnesota Medical Center as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in general pediatric surgery while working with a continuity preceptor in outpatient surgery and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

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INMD 7417. Education in Pediatrics Across the Continuum LIC: Pediatrics. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal pediatrics clerkship based at the University of Minnesota Masonic Children’s Hospital and Fairview Children’s Clinic as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in Pediatrics while working with a continuity preceptor in outpatient pediatrics; and tracking patients to inpatient, subspecialty, or interdisciplinary arenas.

INMD 7418. Education in Pediatrics Across the Continuum LIC ? Emergency Medicine. (4 cr.; P-N only; Every Fall, Spring & Summer) A longitudinal Emergency Medicine clerkship based at the University of Minnesota Masonic Children’s Hospital as a part of the Education in Pediatrics Across the Continuum Longitudinal Integrated Clerkship (EPAC LIC). The course emphasizes the acquisition of knowledge, skills and attitudes in Emergency Medicine while working with a continuity preceptor in Emergency Medicine; tracking patients to inpatient, surgical or outpatient arenas as able; and through simulation experiences.

INMD 7421. Education in Pediatrics Across the Continuum LIC - Enrichment Elective. (2-8 cr. [max 24 cr.]; P-N only; Every Fall, Spring & Summer) The EPAC enrichment elective is a focused experience with the goal of furthering a student’s developmental progress towards entrustment without direct supervision in one or more areas of professional development. In general the assessment framework are the Core Entrustable Professional Activities for Entering Residency (CEPAER). The student will work with the Course Director and EPAC leadership team to identify and assign an experience that is likely to facilitate the developmental goals. This could include direct patient care or not. The student and course director must sign an agreement prior to the start of the experience as to the final elective expectations.

INMD 7422. Education in Pediatrics Across the Continuum - Independent Study. (2-8 cr. [max 24 cr.]; P-N only; Every Fall, Spring & Summer) The EPAC independent study elective is a semester long experience meant to complement patient care in pediatric medicine by developing a student’s non-direct patient care knowledge, skills and attitudes. The student will work with the course director to plan an independent study project; examples include a quality improvement project, drafting/submitting for presentation a case report, etc. They will identify a supervising preceptor. The student, course director and the supervising preceptor will sign an agreement prior to the start of the experience as to the final elective expectations. This elective may be repeated up to a total of three times, to move on to the next phase in a project in progress or to do a new project.

INMD 7423. Education in Pediatrics Across the Continuum - Medical Education Independent Study. (12 cr.; P-N only; Every Fall, Spring & Summer) As a part of participation in the EPAC undergraduate medical education curricular experience, EPAC students will, in the EPAC Medical Education Independent Study: ? Actively participate in educational quality improvement of the local EPAC program ? Contribute to the national data used to evaluate the national EPAC project and test feasibility ? Actively participate in formal, documented self-assessment and feedback beyond that explicitly required for traditionally tracked medical students at the University of Minnesota Medical School To this end, EPAC students will, at a minimum, attend weekly meetings during the EPAC LIC curriculum, complete all required local and national assessments, and keep their diagnosis and procedure tracker up to date.

INMD 7450. Hospice & Palliative Care. (; 4 cr.; H-N only; Every Fall, Spring & Summer) Interdisciplinary course. Hospice, palliative medicine.

INMD 7500. ICU Translational Science. (; 4 cr.; H-N only; Every Fall, Spring & Summer) Year 4 students who want to experience how basic science concepts can be translated to quality care of patients requiring intensive care.

INMD 7508. Clerkship: Primary Care Medicine. (; 4 cr.; H-N or Audit; Every Fall, Spring & Summer) Participation in patient care in outpatient primary care settings located at internal medicine, family practice, pediatric, and geriatric clinics. prereq: 6104

INMD 7509. Clerkship II: Primary Care Medicine. (; 4 cr.; H-N or Audit; Every Fall, Spring & Summer) N/A prereq: 6508

INMD 7510. Health Systems Science. (4 cr.; P-N only; Every Fall) Health Systems Science (HSS) is a new and evolving term in medical education. It is considered the new 3rd science (where the other two are Basic Science and Clinical Science). All three are considered at least equally important for successful future clinical practice. It encompasses a wide range of topics including: patient safety, quality improvement, evidence-based medicine, value in health care, inter-professional teamwork, stewardship of health care resources, population management, clinical informatics, care coordination, leadership, and health care financing and reform.

INMD 7520. Interdisciplinary Health Education in a Community Setting. (; 4 cr.; P-N or Audit; Periodic Fall) Students work with instructor and coordinator at one of three community sites. prereq: Health science student

INMD 7522. Migrant Health Elective. (4 cr.; H-N only; Every Summer) This rotation is an interprofessional, community-engaged medical rotation that focuses on the social determinants of health of the most marginalized population in the state, rural Latino hired agricultural workers. The clinical experience will be caring for patients on mobile medical units that travel to farms in rural, southern Minnesota. Learners will follow a curriculum that includes readings, documentaries, films, medical literature, discussions/workshops, tours of workplaces, and lectures by leading experts around the nation in the health of agricultural workers. We also have meetings with the local Mexican Consulate, community health centers, legal experts, occupational health physicians, and labor organizers. This rotation includes the opportunity to work with residents in internal medicine, pediatrics, emergency medicine, and pharmacy and professionals from other disciplines including pharmacy, dentistry, and vet medicine. We also work directly with Centro Campesino, an organization that pairs AHC students with promising Latino youth from rural farmworker families.

INMD 7523. Occupational and Environmental Medicine Elective. (4 cr.; H-N only; Every Fall, Spring & Summer) By the end of this rotation, students will be able to: 1) identify unique problems associated with occupationally and environmentally-related illness and injury; 2) obtain and organize a thorough occupational or environmental history; 3) formulate appropriate work/activity restrictions based on a specific illness or injury; 4) describe the role of preventive medicine, both patient-focused & programmatic, in individual wellness and overall population health.

INMD 7540. Ambulatory Clinic for the Physician-Scientist. (; 1-6 cr.; [max 12 cr.]; H-N or Audit; Every Fall, Spring & Summer) Students develop/refine ambulatory patient evaluation and management skills. prereq: Med student

INMD 7542. Clinical Continuity Experience for Physician Scientists I. (3 cr. [max 6 cr.]; H-N only; Every Fall) Students paired with active physician scientist who serves as MSTP Clinical Mentor. One-on-one meetings between student/MSTP clinical mentor averaging one-half day per month. Mentors provide ongoing clinical opportunities/teach clinical care skills.

INMD 7545. Clinical Continuity Experience for Physician Scientists II. (3 cr. [max 6 cr.]; H-N only; Every Fall) Students paired with active physician scientist who will serve as MSTP Clinical Mentor. One-on-one meetings between student/MSTP clinical mentor. Mentors provide ongoing
INMD 7548. Clinical Foundations for the Physician Scientist. (4 cr.; max 8 cr.; H-N only; Every Fall, Spring & Summer)
Students paired with active physician scientist who serves as MSTP Clinical Mentor. One-on-one meetings between student/MSTP clinical mentor in clinic averaging one day per week for 9 weeks. Hands-on clinical experience.

INMD 7549. MSTP Directed Study. (3-6 cr.; P-N only; Every Fall, Spring & Summer)
This course is for MD/PhD students to pursue independent research under the directed supervision of a research faculty mentor. The student must have a research mentor prearranged and approved by the MD/PhD program prior to taking the course.

INMD 7552. Traditional Indian Medicine Clerkship. (2-6 cr.; max 2 cr.; H-N or Audit; Every Fall, Spring & Summer)
Clinical experience in a major hospital/center in approved (through Medical School Curriculum Affairs) Indian Health Service area. prereq: Med student, dept consent

INMD 7553. Elective Away at Centers for Disease Control (CDC). (2-8 cr.; H-N or Audit; Every Fall, Spring & Summer)
Full-time experience in section of CDC. prereq: Med student, dept consent

INMD 7555. Elective Away for Credit. (2-8 cr. max 32 cr.; H-N only; Every Fall, Spring & Summer)
A rotation that students take at another institution to fulfill elective credits.

INMD 7565. Global Health Abroad. (4-8 cr. max 24 cr.; P-N only; Every Fall, Spring & Summer)
Student-arranged, structured, approved (through Medical School Global Health Abroad Office) clinical experience in foreign medical institution.

INMD 7568. Clinical Experience in International Medicine II. (2-6 cr.; H-N or Audit; Every Fall, Spring & Summer)
Student-arranged, structured, approved (through Medical School Curriculum Affairs) clinical experience in foreign medical institution. prereq: Med student, dept consent

INMD 7579. Rural Hawaii Public Health Elective. (2-6 cr.; H-N only; Every Fall, Spring & Summer)
Six week rotation. Public health issues, multicultural focus. Students participate in North Hawaii Outcomes Project. Design of outcome measures, data collection, data analysis, program development/implementation. Stroke prevention, chemical use, motor vehicle accidents, teenage pregnancy.

INMD 7580. Integrative Healing in Hawaii. (2 cr.; H-N only; Every Spring)
This course is a two-week elective rotation designed to provide medical students with the opportunity to gain knowledge and exposure to Integrated Healing modalities.

INMD 7650. Flex 5 Individualized Sub-Internship. (4-8 cr. max 24 cr.; H-N only; Every Fall & Summer)
Students accepted into the Flex 5 program may need additional sub-internship experiences for their portfolio. In the case where there is not another specialty-specific course in the medical school catalog for which the Flex 5 student can enroll, the Interdisciplinary Flex 5 Individualized Sub-internship will provide an option for an additional experience in the student's chosen specialty. Experiences under this course will build upon the knowledge and skills learned during their core clerkships and previous advanced experiences, and further improve their clinical skills in their specialty of choice.

INMD 7700. Primary Care Clinic: Minnesota Community Engagement Program (MNCEP). (4 cr.; P-N only; Every Fall, Spring & Summer)
One month clerkship in rural or urban underserved community (initially will pilot in rural settings) Clinical experience with community physician. Participation in projects to address community health outcomes.

INMD 7900. Flexible MD Independent Study. (3-6 cr. max 18 cr.; P-N only; Every Fall, Spring & Summer)
Independent exploration of path toward doctorate of medicine Serving the needs of patients/communities. prereq: Registered medical student accepted into FlexMD Program

INMD 7901. Flexible MD Independent Study. (3-6 cr.; P-N only; Every Fall, Spring & Summer)
Exploration of path toward doctorate of medicine, serving needs of patients/communities. prereq: Registered medical student accepted into FlexMD Program

INMD 7902. Flexible MD Independent Study. (3-6 cr.; P-N only; Every Fall, Spring & Summer)
Exploration of path toward doctorate of medicine, serving needs of patients/communities. prereq: Registered medical student accepted into FlexMD Program

INMD 7910. ICU Sub-Internship - MICU. (4 cr.; H-N only; Every Fall, Spring & Summer)
Goal is to prepare medical students for internship and residency, through a clinically-focused experience focusing on higher acuity patients (ICU, IMC), clinical care, and emphasizing tasks necessary for internship. Students will use knowledge of pathophysiology and clinical epidemiology in order to develop a reasoned differential diagnosis. Finally, students will plan a logical and practical diagnostic evaluation, using the principles of evidence-based medicine.

INMD 7913. ICU Sub-Internship - NICU. (4 cr.; max 8 cr.; H-N only; Every Fall, Spring & Summer)
Goal is to prepare medical students for internship and residency, through a clinically-focused experience focusing on higher acuity patients (ICU, IMC), clinical care, and emphasizing tasks necessary for internship. Students will use knowledge of pathophysiology and clinical epidemiology in order to develop a reasoned differential diagnosis. Finally, students will plan a logical and practical diagnostic evaluation, using the principles of evidence-based medicine.

INMD 7914. ICU Sub-Internship - Med Wards. (4 cr.; H-N only; Every Fall, Spring & Summer)
Goal is to prepare medical students for internship and residency, through a clinically-focused experience focusing on higher acuity patients (ICU, IMC), clinical care, and emphasizing tasks necessary for internship. Students will use knowledge of pathophysiology and clinical epidemiology in order to develop a reasoned differential diagnosis. Finally, students will plan a logical and practical diagnostic evaluation, using the principles of evidence-based medicine.

IDS 5193. Directed Study in Interior Design. (1-4 cr.; max 8 cr.; A-F or Audit; Every Fall, Spring & Summer)
Independent study in interior design under tutorial guidance. prereq: Jr or sr or grad student

IDS 8170. Topics in Interior Design. (1-3 cr.; max 6 cr.; A-F or Audit; Every Fall & Spring)
In-depth investigation of topic, announced in advance.

IDS 8180. Professional Seminar. (1-2 cr.; max 4 cr.; A-F or Audit; Every Fall & Spring)
Professional development issues/trends.

IDS 8192. Readings in Interior Design. (1-3 cr.; max 8 cr.; A-F or Audit; Every Fall, Spring & Summer)
Independent study, review of books/periodicals under tutorial guidance. prereq: instr consent
IBUS 5090. Study Abroad Independent Study. (1-4 cr. [max 6 cr.]; A-F only; Every Fall & Spring)
Independent study coordinated by faculty member.

IBUS 5091. Shanghai Summer Program in International Business (Graduate). (0-18 cr.; S-N only; Every Summer)
Summer study abroad at one of Carlson School's international exchange partner universities, Antai College of Economics and Management. This is a three week summer program integrating intense business education in China context with corporate experience.

IBUS 5110. Business and the Environment in Costa Rica. (4 cr.; A-F only; Every Fall & Spring)
How businesses maintain/increase profits by taking care of environment. Sustainable development, environmental strategy. Travel to Costa Rica to join students from INCAE (partner school) for series of courses. Case studies, site visits, field trips. Taught in English. prereq: Sr or grad student

IBUS 5120. Global Business Practicum in Central and Eastern Europe. (4 cr.; A-F only; Every Spring & Summer)
Rapidly changing business environment of Central/Eastern Europe. Students work in teams with students from WU-Vienna University of Economics/Business for two weeks in May/June in Central/Eastern Europe. prereq: Carlson grad student

IBUS 5122. Global Banking in China. (4 cr.; A-F only; Every Spring)
This course will explore the banking and finance industry in Hong Kong, Shenzhen, and Shanghai with a comparative perspective between these locations and the United States. Program has site visits, business meetings, and guest lectures overseas. Spring B term classes followed by two weeks in China.

IBUS 5130. France Seminar: Doing Business in the European Union (Graduate). (4 cr.; S-N only; Every Fall, Spring & Summer)
Two-week study abroad program at Universite Jean-Moulin Lyon 3 in Lyon, France. Includes courses taught by international faculty, site visits, cultural excursions. prereq: Carlson grad student

IBUS 5140. Vienna Summer Program in International Business (Graduate). (0-18 cr.; S-N only; Every Summer)
Summer study abroad program at Europe's largest business school (WU-Vienna). Students take three business classes, plus German language. Program participants from Europe, Asia, Latin America, United States. prereq: Carlson grad student

IBUS 5150. IBUS 5150: Building on Frugal Innovations to Complete a Global Environment. (4 cr. [max 8 cr.]; A-F only; Every Fall)
On this program, students will be exposed to concepts related to developing a global managerial mindset, with a particular focus on understanding global product/market innovation. A variety of successful examples highlight the potential of frugal innovation - the term used to describe of cost-effective innovations devised to solve local problems in resource constrained markets - as being a very powerful source of ideas for new products and services. Products of frugal innovation, once proven locally, can be subsequently integrated into the broader R&D and product innovation processes within firms and become the base platforms for global products targeted at markets across the world. Students will choose an industry or domain of focus in class sessions and be exposed to global R&D practices in large local firms and then interact with startups and innovators working on frugal innovation projects on the ground in India. This is an education abroad program. Contact the Carlson Global Institute at cgi@umn.edu with questions. prereq: approved application

IBUS 5160. Cologne Summer Program: European Management (Grad). (8 cr. [max 24 cr.]; S-N only; Every Summer)
Summer study abroad at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interest. prereq: Carlson grad student

IBUS 5170. Global Business Practicum in Northern China. (4 cr.; A-F only; Every Spring)
Collaboration with corporate partner/business school in China. Students work in multicultural teams to analyze real-life business problems that corporations face in China. Examine cultural, social, economic differences surrounding global business. prereq: Grad student

IBUS 5171. Global Business Practicum in Southern China. (4 cr.; A-F only; Every Spring)
Collaboration with corporate partner/business school in China. Work in multicultural teams to analyze real-life business problems that corporations face in China. prereq: Grad student

IBUS 5172. IBUS 5172: Global Business Practicum Brazil. (4 cr. [max 8 cr.]; A-F only; Every Summer)
Study abroad course. Short-term global enrichment program traveling to Brazil in May.

IBUS 5175. India Seminar: Doing Business in India. (4 cr.; A-F only; Every Summer)
Live consulting project for international Dairy Queen in India market. prereq: Grad student

IBUS 5190. Brazil Seminar: Doing Business in Brazil. (4 cr.; A-F only; Every Spring)
Two-week study abroad at Escola de Administracao de Empresas de Sao Paulo da Fundacao Getulio Vargas (FGV). Full class days, cultural tours, field trips, site visits. prereq: Carlson grad student

IBUS 5200. International Business: Undergraduate Exchange. (0-16 cr. [max 160 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5201. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5202. International Business: Undergraduate Exchange. (0.5-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5203. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5204. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5205. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5206. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5207. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

IBUS 5208. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. prereq: 60 cr

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
IBUS 5209. International Business: Undergraduate Exchange. (1-6 cr. [max 60 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: 60 cr

IBUS 5260. Sustainability: The New Management Paradigm. (4 cr.; A-F only; Every Spring) View of integrated reporting (sustainability reporting) as it relates to various fields of business. Site visits, meetings with business executives/governmental agencies. Two weeks in the United Kingdom following commencement week, preceded by Spring B Term classes.

IBUS 5300. International Business: Graduate Exchange BLOCK. (0-18 cr. [max 54 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. For current offerings, contact Carlson International Programs. Prereq: Carlson grad student

IBUS 5301. Graduate Exchange in International Business - BLOCK. (0-18 cr. [max 54 cr.]; S-N only; Every Summer) Summer study abroad at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Contact Carlson International Programs. Prereq: Carlson grad student

IBUS 5302. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5303. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5304. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5305. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5306. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5307. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5308. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5309. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5310. International Business: Graduate Exchange. (0-18 cr. [max 72 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5311. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5312. International Business: Graduate Exchange. (0-18 cr. [max 180 cr.]; S-N or Audit; Every Fall & Spring) Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests. Prereq: Carlson grad student

IBUS 5315. Ethical Environment of International Business (Graduate). (4 cr.; A-F only; Every Spring & Summer) Current international business ethics. Students spend two weeks in Europe meeting with leaders of multinational firms, governmental agencies, NGOs. Ethical challenges faced by individuals/organizations in era of globalization. Taught in English. Prereq: Carlson grad student

IBUS 5316. Sustainability & Cooperative Advantage in Scandinavia. (4 cr.; A-F or Audit; Every Summer) Corporate responsibility through exploration of successful Scandinavian approach. Prereq: Carlson grad student

IBUS 5600. Graduate Summer Exchange. (0-4 cr.; S-N only; Every Summer) Summer study abroad exchange to one of Carlson Global Institute's partner universities. Prereq: Carlson grad student

IBUS 5601. Graduate Summer Exchange. (0-4 cr.; S-N only; Every Summer) Summer study abroad exchange to one of Carlson Global Institute's partner universities. Prereq: Carlson grad student

IBUS 5602. Graduate Summer Exchange. (0-4 cr.; S-N only; Every Summer) Summer study abroad exchange to one of Carlson Global Institute's partner universities. Prereq: Carlson grad student

IBUS 5603. Graduate Summer Exchange. (0-4 cr.; S-N only; Every Summer) Summer study abroad exchange to one of Carlson Global Institute's partner universities. Prereq: Carlson grad student

IBUS 5604. Graduate Summer Exchange. (0-4 cr.; S-N only; Every Summer) Summer study abroad exchange to one of Carlson Global Institute's partner universities. Prereq: Carlson grad student

IBUS 5605. Shanghai Summer Program in International Business (Graduate). (0-18 cr.; S-N only; Every Summer) Summer study abroad at one of Carlson School's international exchange partner universities, Antai College of Economics and Management. This is a three week summer program integrating intense business education in China context with corporate experience.

IBUS 6041. IBUS 6041: Global Strategy and Modes of Entry. (4 cr.; A-F or Audit; Every Spring) Course explores issues related to target market analysis, modes of entry, decision making in international business to comprehend complexity of crafting global strategy. Prereq: Carlson grad student

IBUS 6313. Ethical Environment of International Business (Graduate). (4 cr.; A-F only; Every Spring & Summer) Current international business ethics. Students spend two weeks in Europe meeting with leaders of multinational firms, governmental agencies, NGOs. Ethical challenges faced by individuals/organizations in era of globalization. Taught in English. Prereq: Carlson grad student

IBUS 6400. Carlson MBA Global Discovery. (1-3 cr.; A-F only; Every Fall & Spring) How companies/public agencies operate effectively in emerging-market economies. How emerging-market politics, law, social trends are shaping current Minnesota business/agency strategies. Classroom/2-week international visit/symposium following return to United States. Prereq: 2nd yr full-time Carlson MBA student

IBUS 6401. Marketing in the Mayhem: Why Chile Thrives and How Argentina Tries. (4 cr.; [max 8 cr.]; A-F only; Every Fall, Spring & Summer) This course will explore the use of the Marketing Management Process by firms and governments as they seek to grow and will use the comparative perspectives of Argentina and Chile as case studies. This is an education abroad program. Contact the Carlson Global Institute at cgi@umn.edu with questions. Prereq: approved application

IBUS 6402. Economic Diversification: Moving Beyond Oil in UAE and Oman. (4 cr.; max 8 cr.; A-F only; Every Fall, Spring & Summer) This course will explore ways countries in the Arab Gulf are expanding their economies beyond a reliance on oil and consider the impact of culture, history and religion play in business development in the region. This is an education abroad program. Contact the Carlson Global Institute at cgi@umn.edu with questions. Prereq: approved application

IBUS 6500. Mergers and Acquisitions in a Global Context. (1-4 cr.; A-F only; Periodic Fall & Spring) Challenges/strategies for success in mergers/acquisitions. Prereq: Carlson grad student

IBUS 6997. MILI Global Valuation Lab. (4 cr.; [max 8 cr.]; A-F only; Periodic Fall, Spring & Summer)
Forum for presentation of dissertation proposals, results from ISG practica, discussion of environmental risk assessment topics. Focuses on ongoing research or key publications on introduced species/genotypes.

**ISG 8021. Problem Solving Practicum in Risk Analysis.** (3 cr. [max 6 cr.]; A-F only; Every Summer)
Students address real-world problems in environmental risk analysis of introduced species and genotypes, with faculty guidance and in consultation with public/private partner, and apply societal deliberation and scientific/policy analysis. prereq: 5010, 5020

**ISG 8031. Cooperative Learning Practicum.** (1 cr.; A-F only; Every Spring)
Cooperative learning techniques. Scenario planning, decision cases. Students develop/test cooperative learning exercises for environmental risk assessment based on their research experience in 8021. Linking research to teaching. prereq: 8021

**Italian (ITAL)**

**ITAL 5201. Reading Italian Texts: Poetics, Rhetoric, Theory.** (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Rhetorical/poetic aspects of language and literature. Interpretive methods, theoretical concepts. prereq: grad student or instr consent

**ITAL 5203. Italian Travelers: From the Enlightenment to the Present.** (3 cr. [max 12 cr.]; Student Option; Periodic Fall)
Examines literary representations of travel, migration, immigration, exile, and tourism in Italy, from Enlightenment to present. prereq: grad student or instr consent

**ITAL 5305. Staging the Self: Theater and Drama in Modern Italy.** (3 cr. [max 12 cr.]; Student Option; Periodic Fall)
Theatrical representations of the self in modern Italy. Focuses on issues of identity, gender, and class in theatrical works ranging from Alfieri’s Mirra, Pirandello’s Enrico IV to Dacia Maraini’s Clytemnestra. prereq: grad student or instr consent

**ITAL 5401. Mondo di Dante.** (4 cr. [max 16 cr.]; Student Option; Periodic Fall)
Intensive reading of Dante’s Inferno, Purgatorio, and Vita Nuova with emphasis on Dante’s linguistic and cultural contributions. prereq: 3015, 3201 or instr consent

**ITAL 5502. Making of Modern Italy: From the Enlightenment to the Present.** (3 cr. [max 12 cr.]; Student Option; Periodic Spring)
Italian literary, cultural, and symbolic practices, from Enlightenment to present. prereq: grad student or instr consent

**ITAL 5609. World of Dante.** (4 cr. [max 8 cr.]; Student Option;)
Taught in English. Intensive reading of Dante’s Inferno, Purgatorio and Vita Nuova with emphasis on the personal, poetic, and political stakes of the journey of Dante’s pilgrim through hell to the earthly paradise.

**ITAL 5640. Topics in Italian Studies.** (3 cr. [max 12 cr.]; Student Option; Every Fall)
Topics of interest in studies of Italian and/or Italian American culture of the 20th century. Topics and readings may include literary, critical, cultural, historical, and/or social issues, a specific author, a genre, or other topics. Content varies by instructor. Specific content posted in the department and in the Course Guide. prereq: Ital 3015

**ITAL 5970. Directed Readings.** (1-4 cr. [max 16 cr.]; Student Option; Every Fall & Spring)
Meets unique requirements decided on by faculty member and student. Individual contracts list contact hours, number of credits, written and other work required. prereq: instr consent

**ITAL 8333. FTE: Masters.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master’s student, adviser and DGS consent

**ITAL 8777. Thesis Credits: Master’s.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only)

**Japanese (JPN)**

**JPN 5040. Readings in Japanese Texts.** (3 cr. [max 9 cr.]; A-F or Audit; Every Fall)
Students read authentic materials of various types to increase reading and speaking ability. Topics specified in Class Schedule. prereq: 4042 or equiv or instr consent

**JPN 5041. Reading Japanese Texts: Literature and Culture.** (3 cr. [A-F or Audit; Periodic Fall & Spring)
This course is conducted 100% in modern Japanese, including course materials, lectures, and discussions. Close reading of texts written in modern Japanese, including a recent novel, essays on social phenomena, critical essays on Japanese society, and/or academic papers. Read and translate these texts accurately and critically; discuss them in Japanese, and/or compose an essay entirely in modern Japanese. Pre-requisite: JPN 4042 or equivalent or instructor consent.

**JPN 5071. Communicative Competence for Japan-Oriented Careers.** (4 cr.; Student Option; Periodic Fall)
Effective communication using spoken and written Japanese in contexts likely to be encountered by a career-oriented professional in Japan. prereq: 4041 or 4042 or instr consent

**JPN 5211. Introductory Classical Chinese I.** (3 cr.; Student Option; Periodic Fall)
Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or instr consent
JPN 5212. Introductory Classical Chinese II. (3 cr.; Student Option; Periodic Fall & Spring) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or instr consent.

JPN 5993. Directed Studies in Japanese. (1-15 cr.; Student Option; Every Fall & Spring) Individual study with guidance of a faculty member. Prereq instr consent, dept consent, college consent.

JPN 8333. FTE: Master's. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) No description prereq: Master's student, adviser and DGS consent.

JPN 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent.

JPN 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only).

JPN 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required.

JWST 5013W. Scripture and Interpretation in Israelite Religion and Judaism. (WI; 3 cr.; A-F or Audit; Spring Odd Year) Idea of divine revelation. Impact on religion/ literature. Knowledge of 3rd millennium BC textual traditions, interpretation help us think critically about role of revelation in religious traditions. prereq: At least one upper level course (3xxx or higher) in academic biblical or religious studies.

JWST 5992. Directed Readings. (; 1-12 cr.; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. prereq: instr consent.

Jewish Studies (JWST)

JWST 5013W. Scripture and Interpretation in Israelite Religion and Judaism. (WI; 3 cr.; A-F or Audit; Spring Odd Year) Idea of divine revelation. Impact on religion/literature. Knowledge of 3rd millennium BC textual traditions, interpretation help us think critically about role of revelation in religious traditions. prereq: At least one upper level course (3xxx or higher) in academic biblical or religious studies.

JOUR 5001. Introduction to Mass Communication Theory and Research. (3 cr.; A-F only; Every Fall) Course is designed to provide an overview of the evolution and content of the major intellectual perspectives, theories, and methodological approaches that serve as the basis for the mass communication discipline. Provides the intellectual base for first-year master's students' graduate work in mass communication, as well introduces advanced undergraduate students to graduate study in the discipline. prereq: Grad students enrolled in Mass Communication MA or PhD program.

JOUR 5131. In-Depth Reporting. (3 cr.; A-F only; Every Fall) Techniques/issues of special project stories. Explanatory, investigative, civic, literary, or ethnographic journalism. Topics (e.g., civil rights, governmental malfeasance, health care problems) typically involved in stories. prereq: [3004V or 3004W], [3101 or 3101H], [3121]. [major or approved BIS/IDIM/ICP program]

JOUR 5155. Database Reporting. (3 cr.; A-F only; Every Spring) Obtaining and analyzing digital data for computer-assisted reporting that can be published on various media platforms. Using spreadsheets and databases to manage information, find news stories, produce maps and graphics. prereq: [Jour 3004W or 3004V], [3101], [3103 or 3121]; [major or approved BIS/IDIM/ICP program]

JOUR 5174. Magazine Editing and Production. (3 cr.; A-F only; Every Fall & Spring) Writing, editing, illustration, design, layout, photo-composition of print or web magazine. Emphasizes reporting, telling substantive stories. Work in groups with varying specializations. prereq: [3004W or 3004V], [3155 or 3173W or 3279W or 3321 or 4302]. [major or approved BIS/IDIM/ICP program]

JOUR 5251. Strategic Communication Theory. (3 cr.; Student Option; Every Spring) This course is designed to provide an introduction to psychologically-grounded concepts, theories and their applications for strategic communication. The course objectives include comprehension and application of a range of psychological concepts and theories related to attitude development, susceptibility to message influence, and opinion formation and change. The course will provide opportunities to apply theoretical concepts to critically evaluate strategic communications (advertising, public relations, brand marketing, etc.) and to use psychological theory and research to inform the development of communication strategies. The course will examine how these theories help us understand communication processes in digital media environments, as well as how they inform relationship-building areas of strategic communication such as reputation and crisis management. The course will provide opportunities for students to apply concepts and theories to potential research for graduate degree capstone projects.

JOUR 5501. Communication, Public Opinion, and Social Media. (3 cr.; Student Option; Every Fall) Sharpen your understanding of public opinion and its role in political and civic life: What does it mean? Where does it come from? How is it measured? What impact does it have? How are the public’s preferences shaped by the larger communications environment and the strategic messages of politicians, interest groups, and other actors in society? What are polls really measuring, and why do they seem so unreliable sometimes? How are social media technologies giving voice to new segments and dimensions of public opinion? But how are they vulnerable to manipulation from bots and other efforts designed to alter perceptions of collective opinions? Examine the theories of communication, psychology, political science, and sociology that underlie these dynamic questions. We’ll consider cutting edge approaches used by market researchers, political analysts, and data scientists to harness new forms of data about what the public thinks. We investigate theories that explain how people form their opinions, deliberate with others, change their minds, and reveal their preferences, and we apply these frameworks to understand contemporary public opinion issues and campaigns.

JOUR 5541. Mass Communication and Public Health. (3 cr.; Student Option; Every Fall) This course provides an overview of theory and research that lies at the intersection of mass communication and public health. We examine the potential for media exposure to influence public health outcomes, both as a product of people’s everyday interactions with media and the strategic use of media messages to accomplish public health goals. To this end, we will explore large-scale public health campaigns in the context of tobacco, obesity, and cancer screening. We will also explore news media coverage of controversial health issues, such as the human papillomavirus (HPV) vaccine, and how entertainment media, such as smoking in movies. This course seeks to understand whether media messages have had intended and/or unintended effects on public attitudes and behavior. Although our focus is on mass media, interpersonal, medical, and digital media sources will be considered as well.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
JOUR 5542. Theory-based Health Message Design. (3 cr.; Student Option; Every Spring)
This course is designed to provide an overview of theory and research relevant for the design of health messages, and specifically focuses on how such theory and research informs message design. It builds on social and behavioral science approaches to public health communication and media effects with the primary objective to better understand issues and strategies related to the design of media health messages. Prerequisites: Jour 3005 or Jour 3757 or Jour 5541

JOUR 5543. Public Health Campaign Evaluation. (3 cr.; A-F or Audit; Every Fall) Evaluate process and outcomes of message-based health interventions. Utilize campaign evaluation literature. Develop recommendations for evaluation research design based on cross-sectional, experimental, and time-based designs. Focus on evaluation options within constraints.

JOUR 5552. Law of Internet Communications. (3 cr.; A-F or Audit; Every Spring) Digital communication technologies continue to raise a variety of legal issues, including whether and how (and which) traditional media and regulatory laws will apply, and how policy should be applied through regulatory law to enhance and regulate that communication. This course is conducted as a seminar, with an open discussion of legal precedent and the influence of policy on internet and digital communications. This course covers the First Amendment as it applies in a digital era as well as regulatory topics like net neutrality, broadband access, privacy, and copyright.

JOUR 5601W. History of Journalism. (WI; 3 cr.; Student Option; Every Spring) What is (real/fake) news? Who’s a journalist? What is journalism? How did we get to where we are today regarding journalism both as a profession and as an essential tool of democracy? Learn the fundamental chronology of the development of journalism in the United States from the Revolution to today, and then delve into the big quandaries: How free has journalism been? What have been its professional standards? How has journalism affected a diverse audience? What are the challenges of international journalism? And how have new communication technologies interacted with journalism?

JOUR 5606W. Literary Aspects of Journalism. (WI; 3 cr.; Student Option; Every Spring) Journalism isn’t fiction. Yet the relationship between what is true and what is artfully constructed toward a “larger truth” -- beyond the facts -- has a complex and intriguing history. This writing-intensive course explores that relationship through close readings of some the best writers of long-form nonfiction, starting with the birth of the novel from journalistic roots in the 18th century and ending with postmodern forms that challenge the notion of what we can ever know. Discover the literary devices used by Stephen Crane’s reported street scenes or Nellie Bly’s first-hand investigations into conditions for the mentally ill in the 19th century, and, later, Truman Capote’s nonfiction novel about a Kansas farm family’s murder. Readings include works by pivotal 20th-century writers such as John Hersey, Joseph Mitchell, Lillian Ross, Michael Herr, Norman Mailer, Gay Talese, Joan Didion, Tom Wolfe, and Hunter S. Thompson, and will trace how their pioneering methods influenced contemporary journalism as well as the documentary films of Errol Morris and contemporary nonfiction writers expanding into new forms.

JOUR 5725. Management of Media Organizations. (3 cr.; Student Option; Every Fall) Introduction to concepts/principles of media management. Strategic planning, leadership, organizational strategies, ethical/legal issues. Working in teams. Balance sheets, income statements. Motivating/promoting people.

JOUR 5777. Contemporary Problems in Freedom of Speech and Press. (3 cr.; A-F only; Every Fall) Most of us use devices like Smartphones, GPS, streaming services, or hands-free speakers like Amazon’s Echo that connect to online voice services like Alexa without thinking about them very much. But, what kind of information are they collecting? Are merchants allowed to gather your shopping history and use it to send you targeted advertising, or to sell it to other companies for profit? Should other people be able to post your personal information or photos online without your consent? Can the government read your text messages, track your online browsing, or intercept your text messages? This course considers how growing concerns about privacy and national security affect the First Amendment and the rights of journalists to gather and report the news. We will read significant court decisions and take a look at current statutory and regulatory initiatives both in the United States and abroad. You can expect lively debates and discussion, and the opportunity to explore a privacy or national security issue in depth in a substantial research paper.

JOUR 5993. Directed Study. (1-3 cr. [max 6 cr.]; A-F or Audit; Every Fall, Spring & Summer) Directed study/projects. Prereq [Jour major or jour minor or approved IDIM major or ICP major or BSS major], GPA of at least 3.00, college consent, dept consent, instr consent.

JOUR 8001. Studies and Theories of Mass Communication. (3 cr.; A-F or Audit; Every Fall) Introduction to key concepts, theories, methods in study of mass communication from social sciences perspective. Survey of research literature using individualistic/structural approaches.

JOUR 8002. Studies in Mass Communication II. (3 cr.; A-F or Audit; Every Spring) Literature on history of the field, cultural and humanistic approaches to its study, and legal and ethical issues. prereq: 8001

JOUR 8003. Digital Media Issues and Theories. (3 cr.; A-F or Audit; Periodic Fall & Spring) Nonprofessional skills course. Prepares entering graduate students to work in changing media environment. Political, social, economic, legal, ethical, technological implications nationally/globally. Produce scholarly research about changing media. prereq: Journalism grad student

JOUR 8009. Pro-seminar in Mass Communication. (1 cr.; S-N only; Every Fall) Introduction/socialization to scholarly discipline of mass communication, mass communication pedagogy, pathways to successful career. Develop action plan for completing graduate school starters career in academy or relevant communication industries. prereq: Grad students enrolled in Mass Communication MA or PhD program

JOUR 8191. Health Journalism: Introduction to Health and Medical Journalism. (3 cr.; A-F or Audit; Every Fall) Best practices in health/medical reporting in different formats/media. Story ideas that challenge conventional wisdom about health care. Elements of health beat. Narrative/ investigative styles of journalism. Students do semester-long project. prereq: Enrolled in MA in health journalism or instr consent

JOUR 8192. Advanced Health Journalism: Computer-Assisted Reporting on Health. (3 cr.; A-F or Audit; Every Spring) How to use data/databases to tell health news stories or help with health campaigns. Databases, how to access them. How to mine data for effective communication to consumer audience. prereq: Enrolled in MA in health journalism or instr consent

JOUR 8193. Health Communication Capstone. (3 cr.; A-F or Audit; Every Spring) Focus on different aspects of a health issue, audience, context, and message mix that is central to the Health Communication M.A. program. Develop a final project focusing on a health communication topic of interest. Projects would be a publishable article, research paper, multimedia production, or any other format relevant for the chosen topic. Project is accompanied by a reflection paper.

JOUR 8194. Health Communication Practicum. (3 cr.; A-F only; Every Summer) Field-based practicum for students enrolled in the Health Communication M.A. program. Work with a local non-profit or for-profit organization in the health care domain. Participatory observation study: work with organization staff on a strategic communication project and use experiences to analyze how message, audience, and context design processes take place in professional health communication settings.

JOUR 8200. Strategic Communication Research Methods. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Concepts, analytical techniques, and methods to analyze audiences, target markets, and social trends affecting communication strategy...
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
setting, priming, and framing, networked communications, micro-targeting, and mobile technology.

JOUR 8671. Seminar: Communication Ethics—Public/Civic Journalism. (3 cr.; A-F or Audit; Periodic Fall & Spring) Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.

JOUR 8672. Seminar: Media Management. (3 cr.; A-F or Audit; Periodic Fall & Spring) Management issues in media organizations. Relation to dynamics of organization structure, employees, markets, economics/finances. preq: 5725 recommended

JOUR 8675. Seminar: Issues in Information Access and Communication. (3 cr.; A-F or Audit; Periodic Fall) Societal, industry, technological, and policy aspects/developments that affect information access, particularly through mass media. preq: Grad students enrolled in Mass Communication MA or PhD program or instr consent

JOUR 8676. Seminar: Constitutional Law—Theories of Freedom of Expression. (3 cr.; A-F or Audit; Every Spring) Problems of constitutional/tort law affecting the press. Underlying theories. preq: 8777 or instr consent or law student

JOUR 8679. Seminar: Research Methods in Media Ethics and Law. (3 cr.; A-F or Audit; Periodic Fall & Spring) Research at intersection of first amendment and media ethics.

JOUR 8681. Seminar: International Media Perspectives. (3 cr.; A-F or Audit; Periodic Fall & Spring) Main problems/currents. Concepts, research, policy relevant to global development. Issues of freedom/constraint, media technology, role of journalism in world affairs.

JOUR 8720. Seminar: Mass Media and Health. (3 cr.; A-F only; Periodic Fall & Spring) Theories, methods, research that characterize field of health communication. Mass media influence on health, including use of mass media to promote health behaviors. Theoretical frameworks that inform health communication scholarship, as well as methodological approaches to studying health communication issues. preq: Grad students enrolled in Mass Communication MA or PhD program or instr consent

JOUR 8721. Seminar: Communication Agencies as Social Institutions. (3 cr.; A-F or Audit; Every Fall & Spring) Influence/effects of mass communication, internal dynamics of media organizations, criticism/modes of reform. Theoretical frameworks for analysis.

JOUR 8777. Thesis Credits: Master's. (3-18 cr.; no grade associated) Thesis work. Topics specified in Class Schedule. preq: Grad student or MEd student

KIN 5001. Foundations of Human Factors/Ergonomics. (3 cr.; A-F or Audit; Every Fall) Variability in human performance as influenced by interaction with designs of machines and tools, computers and software, complex technological systems, jobs and working conditions, organizations, and sociotechnical institutions. Emphasizes conceptual, empirical, practical aspects of human factors/ergonomic science.

KIN 5104. Physical Activities for Persons with Disabilities. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Different approaches to providing physical education service and related movement interventions for persons with disabilities. Topics: movement behavior foundations, movement skill progressions, unique considerations for specific impairments, and sport for persons with disabilities

KIN 5111. Sports Facilities. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use. preq: Kin or Rec grad student or MEd student

KIN 5115. Event Management in Sport. (3 cr.; A-F or Audit; Every Spring & Summer) Techniques/principles of planning, funding, and managing sport events. Collegiate championships, non-profit events, benefits, professional events. preq: Grad student, instr consent

KIN 5122. Applied Exercise Physiology. (3 cr.; A-F or Audit; Periodic Fall) Mechanisms of cardiorespiratory and muscular responses to exercise; application of exercise physiology to assessment of work capacity, athletic conditioning, and requirements of human powered vehicles; low to moderate exercise as an intervention in lowering risk for common health problems. preq: 4385 or equiv or instr consent

KIN 5123. Motivational Interventions in Physical Activity. (3 cr.; A-F only; Every Fall & Spring) Psychological principles related to physical activity (PA). Delivery of motivational interventions for physical activity. Motivational PA interventions. Two papers, oral presentation, two exams. preq: 3126W or grad student

KIN 5125. Advances in Physical Activity and Health. (3 cr.; A-F only; Periodic Spring) This course exposes students with accurate and up-to-date information regarding physical activity as it relates to health in the United States. It is intended to enhance students' ability to identify important issues pertinent to physical activity and health, as well as develop and maintain a physically active lifestyle. Credits will not be given if taken as KIN 5720 with the same title.

KIN 5126. Social Psychology of Sport & Physical Activity. (3 cr.; A-F only; Every Fall & Spring) Theory/research on social influences, individual differences, motivational processes. How sport/physical activity contribute to psycho-social development. Social psychological factors influencing physical activity beliefs/behaviors. preq: 3126W or equiv or grad student or instr consent

KIN 5136. Psychology of Coaching. (3 cr.; Student Option; Every Fall, Spring & Summer) Psychological dimensions of coaching across age levels, including coaching philosophy, leadership, communication skills, motivation, and mental skills training for performance enhancement.

KIN 5141. Nutrition and Exercise for Health Promotion and Disease Prevention. (3 cr.; A-F only; Every Fall) Requirements/physiologic roles of nutrients/physical activity in promotion of health. Assessment of energy requirements. RDAs, food composition/safety, weight management. Prevention of chronic diseases. Coronary heart disease. preq: FSN 1112 or equiv
KIN 5142. Applied Nutrition for Sport Performance and Optimal Health. (3 cr.; A-F only; Every Spring)
This course is designed for students interested in nutrition as it relates to health, exercise and athletic training. Evidenced based information is used to apply current nutrition concepts to improve health, physical and athletic performance. Case studies as well as personal data are employed throughout course to support concepts of lecture.

KIN 5152. Curriculum Development in Physical Education. (2 cr.; A-F or Audit; Every Spring)
Trends, issues, and challenges in early childhood/K-12 physical education. Potential effect on curriculum. prereq: initial licensure/MEd phys ed student

KIN 5181. Understanding Kinesiology Research. (3 cr.; A-F only; Every Fall)
Prepares students to critically analyze research specific to kinesiology. prereq: Intro statistics recommended

KIN 5196. Practicum: Developmental/Adapted Physical Education. (1-4 cr.; S-N only; Every Fall & Spring)
Observation of, participation in physical education instruction for students with disabilities. Current issues in developmental/adapted physical education. Exchange of ideas/problems. prereq: [5103 or 5104], instr consent

KIN 5201. Health Education Foundations. (3 cr.; A-F only; Every Summer)

KIN 5202. Current Issues in Health. (2 cr.; A-F only; Every Summer)
Critical thinking for health issues in research/media. Issues specific to conflict, stress, public policy, and communication. Projects, debates.

KIN 5203. Health Media, Consumerism, and Communication. (2 cr.; A-F only; Every Spring)
Effects of media, consumerism, technology, and health related issues. Students form/defend opinions on positive/negative aspects of how health information is disseminated and how individual health decisions are made.

KIN 5204. Methods in Health Education. (3 cr.; A-F only; Every Fall)
Background knowledge/skills to deliver comprehensive health education program. Techniques, skills, and methods for teaching active learning projects. Lessons/units in health curriculum discussed/demonstrated. Focuses on grades 5-12. prereq: Health licensure student or instr consent

KIN 5205. Health Education Curriculum. (3 cr.; A-F only; Every Fall)
Curriculum development in health education. Trends in society. How they impact teaching of health curriculum. Culminates in written curriculum for grades 5-12. prereq: Health licensure student or instr consent

KIN 5235. Advanced Biomechanics II: Kinetics. (3 cr.; A-F or Audit; Spring Odd Year)
Kinetic aspects of human movement (single/multi-joint torques, simple inverted-pendulum models, mass-spring systems). Analysis of experimental data and of computer simulations. Lectures, seminars, lab. prereq: [3112 or equiv], PMed 5135, undergrad college physics, intro calculus

KIN 5237. Sport and Society. (3 cr.; A-F or Audit; Every Spring)
Sport, sporting processes, social influences, systems. Structures that have effected and exist within/among societies, nations, and cultures. Contemporary issues such as social differentiation, violence, and honesty. prereq: [3126W, grad student] or instr consent

KIN 5275. Youth Sport Science. (3 cr.; A-F only; Every Spring)
Cognitive, behavioral, and biological factors having important implications for competitive sport participants from early childhood through high school age. Emphasis on translating sport science research into practical implications for youth sport coaches, teachers, and administrators.

KIN 5285. Exercise for Healthy Aging & Disease Prevention and Management. (3 cr.; A-F only; Every Spring)
Exercise testing/prescription with modifications required because of special considerations associated with aging, gender differences, or presence of medical conditions. prereq: Physiology or biology undergrad

KIN 5421. Sport Finance. (3 cr.; A-F or Audit; Every Fall)
Introduction to financial analysis in sport. Cash flow statements, budgeting issues, traditional/innovative revenue producing strategies available to sport organizations. Discussion, practical analysis of current market. prereq: Grad student or instr consent

KIN 5435. Advanced Theory and Techniques of Exercise Science. (3 cr.; A-F only; Every Spring)
Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures. prereq: [3385, 4385, Kin major] or instr consent

KIN 5441. Applied Sport Science Research. (3 cr.; A-F only; Every Fall, Spring & Summer)
Introduction to varied contributions of sport sciences to athletic performance. Evaluation of historical research’s contributions toward modern day research questions.

KIN 5461. Issues in the Sport Industry. (3 cr.; A-F only; Every Fall)
Critical analysis of management issues within sport industry. Strategic management, corporate social responsibility, human resource management/diversity, governance, sport globalization, sport development. prereq: postbac or grad student or instr consent

KIN 5485. Advanced Electrocardiogram Interpretation. (3 cr.; A-F only; Every Fall)
Placement and interpretation. Clinical exercise testing hands-on experience in electrocardiogram for resting and exercise testing situations. prereq: [3385, 4385] or instr consent

KIN 5505. Human-Centered Design - Principles and Applications. (3 cr.; A-F only; Every Fall)
Application of design to meet human needs. Design of fabricated products, tools/machines, software/hardware interfaces, art/culture, living environments, and complex sociotechnical systems.

KIN 5511. Sport and Gender. (3 cr.; A-F only; Every Fall)
Critically examines women’s involvement in/contributions to sport, physical activity, and leisure.

KIN 5585. Pediatric Physiology and Health: Concepts and Applications. (3 cr.; A-F only; Every Summer)
Current understanding of pediatric medicine and exercise physiology. Use of physical activity and weight management in the treatment of various diseases (i.e. obesity) that affect children and adolescents. prereq: 3385 or 4385

KIN 5501. Sport Management Ethics and Policy. (3 cr.; A-F or Audit; Every Spring)
How to critically analyze ethical concepts that underpin or inform sport policies and evaluate sport policies from a normative point of view. Selected sport policy issues are used to illustrate relevance of ethical considerations in policy development and to explore the ethical implications of sport policy. prereq: MEd or grad student or instr consent

KIN 5631. Programming and Promotion in Sport. (3 cr.; A-F or Audit; Every Fall & Spring)
Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing. Discussion, practical application. prereq: Kin or Rec grad student or instr consent

KIN 5641. Scientific Theory and Application of Training and Conditioning in Sport. (3 cr.; A-F only; Every Spring & Summer)
Current scientific literature on physiological adaptation through training/conditioning for sport. Applying methods in research journals to improve physiological adaptation through training/conditioning with sport specificity. prereq: 4385 or SPST 3641 or SPST 4641 or exercise physiology course or instr consent

KIN 5643. Applied Motion Capture and Movement Analysis Technology. (3 cr.; A-F only; Every Fall)
Course provides students with the knowledge and tools to effectively analyze human movement patterns in a wide variety of field-based settings, such as assessing sport skill performance or measuring movement deficits after injury. Students will comprehend the basic, underlying components of movement and movement deficits. It is strongly suggested students have taken Physics, Biomechanics, and Human Anatomy. Credit will not be
KIN 5981. Research Methodology in Kinesiology. (3 cr.; A-F only; Every Fall) Defines/reviews various types of research in exercise/sport science, and physical education. Qualitative research, field studies, and methods of introspection as alternative research strategies to traditional scientific paradigm.

KIN 5987. Professional Skills and Grant Writing for Health Sciences. (2 cr.; Student Option No Audit; Spring Odd Year) Introduction to structure/function of different organizations (e.g., NIH, AHA). Writing/reviewing grants/manuscripts. Preparing for a job in academia. prereq: Grad student

KIN 5992. Readings in Kinesiology. (1-9 cr.; A-F only; Every Fall, Spring & Summer) Independent study under tutorial guidance. prereq: [KIN upper div undergrad or MEd or grad student], instr consent

KIN 5995. Research Problems in Applied Kinesiology. (1-6 cr.; A-F only; Every Fall, Spring & Summer) Selected topics in physical activity and human performance. prereq: [KIN upper div undergrad or MEd or grad student], 15 cr of major coursework [including 4981 or 5981], instr consent

KIN 6151. Theoretical Foundations of Curriculum and Instruction in Physical Education. (2 cr.; A-F or Audit; Every Fall & Spring) Selection of effective instructional strategies/assessment. Design, progression, and presentation of tasks in physical education curriculum. prereq: initial licensure/MEd phys ed student

KIN 6201. Clinical Experience I: Health Education. (1-4 cr.; A-F only; Every Spring) Half-day supervised teaching in urban or suburban middle or high school health education setting.

KIN 6202. Clinical Experience II: Health Education. (2-6 cr.; A-F only; Every Spring) Full-day supervised teaching in urban or suburban middle or high school health education setting. prereq: Health licensure student or instr consent

KIN 6251. Pedagogy I: Elementary Physical Education. (4 cr.; A-F or Audit; Every Summer) Instructional components/knowledge structures for teaching/learning process of K-6 physical educator in diverse settings. prereq: initial licensure/MEd phys ed student

KIN 6252. Pedagogy II: Secondary Physical Education. (4 cr.; A-F or Audit; Every Summer) Instructional components for teaching/learning process of grades 6-12 physical educator in diverse settings. prereq: initial licensure/MEd phys ed student

KIN 6596. Clinical Experience I: Physical Education. (4 cr.; S-N or Audit; Every Fall) Half-day supervised teaching in an urban elementary school physical education setting. prereq: 6151, 6521, 6522, initial licensure/MEd phys ed student or instr consent

KIN 6597. Clinical Experience II: Physical Education. (1-4 cr.; A-F only; Every Spring) Half-day supervised teaching in urban or suburban elementary, middle, or high school physical education setting. prereq: 6596, initial licensure/MEd phys ed student or instr consent

KIN 6598. Clinical Experience III: Physical Education. (2-6 cr.; A-F only; Every Spring) Supervised teaching in urban or suburban elementary, middle, or high school physical education setting. prereq: 6597, initial licensure/MEd phys ed student or instr consent


KIN 8002. Proseminar in Human Factors/Ergonomics. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring) Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interaction of performance/behavior with design factors in performance environment. prereq: Enrollment in good standing, grad HumF minor

KIN 8121. Seminar: Exercise Physiology. (2 cr. [max 8 cr.]; A-F only; Every Fall & Spring) Classic/contemporary literature in exercise physiology/allied disciplines. Contributions of major leaders in field. Opportunities for interdisciplinary research. Spring semester students/faculty in exercise science present original research. prereq: 5122 or equiv or instr consent

KIN 8126. Sports Medicine Psychology. (3 cr.; A-F only; Periodic Fall) Advanced seminar course. Multidisciplinary contributors to sports medicine psychology. Theory, research, and practice in the behavioral/social aspects of injury prevention/experiences among physically active populations across the life span. prereq: Grad student or instr consent

KIN 8128. Doctoral Sport Management Seminar. (3 cr.; A-F only; Periodic Fall & Spring) Analysis of current literature, theoretical constructs, research methodology and design relative to sport management. Focuses on student-selected topics, research problems. prereq: PhD student, instr consent

KIN 8132. Seminar: Motor Development. (3 cr.; A-F or Audit; Periodic Spring) Contemporary research literature on motor skill development from birth to senescence. Emphasizes interaction between physical/environmental/performer constraints. Coordination/control of movement. prereq: grad student or instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
KIN 8135. Seminar: Motor Control and Learning. (3 cr.; A-F or Audit; Periodic Spring)
Advanced reading/discussion of research on motor control, motor learning, human performance. prereq: grad student or instr consent

KIN 8136. Developmental Sport and Exercise Psychology. (3 cr.; A-F only; Every Fall & Spring)
Sport and exercise psychology from a life span developmental perspective. Theoretical perspectives, self-perceptions, social influences, emotional development, motivational processes, self-regulation, development of expertise, moral development, sport injury, and gender and cultural diversity. prereq: Grad student or instr consent

KIN 8211. Seminar: Perception and Action. (3 cr.; A-F or Audit; Periodic Spring)
Survey of theory/research on use of perceptual information for control of action. Behavioral research on perceptual guidance of daily activities (e.g., standing, walking, driving). Perceptual control in context of expertise (e.g., sports). Perceptual-motor development. prereq: grad student or instr consent

KIN 8285. Cellular and Molecular Exercise Physiology. (3 cr.; A-F only; Periodic Fall & Spring)
This course emphasizes the cellular and molecular mechanisms in response to acute and chronic physical exercise. Biochemical pathways of regulating energy metabolism during exercise, change of gene expression as adaptation to altered diet, environmental factors and aging, and cellular oxidative-antioxidant homeostasis will be the main foci. The course will expose graduate students and advanced undergraduate students to current topics of biomedical issues affecting human health and wellbeing, modern techniques of exercise science research, and important research articles in literature. prereq: KIN 3385: Human Physiology and KIN 4385: Exercise Physiology; KIN 5122: Applied Exercise Physiology; college level chemistry. Suggested: organic chemistry, or instr consent Credits will not be given if taken as KIN 5720 with the same title.

KIN 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

KIN 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

KIN 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 24 cr.]; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; Dept consent required; No grade associated; 4 completions allowed; up to 24 combined cr.

KIN 8696. Internship: Applied Sport Psychology. (3-6 cr.; S-N or Audit; Periodic Fall & Spring)
Supervised internship; emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury. prereq: 5126, 8126, Kin PhD student, instr consent

KIN 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only)

KIN 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

KIN 8980. Graduate Research Seminar in Kinesiology. (1 cr. [max 9 cr.]; S-N only; Every Fall & Spring) Reporting/discussion of student/faculty research activity. prereq: KIN M.S. or Ph.D. or SMGT M.A. or instr consent

KIN 8995. Research Problems in Kinesiology. (1-12 cr.; S-N only; Every Fall, Spring & Summer) Individual scholarly research. prereq: Kin Ph.D. student or SMGT grad student or instr consent

Korean (KOR)

KOR 5040. Readings in Korean Texts: North Korean Dialect. (3 cr.; [max 9 cr.]; Student Option No Audit; Periodic Fall) Expose advanced students of Korean to various North Korean contexts. Improve ability to understand North Korean literary work. Various authentic texts from North Korea. Mostly taught in Korean. prereq: 3022 or intermediate level of Korean proficiency

KOR 5410. Readings in Sino-Korean Texts. (3 cr.; [max 9 cr.]; Student Option; Periodic Fall & Spring) Sino-Korean vocabulary/characters necessary for advanced and superior level of knowledge in Korean. Students conduct research projects based on specialized readings in their own fields of study. prereq: 3032 or equiv or instr consent

KOR 5211. Introductory Classical Chinese I. (3 cr.; Student Option; Periodic Fall) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or instr consent

KOR 5212. Introductory Classical Chinese II. (3 cr.; Student Option; Periodic Spring) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English. prereq: 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or instr consent

KOR 5993. Directed Studies. (1-5 cr. [max 15 cr.]; Student Option No Audit; Every Fall & Spring) Guided individual study of Korean language or linguistics. prereq: instr consent, dept consent, college consent

Laboratory Medicine and Path (LAMP)

LAMP 7114. Surgical Pathology. (4 cr.; H-N only; Every Fall, Spring & Summer) The student participates in all areas of surgical pathology activities.

LAMP 7119. Forensic Pathology. (4 cr.; H-N only; Every Fall, Spring & Summer) This course acquaints students with the field of forensic medicine. The student will become familiar with the function of a medical examiner's office in determining the various causes and manners of death that fall under the jurisdiction of such a public official.

LAMP 7120. Perinatal/Pediatric Pathology. (4 cr.; P-N only; Every Fall, Spring & Summer) This elective will expose medical students to pediatric pathology, a diagnostic subspecialty that ranges broadly across anatomic and clinical pathology as these relate to children and adolescents, fetuses and infants, and pregnant women. It should prove useful to medical students interested in pediatric medicine, pediatric surgery, obstetrics and gynecology, or pathology.

LAMP 7145. Neuropathology. (4 cr.; H-N only; Every Fall, Spring & Summer) The course is a practical introduction to neuropathology. The students will work with the attending neuropathologist and residents (from LMP, Neurology and/or Neurosurgery) performing diagnostic services in neuropathology.

LAMP 7150. Anatomic Pathology. (4 cr.; H-N only; Every Fall, Spring & Summer) The student will become acquainted with current basic concepts of anatomic pathology, especially in relation to morphological interpretation.

LAMP 7152. Anatomic Pathology-VA. (4 cr.; H-N only; Every Fall, Spring & Summer) The goal of this rotation is to familiarize the medical student with the role of pathology in the diagnosis, prognosis and treatment of patients through the activities of pathologist as members of the clinical team.

LAMP 7158. Cardiac Pathology. (2 cr.; H-N only; Every Fall, Spring & Summer) Students will observe examinations of existing and newly acquired cardiovascular specimens to identify variations of specific congenital and acquired disease entities and their functional significance.

LAMP 7181. Hematopathology. (4 cr.; H-N only; Every Fall, Spring & Summer) Over the course of the rotation, students will be fully integrated into the blood and bone marrow biopsy service, with ?ownship? of their cases and graduated responsibility for
LAMP 7184. Introduction to Transfusion Therapy. (3 cr.; H-N only; Every Fall, Spring & Summer) The student will address transfusion problems in patients with red cell, white cell, and platelet antibodies and coagulopathy.

LAMP 7186. Laboratory Medicine in a Community Hospital. (4 cr.; H-N only; Every Fall, Spring & Summer) The student will specialize in one or two areas of the clinical lab but will participate in all its general teaching activities. SPECIAL INSTRUCTIONS: Students must contact Dr. Apple at least one month prior to beginning elective.

LAMP 7187. Interpretation of Lab Data. (4 cr.; P-N only; Every Fall) This course is designed for 3rd and 4th year medical students who are faced with the challenge of bringing the extensive diagnostic capabilities of the clinical laboratory to bear on specific clinical problems. prereq: Med Student Yr 3 or 4/one previous rotation

LAMP 7195. Medical Informatics. (4 cr.; H-N only; Every Fall, Spring & Summer) Medical informatics uses computer and information science to solve problems in medicine, health care delivery, and medical research. The student works on a project under the supervision of faculty and/or fellows in medical informatics. The specific project depends on faculty availability and the student's background, interests, and experience. Projects have included computer assisted instruction for medical students or patients, computer-based medical decision support systems, creation of clinical database management systems, and statistical analysis of data from clinical research. As schedule permits, the student is expected to attend health informatics courses and seminars.

LAMP 7210. Surgical Pathology for Post-M.D.s. (1-10 cr.; H-N or Audit; Every Fall & Summer) Surgical Pathology for post MD's. prereq: Regis med fellow special

LAMP 7400. Pathology-Duluth. (2 cr. [max 6 cr.]; P-N only; Every Fall, Spring & Summer) Students experience practice of pathology in a tertiary care regional medical center. Clinical pathology disciplines of transfusion medicine, microbiology, chemistry, and hematology. Students spend time with medical directors and supervisors of each section. Directed self-study, case-based, didactic, and hands-on instruction. Laboratory medicine's role in ongoing patient care.

LAMP 7910. Laboratory Medicine and Pathology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Laboratory medicine and pathology medical residency.

LAMP 7930. Laboratory Medicine and Pathology Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Laboratory medicine and pathology medical fellowship.

Land and Atmospheric Science (LAAS)

LAAS 5050. Integrated Topics in Land & Atmospheric Science. (5 cr.; A-F or Audit; Every Fall) Earth system science. Interactions between the land and atmosphere. Biogeochmistry, human-environment interactions, environmental biophysics, and global environmental change.

LAAS 5051. Thesis Proposal Writing for Land & Atmospheric Science. (2 cr.; A-F or Audit; Every Spring) Grant proposals, including proposal formats of various funding sources, how to develop a significant statement, hypotheses and objectives, background, methods, project summary, time line, and budget. Critique proposal samples/discuss other aspects of seeking funding for research. Discuss LAAS graduate program prelim exam process.

LAAS 5311. Soil Chemistry and Mineralogy. (3 cr.; Student Option; Every Fall & Spring) Structural chemistry, origin/identification of crystalline soil clay minerals. Structure of soil organic matter. Chemical processes in soil: solubility, adsorption/desorption, ion exchange, oxidation/reduction, acidity, alkalinity. Solution of problems related to environmental degradation, plant nutrition, and soil genesis. prereq: [Chem 1022 or equiv], Phys 1102, grad) or instr consent

LAAS 5425. Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere. (3 cr.; A-F or Audit; Fall Odd Year) Basic laws governing atmospheric motion through analysis of atmospheric dynamics and thermodynamics at the micro, synoptic, and global scales. Fundamental thermodynamic and dynamical processes/equations governing the behavior of the atmosphere/apply to large-scale geophysical situations. prereq: One yr college-level [calculus, physics]

LAAS 5426. Atmospheric Processes II: Radiation, Composition, and Climate. (3 cr.; A-F or Audit; Spring Odd Year) Atmospheric radiation, composition/chemistry, climate change. Radiative transfer in Earth's atmosphere. Changing chemical makeup of troposphere/stratosphere. Interplay between natural processes and human activities in air pollution, stratospheric ozone depletion, and chemical forcing of climate. Anthropogenic contribution to climate change/role of land-atmosphere feedbacks affecting atmosphere's energy budget and cycling of greenhouse gases. Application to numerical modeling. prereq: [one yr college-level [calculus, physics, chemistry]]; LAAS 5425 recommended

LAAS 5480. Special Topics in Land and Atmospheric Science. (1-4 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule. prereq: grad student or instr consent


LAAS 5621. Soil and Environmental Genomics. (3 cr.; Student Option; Every Fall) Molecular and genomic approaches to answer ecological questions related to soil and environmental sciences. Genomics/ transcriptomics/proteomics. Metagenomics and single cell genomics. Includes computer exercise to learn basic bioinformatics. No prior programming skills are required, prereq: basic microbiology courses (e.g., MicB 3301) recommended.

LAAS 8005. Supervised Classroom or Extension Teaching Experience. (2 cr.; S-N or Audit; Every Fall & Spring) Teaching experience in biosystems and agricultural engineering or agronomy and plant genetics or horticultural science or soil, water, and climate or plant pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy. prereq: instr consent

LAAS 8128. Land and Atmospheric Science Seminar. (1.5 cr.; max 3 cr.; S-N or Audit; Every Fall & Spring) Students present an open seminar on an advanced topic and attend seminars presented by other graduate students.

LAAS 8195. Research Problems in Soils. (1-5 cr.; max 10 cr.; Student Option; Every Fall, Spring & Summer) Directed research on special topics of interest in soil science or climatology supervised by individual or small groups of faculty. prereq: [Grad major in soil sci or related field]; instr consent

LAAS 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

LAAS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

LAAS 8550. Teaching Experience. (1 cr.; max 6 cr.; S-N or Audit; Every Fall & Spring) Provides students with practical experiences in instructional techniques in a university setting. prereq: Grad major in soil sci or related field; instr consent

LAAS 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no
required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

LAAS 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

LAAS 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Landscape Architecture (LA)

LA 5001. Sustainable Landscape Design and Planning Practices. (; 3 cr.; Student Option; Every Fall) Systemic, formal and spatial relationships. Quantitative and qualitative changes in global biodiversity, quality of the earth’s air, soil, and water resources, development and consumption of energy resources and climate change. Development of design processes for selection, deployment, and management of sustainable practices. prereq: 5201, 5203

LA 5002. Implementation of Sustainable Landscape Design and Planning Practices. (; 3 cr.; Student Option; Every Spring) Design exploration of a complex urban site. Habitation patterns and sociocultural systems that slow and reverse environmental degradation and climate change. Researching/creating landscape patterns that address multi-scalar sustainability. prereq: 5201, 5203

LA 5003. Climate Change Adaptation. (; 3 cr.; Student Option; Every Fall) This course will study nations, regions, cities, and communities that have adapted or are undergoing adaptation to climate change. The course will examine different approaches in planning, policy, economics, infrastructure, and building design that increase the adaptive capacity of human settlements. These approaches will vary in scale from the construction of new neighborhoods to the implementation of storm water gardens. The course will emphasize multi-functional strategies which couple climate change adaptation with other urban improvements. Learning Objectives: To understand role of climate adaptation in the reconfiguration of human settlements. To apply design thinking to the issue of climate adaptation in the context of an urban society. To apply knowledge to challenge-based coursework on managing climate risk, decreasing climate vulnerability, and building resilience to climate change.

LA 5004. Regional Environmental Landscape Planning. (4 cr.; Student Option; Every Spring) An exploration of critical regional landscape parameters affecting the growth and development of metropolitan areas. Students assess these parameters and prepare a multifunctional land use plan for a defined locale. prereq: PA 5271 or LA 5131 or FR 3131 or GEOG 3561 or GEOG 5561 or equivalent

LA 5096. Internship for Master of Landscape Architecture Students. (1-3 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Students will receive supervised professional experience in a landscape architectural design firm in order to gain employment experience related to the field as well as receiving graduate credit. As a requirement of the course, students will submit a reflection paper relating the professional experiences to their education. Must have director of graduate studies (DGS) approval of the internship to register.

LA 5131. Geospatial Data Analysis and Design. (3 cr.; A-F only; Every Fall) Introduction to geospatial data analysis/application in landscape architectural, environmental design research/practice. prereq: Master of Landscape Architecture Student or instr consent

LA 5201. Making Landscape Spaces and Types. (6 cr.; A-F or Audit; Every Fall) Design exploration using 3-D models and historical precedent studies to create outdoor spaces for human habitation and use. Application of the basic landscape palette of landform, plants, and structures to give physical, emotional, cognitive, and social definition to created places. prereq: B.E.D accelerated status or LA grad or instr consent

LA 5202. Landscape Analysis Workshop. (; 1 cr.; S-N only; Every Fall) Introduction to field techniques for site analysis, including vegetation, soil, and landform description. One-week session, before fall term, at lake Itasca Forestry and Biological Station.

LA 5203. Ecological Dimensions of Space Making. (; 6 cr.; A-F or Audit; Every Spring) Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas responsive to ecological issues and human experience. prereq: LA major or instr consent; recommended for both BED and Grad students

LA 5204. Metropolitan Landscape Ecology. (; 3 cr.; A-F only; Every Fall & Spring) Theories/principles of holistic landscape ecology. People, nature, and environmental stewardship in metropolitan landscapes. Urban areas, rural areas that provide food, water, energy, and recreation. prereq: B.E.D accelerated status or LA grad student or instr consent

LA 5376. Representation I. (4 cr. [max 8 cr.]; A-F only; Every Fall) Strengthen freehand sketching ability. Develop observation skills. Develop ability to communicate ideas clearly through visual expression. Learn/explore conventions of landscape architectural drawing. Basic tools/techniques associated with Adobe Photoshop CS6. Promote fluidity between analog/digital media. Create drawing personality/graphic style. prereq: Master of Landscape Architecture (MLA) or Accelerated Bachelor of Environmental Design.

LA 5377. Representation II. (4 cr. [max 8 cr.]; A-F only; Every Spring) Explore multi-media rendering techniques. Increase knowledge of art materials/graphic programs. Increase hand-drawing ability. Color theory, contemporary graphic styles. Layout, grid systems/type. Increase speed of drawing/producing renderings. Create or strengthen graphic style. prereq: Master of Landscape Architecture (MLA) or Accelerated Bachelor of Environmental Design

LA 5378. Representation III. (3 cr.; A-F or Audit; Every Spring) Increase skills learned in Representation I and Representation II and develop 3-D modeling skills, distill complex information to visually explain a design concept while gaining skills that are valuable in the workplace and create portfolio quality work.

LA 5381. The City in Visual Culture. (3 cr.; A-F only; Every Spring) Visual culture is not just that we see the way we do because we are social animals, but also that our social arrangements take the forms they do because we are seeing animals. The social arrangements of the city, the buildings and public spaces, are concretized expressions of power and culture. The course will, through multiple drawings, attempt to critically examine these social arrangements as they have evolved over time (history) by re-presenting the city (as human experience and aesthetic form). The course will be structured around on-site work sessions, critical readings, on- and off-site lectures, and weekly drawing assignments.

LA 5400. Topics in Landscape Architecture. (; 1-3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Current topics in landscape architecture. Taught by regular or visiting faculty in their areas of specialization. prereq: B.E.D., accelerated status or LA grad or instr consent

LA 5401. Directed Studies in Emerging Areas of Landscape Architecture. (; 1-3 cr. [max 12 cr.]; Student Option; Every Fall & Spring) tbd prereq: instr consent

LA 5402. Directed Studies in Landscape Architecture History and Theory. (; 1-6 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Independent studies under the direction of landscape architecture faculty. prereq: instr consent

LA 5403. Directed Studies in Landscape Architecture Technology. (; 1-6 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Independent studies under the direction of landscape architecture faculty. prereq: instr consent

LA 5404. Directed Studies in Landscape Architecture Design. (; 1-6 cr. [max 12 cr.]; Student Option; Every Fall & Spring) Independent studies under the direction of landscape architecture faculty. prereq: instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
LA 5405. Interdisciplinary Studies in Landscape Architecture. (3-6 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring) Research, planning, or design projects. Topics vary. prereq: instr consent

LA 5408. Landscape Architecture, Architecture, and Planning. (3-4 cr.; A-F or Audit; Every Fall & Spring) Methods and theories in urban design and human behavior. Students develop urban design journal as tool for experiencing, analyzing, and recording the urban landscape, its fabric, spatial elements, and individual components, and for analyzing design solutions. prereq: Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark

LA 5413. Introduction to Landscape Architectural History. (3 cr.; A-F or Audit; Every Fall) Introductory course examines the multiple roots of landscape architecture by examining the making of types of landscapes over time. Emphasis on environmental issues, and issues related to political, economic, and social contexts of landscape architectural works. prereq: One course in history at 1xxx or higher

LA 5414. Study Abroad: History and Culture. (0-3 cr.; A-F only; Every Spring) This is a history course aimed at investigating the rich urban, landscape and architectural legacy of Spain, tracing the multiple histories of the Spain through the ceremonial and quotidian spaces of Madrid as it developed as the capital city of the Catholic monarchy and the monuments of Al-Andalus, the Islamic caliphate in Southern Spain. The course is structured so that each week there will be an in-class lecture and a walking tour of Madrid. There will also be several field trips to historic sites.

LA 5514. Making the Mississippi. (3 cr.; A-F or Audit; Every Spring) Critical environmental parameters affecting growth/development of metropolitan areas. Students assess these parameters and prepare a multi-functional land use plan for a defined locale.

LA 5576. Ecological Restoration Project Planning and Management. (3 cr.; A-F only; Every Fall) Applied practice of ecological restoration of landscapes. Grasslands, wetlands, forests, disturbed agricultural sites, former industrial parcels. Restoration management, skills needed to lead successful projects. prereq: [MLA student, senior B.E.D.] or senior or grad with one college course in ecology/one college course in plant science or botany or instr consent

LA 5705. Regreening Minds, Cities, and Regions. (3 cr.; A-F; Every Fall) Emerging types of green spaces. Urban agriculture, urban wetscapes, urban wilderness. Politics, policies, metrics, planning of alternative visions of urban nature/sustainability in American cities. Role of social networks in creating emerging types of green spaces. prereq: Landscape Architecture graduate student or instr consent

LA 5755. Infrastructure, Natural Systems and the Space of Inhabited Landscapes. (3 cr.; A-F or Audit; Every Fall) Cross-disciplinary exploration of urban infrastructural solutions to mitigate/reverse anthropogenic impacts on Earth. Design of sustainable urban infrastructure systems, policy options, available technologies, criteria, design methods. prereq: Grad student

LA 5761. Infrastructure + Culture. (3 cr.; A-F only; Every Spring) As attitudes about ecology and nature are shifting and as the threats from climate change are becoming more pronounced, new infrastructure works in the Netherlands are caught in a double bind of responding to ecological concerns and protection of the land. This course will explore both historic and modern water management infrastructures as cultural and engineering constructs through visual representation as a form of critique. The course will be structured around study trips, preparatory readings, on-site lectures, and will be supplemented by the participation of several guest speakers.

LA 5771. Landscape Infrastructure and Systems I. (3 cr. [max 6 cr.]; A-F only; Every Fall) Basic principles, techniques, skills of creating infrastructures of built landscapes. Basic concepts of simple plant taxonomy, plant community structure, earthwork, water management, landscape structures. Small site scale design development. prereq: Master of Landscape Architecture Student, [Accelerated Track B.E.D or instr consent]

LA 5772. Landscape Infrastructure Systems II. (3 cr. [max 6 cr.]; A-F only; Every Spring) Principles, techniques, skills of creating ecological infrastructures of built landscapes systems. Builds on basic concepts taught in LA 5771. Focuses on ecological connections among plants, landscape structure, earthwork techniques, water management, landscape structural systems. prereq: Master of Landscape Architecture Student, [Accelerated BED Student or instr consent]

LA 8201. Designing Landscapes for Dwelling and Settlement. (6 cr.; A-F or Audit; Every Fall) Professional design studio. Hypothetical projects include development of schematic master plans for site layout, grading, and planting. Design for residential, commercial, and civic uses with attention to zoning and other controls, environmental quality, human behavior, markets, project finance, and technics. Requires concurrent registration in LA 8202. prereq: 5203, 5571, grad LA major, concurrent registration is required (or allowed) in 8202 or instr consent

LA 8202. Design of Planned Developments. (2-3 cr.; Student Option; Every Fall & Spring) Issues related to planned community developments: historical precedents; design for residential, commercial, and civic uses; role of zoning and other controls; deed restrictions; preparation of design brief; environmental quality; human behavior; market; project finance; and techniques of site development. prereq: Grad LA major or instr consent

LA 8204. Regional Landscape Space. (3 cr.; A-F or Audit; Periodic Fall & Spring) Theoretical investigations and current advances in use of landscape ecology, landscape perception, regional economies, and public policy as informants of design decision making in regional landscapes at or exceeding township level. Geographic information systems as design tools. prereq: Grad LA major or instr consent

LA 8205. Urban Form Options: Landscape Architecture Studio. (6 cr.; max 8 cr.; Student Option; Every Fall & Spring) Urban landscape design issues, theories, and problems explored via formal/spatial inquiry in studio, reading, and the exposition of ideas in paired seminar. Urban systems, gathering spaces, ecology, infrastructure, recreation, and public space. prereq: 2 yrs of studio, grad LA major or instr consent

LA 8206. Making Urban Landscape Space. (6 cr.; A-F only; Every Fall) Studio course focusing on the restoration and reuse of urban brownfield (former industrial) sites. Biological and mechanical remediation processes and the development of hard and soft site infrastructures to deal with storm water, energy generation, and the handling of waste. Re-design sites in terms of new uses and economies, and to re-integrate sites into existing and future urban systems of transportation. prereq: MLA grad student

LA 8207. Cities on Water International Workshop. (6 cr.; max 16 cr.; A-F only; Every Spring) Intensive studio course on international applications of sustainable urban design. prereq: Grad LA or ARCH major or instr consent

LA 8301. Landscape Architecture: Research Issues and Methods. (3 cr.; A-F or Audit; Every Fall & Spring) Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics. prereq: 8201 or concurrent registration is required (or allowed) in 8201, grad LA major or instr consent

LA 8302. Professional Practice. (3 cr.; A-F or Audit; Every Spring) Office and project management case studies. Organizational behavior, marketing, sales, strategic planning, financial and cost accounting, insurance, legal issues and contracts. prereq: 8205, grad LA major or instr consent

LA 8333. FTE: Masters. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

LA 8400. Topics in Landscape Architecture. (1-8 cr.; max 96 cr.; Student Option; Every Fall, Spring & Summer)
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Guided individual reading or study. prereq: instr consent, dept consent

LAT 5994. Directed Research. (1-12 cr. ; Student Option; Every Fall & Spring)
Guided research on original topic chosen by student. prereq: Grad student or instr consent

LAT 5996. Directed Instruction. (1-12 cr. ; Student Option; Every Fall & Spring)
Supervised teaching internship. prereq: Grad student or instr consent

LAT 8100. Readings in Latin Prose. (3 cr. ; Student Option; Every Fall & Spring)
Reading/discussion of Latin prose texts.

LAT 8120. Latin Text Course. (3 cr. ; student or instr consent)
Students attend 3xxx Latin courses. Supplementary work at discretion of instructor. prereq: 3111 or dept consent; not for students in dept of Classical and Near Eastern Studies

LAT 8200. Readings in Latin Verse. (3 cr. ; Student Option; Every Fall & Spring)
Reading/discussion of Latin poetic texts. prereq: Advanced grad student

LAT 8262. Survey of Latin Literature I. (3 cr. ; Student Option; )
Extensive readings in variety of works from republican and early Augustan period.

LAT 8263. Survey of Latin Literature II. (3 cr. ; Student Option; )
Variety of works from Augustan and imperial periods.

LAT 8267. Graduate Survey of Latin Literature of Late Antiquity. (3 cr. ; Student Option; Periodic Spring)
Latin literature of 3rd to 6th centuries A.D., including Ammianus and Augustine. prereq: instr consent, dept consent

LAT 8300. Readings in Latin Texts. (3 cr. ; Student Option; Every Fall & Spring)
Reading/discussion of literary or documentary texts from Roman antiquity. Topics may include subjects that draw on various sources, genres, or methods. prereq: Advanced grad student

LAT 8910. Seminar. (3 cr. ; max 30 cr.) ; Student Option; Periodic Fall & Spring)
Topics in Latin literature examined in depth. Emphasizes current scholarship, original student research.

Law School (LAW)

LAW 5000. Introduction to American Law and Legal Reasoning. (3 cr. ; A-F only; Every Fall)
Law pervades all areas of modern life. Yet it remains mysterious to those without legal training. This course will equip you to better answer such questions by exploring the tools that lawyers use to interpret and apply the law. Students will learn to think like lawyers through a series of contemporary case studies that require reading, writing, thinking, and problem solving like a lawyer. Cases will be drawn from topics such as contracts, torts, civil procedure, property, business law, criminal law, sports law, privacy, and law and science.

LAW 5001. Introduction to the American Legal System. (2 cr. ; A-F only; Every Fall)
This is an introductory course in American law, providing an overview of a wide variety of constitutional, statutory, and common law legal issues. A primary focus will be on American constitutional law: legislative, judicial, and executive powers; the legal structure of checks and balances? among the three national governmental powers; the distribution of powers between the national government and state governments (federalism); and the constitutional rights of individuals (including rights of free speech, freedom of religion, due process, and equal protection). We will also examine the American system of litigation: the structure of the court system, the jurisdiction of federal (national) and state courts, and the litigation process. We will also address some common law substantive topics in American law including torts and contracts. Students will have the opportunity to learn how to read and interpret American legal materials, to do legal research within the legal system, and to write an analytical legal memorandum.

LAW 5002. MSPL Legal Research and Writing. (1 cr. ; S-N only; Every Fall)
This course covers the process of communicating about the law. Our goal is to teach students the building blocks of legal communication through multiple practice exercises so that students can repeat the process on their own after completion of the course. In the fall (one credit), we begin at orientation with a short exercise, then move on to email, letter, and office memorandum exercises written in an objective/predictive mode.

LAW 5025. Patent Law Proseminar. (1 cr. ; S-N only; Every Spring)
The field of patent law extends across the boundaries of business, technology, innovation, and law. In this course, students will be introduced to current topics and compelling issues in patent law presented by leading patent and intellectual property law professionals. Students will gain real-world insights from in-house and private practice attorneys and agents, with a focus on patent prosecution and patent litigation.

LAW 5026. Intellectual Property and Technology Proseminar. (1 cr. ; S-N only; Every Fall)
The field of intellectual property extends across the boundaries of business, technology, innovation, and law. In this course, students will be introduced to a broad range of IP related topics presented by leading practitioners working at the intersection of law and technology. Topics may include trade secrets, copyrights, trademarks, patents, IP transactions, IP litigation, emerging technologies, intellectual asset management, IP valuation and commercialization. Lecturers may include corporate general counsels, firm lawyers, transactional lawyers, litigators,
LAW 5050. Law of Business Organizations.  (3 cr.; A-F only; Every Spring)
This course surveys the leading forms of legal business association governing the formation of business entities, including the laws of agency, partnerships, limited liability companies, and corporations. Emphasis is put on the methods lawyers use to interpret statutes and cases.

LAW 5051. Business Associations/Corporations.  (4 cr.; Student Option; Every Fall & Spring)
The initial part of this course is an introduction to the general law of multi-person unincorporated business organizations, principally partnerships, limited partnerships, and limited liability companies. Matters covered include the procedures for forming such organizations and the rights and obligations of the participants as among themselves and with respect to third persons. The remaining class hours constitute the first portion of the basic Corporations course, and will cover such matters as corporate organization; the distribution of powers among the corporate board of directors, its officers and its stockholders; the proxy system; control devices in the close corporation; and the fiduciary duties of directors, officers and controlling shareholders. Matters dealing with corporate finance? (issuance of shares, payment of dividends, and corporate reorganizations) are covered in Advanced Corporate Law.

LAW 5061. Financial Regulation.  (3 cr.; Student Option; Periodic Fall & Spring)
This course will be a high-level overview of several different areas of financial regulation: banking regulation, insurance regulation, and elements of securities regulation (particularly broker-dealer and investment company regulation).

LAW 5062. Energy Law.  (3 cr.; Student Option; Periodic Fall & Spring)
This course provides an introduction to US energy law. The first portion of the course introduces the nation's primary sources of energy: coal, oil, biofuels, natural gas, hydropower, nuclear, wind, solar, and geothermal energy. In doing so, it explores the physical, market, and legal structures within which these energy sources are extracted, transported, and converted into energy. The second portion of the course turns to the two major sectors of our energy economy--electricity and transportation--and the full range of federal and state regulation of each sector. The third portion of the course explores case studies of hot topics in energy law and policy that highlight the complex transitions taking place in the energy system. These topics include electric grid modernization, electric vehicles, risks and benefits associated with hydraulic fracturing and deepwater drilling for oil and gas, and the continued role of nuclear energy. In addition to traditional textbook reading and class discussion, the course will include industry, government, and nonprofit guest speaker presentations. Grading will be based on a final exam given at the end of the semester as well as class discussion and weekly written postings on the TWEN site for the course.

LAW 5075. Ethics for Patent Agents.  (1 cr.; A-F only; Every Spring)
This course is designed to provide students with an introduction and understanding of the ethics and rules of professional responsibility and the unauthorized practice of law. Scope: This course covers ethics and professional responsibility for lawyers, ethics and professional responsibility for patent agents and patent attorney?s and the unauthorized practice of law. Goals: This course will provide students with the framework that will guide their actions and conduct as future patent professionals by introducing them to various scenarios that they are likely to encounter in their professional career. By the end of the course, students will understand the principles behind the ethics and rules of professional responsibility and the unauthorized practice of law as it applies to nonlawyers. prereq: Master of Science Patent Law Students.

LAW 5076. Essentials of Business for Lawyers.  (3 cr.; Student Option; Every Fall & Spring)
This course will teach you how to: (1) Understand basic accounting principles; (2) Read an annual report and analyze financial statements; (3) Look beyond numbers to gauge the financial performance and strength of an entity; (4) Employ cash flow analysis to value a business or determine the potential financial rewards of an investment opportunity; and (5) Understand the strategic questions that business managers must confront in governing their companies. The course surveys foundational concepts, analytical techniques and practices related to finance, accounting and strategic management issues lawyers confront when working with business executives either as an outside consulting attorney or as an inside corporate counsel. It may also consider other concepts used by business executives, including organizational behavior, marketing and quantitative analysis. The aim of the course is to help law students better appreciate the broader business context of legal decision-making so that they can contribute more effectively as a member of a firm's top management team or as outside counsel.

LAW 5078. Legislation and Regulation.  (3 cr.; Student Option; Every Fall)
This course explores lawmaking in the administrative state. Topics include: the legislative process, delegation of legislative authority to administrative agencies, the rulemaking process, statutory interpretation by courts and agencies, and judicial review of agency decisions. The course will focus on how statutes structure and constrain judicial and administrative decisionmaking.

LAW 5100. Taxation I.  (3 cr.; A-F only; Periodic Fall & Spring)
This basic course in federal income taxation introduces the student to the Internal Revenue Code and the income taxation of individuals through the following topics: definition of income, relevant accounting concepts, exclusions, deductions, income splitting, sales and dispositions of property, amortization, capital losses, and current issues of tax policy.

LAW 5102. Mergers and Acquisitions.  (3 cr.; Student Option; Every Fall)
This class will cover the theory behind, the Federal and state law governing, and the practice of, mergers and acquisitions. Our main focus will be what a transactional lawyer would want and need to know as to why mergers and acquisitions might occur and how and why companies or shareholders would embrace or disfavor them, how the transactions are documented and how disclosure requirements are met, and what the present cases say.

LAW 5103. Data Privacy Law.  (3 cr.; A-F only; Periodic Fall & Spring)
Every single day, the newspaper contains stories?plural intended?about data privacy and security. Whether they concern the National Security Agency, Facebook, or a data breach at a small business, the handling of personal information has become a central concern of our time. In response, a complex law of data privacy has emerged, and now it is a fast growing area of legal practice. This course will equip students to counsel clients about an array of federal, state, and international legal requirements?while also analyzing them critically and thinking about the societal challenges posed by new information technology. Assessment will include group projects and a take-home final.

LAW 5112. Essentials of Business.  (3 cr.; A-F only; Periodic Fall & Spring)
This course will teach you how to: (1) Understand basic accounting principles; (2) Read an annual report and analyze financial statements; (3) Look beyond numbers to gauge the financial performance and strength of an entity; (4) Employ cash flow analysis to value a business or determine the potential financial rewards of an investment opportunity; and (5) Understand the strategic questions that business managers must confront in governing their companies. The course surveys foundational concepts, analytical techniques and practices related to finance, accounting and strategic management issues lawyers confront when working with business executives either as an outside consulting attorney or as an inside corporate counsel. It may also consider other concepts used by business executives, including organizational behavior, marketing and quantitative analysis. The aim of the course is to help law students better appreciate the broader business context of legal decision-making so that they can contribute more effectively as a member of a firm's top management team or as outside counsel.

LAW 5214. Insurance Law.  (3 cr.; Student Option; Every Fall)
Insurance is omnipresent in the practice of law because insurance is the primary means by which companies and individuals deal with risks. Lawyers, of course, often make a living either by counseling clients about
how to plan for risks or by serving clients whose risks have developed into losses. This course will introduce students to fundamental principles of insurance law and regulation. It will survey the nature and function of insurance, insurance contract formation and meanings, and insurance regulation. We will also look at specific legal issues relating to different lines of insurance, such as property, life, health, and liability insurance.

LAW 5224. Patents. (3 cr.; A-F only; Every Fall)
This course offers an overview of patent law for both those students intending to specialize in patent prosecution and those whose general practice may include patent litigation and licensing. Topics to be covered include the requirements for patentable subject matter; standards of novelty, utility, and non-obviousness; statutory bars; conception, priority, enablement, and written description requirements in patent procurement; direct and vicarious patent infringement; claims interpretation.

LAW 5231. Patent Prosecution Practice I. (2 cr.; A-F only; Every Fall)
Patent Prosecution Practice I is recommended for all students interested in intellectual property and patent law, including students considering practicing in the areas of patent prosecution, litigation, licensing, technology commercialization, and patent portfolio management. The course focuses on US patent practice and is designed to extensively develop the student’s skills. Throughout the semester each student will complete two projects: (1) formulate and draft patent claims for a number of different inventions in view of prior art. (2) develop strategies for responding to a patent examiner according to rules of the U.S. Patent Office, arguing patentability and allowance of a patent application over cited prior art. Each student will be paired with a senior practicing attorney who will act as a mentor, including reviewing drafts and providing candid feedback to the student. Lectures and discussion topics include: organization and structure of the U.S. Patent Office, the US patent process including the entire life cycle of a patent from application preparation and filing through examination and grant, formulating patent claims in view of prior art and potential infringers, architecting patent portfolios including all types of US patent applications, such as provisional, utilities, continuations and divisions, examination of patent applications including responding to Office Actions issued by the US Patent Office, invention and ownership determination and legal ramifications flowing therefrom, and US law and regulations governing patent prosecution practice. A technical background is not required to take this course.

LAW 5232. Patent Prosecution Practice II. (3 cr.; A-F only; Every Spring)
Patent Prosecution Practice II is recommended for all students interested in intellectual property and, in particular, students interested in advancing their skills and understanding of patent law and practice. Throughout the semester each student will complete three practical and diverse assignments designed to develop the student’s skills. Each student will be paired with a senior practicing attorney who will act as a mentor, including reviewing drafts and providing candid feedback to the student. Specifically, in this class, each student will: (1) prepare a complete US Patent Application based on a real invention, (2) write an appeal brief according to rules of the US Patent Trial and Appeal Board, arguing patentability and reversal of the patent examiner in view of an examination history by the US Patent Office, and (3) provide counseling to a client about to launch a new product, including reviewing issued US patents and developing a full non-infringement / invalidity opinion for the client. The course grade is primarily based on these three projects in lieu of a final exam. Lectures and discussion topics throughout the semester include: -skills and strategies for writing patent applications, -appeal practice including brief writing before the Patent Trial and Appeal Board (PTAB) at the US Patent Office, -clearance analysis including invalidity and non-infringement counseling and opinions, -foreign practice including national filings in foreign countries and international filings using the Patent Cooperation Treaty (PCT), including leveraging patent prosecution highways for accelerated examination, -eligible subject matter issues including recent case law and claim drafting tips, -accelerated examination procedures within the US Patent and Trademark Office, -legal and practical considerations of infringement counseling including formulating invalidity and non-infringement opinions, - post grant review and other mechanisms for challenging issued patents before the US Patent and Trademark Office, -patent prosecution related considerations that arise in relation to participation in industry standards organizations, -patent prosecution related considerations that arise in the context of universities and technology licensing organizations, and -design patents, prerequisite: Master of Science Patent Law Students only.

LAW 5242. Patent Application Drafting. (1 cr.; A-F only; Every Spring)
Patent Application Drafting. Students must also be enrolled in Law 5232 Patent Prosecution Practice II to take this course.

LAW 5243. Patent Research and Writing. (2 cr.; A-F only; Every Fall)
Patent lawyers and agents spend their entire professional careers communicating (with clients, patent examiners, judges, colleagues) no matter what their individual career paths may be. This course is about the process of research and communicating about patents. In other words, the goal of the course is to teach the building blocks of patent research and communication through multiple practice exercises so the student may repeat the process independently after successful completion of this course. This course leverages free, patent office, and commercial research tools. Deliverables and works include: patent landscape search and report, patentability search and opinion, patent risk search and assessment, patent invalidity search and opinion. Recommended prereq: Patents (5224), Patent Prosecution Practice I (5231) or Patent Portfolio Management (5250)

LAW 5250. Patent Portfolio Management. (2 cr.; A-F only; Every Fall)
Patent portfolio management is the art of aligning patent strategy with business objectives. In general, the successful portfolio manager must have the ability to transform complex patent information into actionable insights that provide decision-making value to a wide variety of stakeholders. This course introduces students to the various practices and skills that go into building, implementing, and managing a patent portfolio whether from the point of view of a small, innovative, start-up company or a Fortune 500 company in a highly competitive market space.

LAW 5290. Patent Law Capstone: Innovation. (3 cr.; A-F only; Every Spring)
This capstone course introduces students to the principles of successful innovation and the integral role of patents in this process. This is a course in innovation. There are no right or wrong answers. Large companies with very smart people often launch products that fail. Venture capitalists seeking to invest in winners more-often-than-not end up investing in losers. Innovation is an art not a science. There is no ?secret formula? that guarantees success. There are simply different tools, skills, methods of analysis and approaches that may or may not work better than others. We will explore the art of innovation and the integral role that patents play in turning an idea into an innovation. Goals: Students will learn how to research complex subject matter across the intersecting domains of business, finance, marketing, science, technology and intellectual property. Students will then develop the ability to present their findings in a clear and concise manner that is understandable to and can be acted upon by a cross-functional audience of high-level decision makers.

LAW 5601. International Business Transactions. (3 cr.; Student Option; Periodic Fall & Spring)
International Business Transactions is a three-credit course whose main focus of discussion and study is the private law aspects pertaining to international business transactions, rather than issues of national and international trade regulation. Thus, the course is primarily concerned with private international business law. We examine three basic methods of doing business abroad, namely, the sales of goods (export) transaction, licensing and franchising, and foreign direct investment. The course materials touch upon substantive law in areas as diverse as commercial transactions and the uniform commercial code, antitrust, intellectual property, conflict of laws, civil procedure, contracts, bankruptcy, taxation, and international law. While knowledge or background in these areas is certainly helpful it is not necessary for success in the course and for dealing with the issues raised in the readings or in class.
LAW 5603. Intellectual Property Survey. (3 cr.; Student Option; Periodic Fall & Spring) The intellectual property survey course presents an overview of patent, copyright, and trademark law. The course also will include some coverage of trade secrets, unfair competition, or federal preemption of state intellectual property laws. The course provides an opportunity for students to acquaint themselves with the major branches of intellectual property law, and may be most useful for students who intend to pursue careers in general business law or civil litigation; intend to specialize in one of the major branches of intellectual property law but want to develop a basic understanding of the other branches as well; or are interested in learning something about the field before committing to further in-depth study of one or more of its branches. Students should not enroll in this course if they already have taken, or will have taken by the end of the semester in which they plan to enroll in this course, two or more of the following courses: Patent Law, Copyright Law, Trademark Law, or Unfair Competition Law.

LAW 5608. Trademarks. (3 cr.; Student Option; Periodic Fall & Spring) This course will consider how marketers secure and enforce trademark rights. Trademarks are the indicators that consumers rely upon to determine the origin of goods and services. The course will focus on U.S. federal trademark law, but will also look at state and international trademark law as well as related areas such as false advertising, publicity rights, and cybersquatting. This course will provide a solid foundation for students interested in practicing trademark law (application, enforcement, licensing, or litigation) or more general intellectual property law. It will also be useful to attorneys who do any work with trademark-dependent industries such as retail sales, advertising, or media and entertainment. Finally, and more generally, trademark law offers excellent case studies of the interaction between law, culture, and technology, and of the evolution of traditional doctrine under pressure from rapid changes in surrounding circumstances.

LAW 5613. Copyright. (3 cr.; Student Option; Periodic Fall & Spring) This course provides a detailed introduction to the basic law of copyright/traditional copyright subject matter, the concept of originality and authorship, copyright transfers (and terminations of transfers), infringement, and fair use. The course coverage excludes patent law, except in brief overview, and only touches briefly upon related areas of intellectual property law. Copyright (and copyright-like schemes) have increasingly become a necessary tool of the general practitioner, used to protect the explosive growth in economic value of information-based products, like computer software and digital networks and databases. The lawyer ignorant of basic copyright principles will be increasingly handicapped in many areas of practice, such as negotiating technology transfers, drafting contractual rights, developing schemes of protection and privacy, distinguishing criminal from non-criminal behavior, and in litigation.

LAW 5624. Strategic Management of Intellectual Property. (3 cr.; Student Option; Periodic Fall & Spring) Firms competing in a knowledge economy depend increasingly on intellectual property (IP): patents, trademarks, copyrights, trade secrets, and copyrights. Adroit firms understand that IP-based competition demands close coordination between legal and strategic management executives. This course introduces you to fundamental IP concepts, competitive strategies, and public policy challenges from legal and strategic management perspectives. Learn how the scope of IP protection and legal weaponry to vindicate IP rights has changed substantially in the past 15 years. Learn how IP management integrates within a broader strategy for sustained profitability in high-tech industries. Learn how firm IP strategy to limit competitors is reconciled with antitrust policies promoting competition. Learn how managers price IP-protected products and services differently in developed versus developing economies. Come away with legal and managerial tools for applying IP-based strategies that will advance your firm and career.

LAW 5707. Intellectual Property Transactions. (2 cr.; A-F only; Every Spring) Intellectual property rights have been described as a ?sword and shield.? Rights holders are thought to act offensively by suing or threatening to sue infringers and seeking money damages, irrespective of the holders? marketing and product sales programs. Or they act defensively to protect their current or future market positions by having federal courts enjoin competitors. This course considers a third way: intellectual property rights are also valuable intangible assets that may be bought and sold. In this course, we will explore the principal theories and practices of intellectual property transactions. We will be considering closely the doctrines regulating the assigning and licensing of patent, copyright, trademark and other intellectual property rights, and we will be questioning critically whether these laws and practices encourage or inhibit commercial activity and innovation. While studying specific transactions in the course, we will be examining the practical uses of intellectual property law to meet commercial objectives.

LAW 5908. Independent Research and Writing. (1-2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Students may earn 1 or 2 credits (and in exceptional circumstances, 3 credits) for researching and writing a note, article, memo, or other paper on a legal topic. At least 3,750 words are required for one credit, at least 7,500 for two credits, and at least 11,250 for three credits. To register, the student should confer with a supervising faculty member, draft a description of the proposed project, and complete the online Independent Research form. LAW 5908 is for students who are not enrolled in the Law School, as well as MSPL candidates. Other law school degree candidates should enroll in LAW 7606 or LAW 7608 instead of LAW 5908.

LAW 5909. Independent Field Placement. (1-3 cr.; S-N only; Every Fall, Spring & Summer) Students may earn up to three credits in a semester for work in a patent practice setting under the supervision of a qualified field supervisor and a faculty advisor. At least 50 hours of patent-related activities are required per credit. The student is responsible for identifying a field placement setting and supervisor, finding a faculty advisor, and submitting the Independent Field Placement Enrollment Form for approval by the Associate Dean of Academic Affairs prior to enrollment.

LAW 6000. First Year Law Coursework. (13-16 cr. [max 32 cr.]; A-F only; Every Fall & Spring) First year Law Students have 16-credits of required coursework in fall and 13-credits of required coursework in spring. Registration in Law 6000 represents registration in these courses.

LAW 6001. Contracts. (4 cr.; A-F only; Every Fall) Basic course in contract and promissory obligation; formation of contracts; legal validity and construction; breach; legal and equitable remedies for breach; conditions; third-party rights.

LAW 6002. Legal Research & Writing. (1 cr.; P-F only; Every Fall) This year-long course covers the process of communicating about the law. Our goal is to teach students the building blocks of legal communication through multiple practice exercises so that students can repeat the process on their own after successful completion of the course. In the fall (one credit), we begin at orientation with a short exercise, then move on to email, letter, and office memorandum exercises written in an objective/predictive mode. In the spring (two credits), we proceed gradually to a persuasive trial court brief and delivery of formal oral arguments. The spring also includes a Statutory Interpretation module (one credit).

LAW 6003. Legal Research & Writing. (3 cr.; P-F only; Every Spring) The course continues in the spring (Fall Law 6002 - 1 credit; Spring Law 6003 - 3 credits) with a focus on statutory law. Students learn the basic doctrines of statutory interpretation while preparing a trial court (persuasive) brief. Students work through building block assignments in researching and drafting the brief. Students also learn the basic guidelines for formal oral argument, and the semester concludes with two rounds of oral argument. The semester also includes: additional research training focused on statutes, legislative history, and administrative law; individual conferences with instructors; peer review; a writing workshop; and an observation of oral argument before the Minnesota Supreme Court.

LAW 6004. Property. (4 cr.; A-F only; Every Spring)
The law’s protection of possession and ownership of real and personal property.

**LAW 6005. Torts.** (4 cr.; A-F only; Every Fall)
Civil liability for infliction of harm, including assault, battery, false imprisonment, infliction of mental distress, negligence, and their respective defenses; function of torts process.

**LAW 6006. Civil Procedure.** (4 cr.; A-F only; Every Fall & Spring)
This course addresses rules governing civil litigation, with emphasis on rules applicable in federal district courts. Topics may include due process, pleading, joinder, discovery, case management, the relationship between judges and juries, settlement, alternative dispute resolution, summary judgment, post-trial motions, finality, and preclusion. The course will also provide a brief survey of the topics covered in Civil Procedure I.

**LAW 6007. Constitutional Law.** (3 cr.; A-F only; Every Fall & Spring)
Judicial review authority; problems of government structure (federalism, intergovernmental relations, separation of powers); and individual rights and limitations on government power (protection of economic and property claims, equality under the law, personal liberties, freedom of speech and of religion).

**LAW 6009. Criminal Law.** (3 cr.; A-F only; Every Fall & Spring)
Purposes/functions of criminal processes and of several deprivations they impose. Requisites for official designation of acts and persons as “crimes” and “criminals.” Justifications for acts otherwise designated “criminal.” Emphasizes concepts of criminal responsibility. Nature/limits of criminal sentencing process; pretrial: dept consent

**LAW 6010. Perspectives: 1L.** (3 cr.; A-F only; Every Spring)
This course, offered in first-year and upper-year sections, is team-taught by faculty who approach the law from three different disciplinary perspectives. The disciplines presented will vary from year to year.

**LAW 6011. International Law: 1L.** (3 cr.; A-F only; Every Spring)
The course is an introduction to public international law. It will examine the sources and history of the law of nations, and how international law is formed, interpreted and (sometimes) enforced. It will also provide a brief introduction to the law of international organizations (specifically the United Nations), concepts of jurisdiction and conflicts of jurisdiction among nation states, international protection of human rights, the law of war, international criminal law, and the control of the use of force (including peacekeeping and related topics).

**LAW 6013. Law In Practice: 1L.** (3 cr.; P-F only; Every Spring)
This course introduces first-year students to the skills needed to apply emerging knowledge of legal doctrine and reasoning in the actual practice of law. The course involves a series of simulation experiences related to two case files?one litigation case and one transactional matter. Students attend ?Law Firm? classes taught by Law School faculty that explore the doctrinal and strategic issues in the simulated cases. Students also perform simulations in ? Practice Groups? of eight students led by local practicing attorneys. Each student individually takes and defends a deposition. Groups of two students engage in client or witness interviews, client counseling and negotiation simulations. Students also complete either a simulated conference in the chambers of a local judge or engage in a simulated mediation conducted by a qualified neutral.

**LAW 6015. Civil Procedure II: 1L.** (3 cr.; A-F only; Every Spring)
This course builds on Civil Procedure I by examining additional facets of civil litigation. Topics may include personal jurisdiction, subject matter jurisdiction, venue, preliminary injunctions and temporary restraining orders, the Erie doctrine, appeals, and class actions.

**LAW 6016. Essentials of Business for Lawyers.** (3 cr.; A-F only; Every Spring)
This course will teach you how to:
1. Understand basic accounting principles; (2) Read an annual report and analyze financial statements; (3) Look beyond numbers to gauge the financial performance and strength of an entity; (4) Employ cash flow analysis to value a business or determine the potential financial rewards of an investment opportunity; and (5) Understand the strategic questions that business managers must consider in governing their companies. The course surveys foundational concepts, analytical techniques and practices related to finance, accounting and strategic management issues lawyers confront when working with business executives either as an outside consulting attorney or as an inside corporate counsel. It may also consider other concepts used by business executives, including organizational behavior, marketing and quantitative analysis. The aim of the course is to help law students better appreciate the broader business context of legal decision-making so that they can contribute more effectively as a member of a firm?s top management team or as outside counsel.

**LAW 6018. Legislation and Regulation.** (3 cr.; A-F only; Every Spring)
This course explores lawmaking in the administrative state. Topics include: the legislative process, delegation of legislative authority to administrative agencies, the rulemaking process, statutory interpretation by courts and agencies, and judicial review of agency decisions. The course will focus on how statutes structure and constrain judicial and administrative decision making.

**LAW 6019. Leadership and Law - LL.M.s.** (2 cr.; A-F only; Periodic Spring)
In this age of globalization, leadership and professionalism within the legal profession takes on new and complex meanings. Research has demonstrated that introducing legal practitioners to emotional intelligence competencies impacts their professionalism and professional identity by increasing their ability to persuade, advocate, influence, and communicate. In this course students will begin to develop their personal leadership identity and explore how that identity is influenced by culture. Students will explore what it means for the lawyer to be a leader. They will be challenged to: determine their professional strengths and developmental points; consider how individual personality and cultural traits affect group processes in legal institutions; explore the contextual nature of professionalism and how to adjust techniques based upon cultural cues (especially in international settings); navigate professional, legal settings to maximize their organizational impact; and discover and develop various leadership skills.

**LAW 6020. LL.M. Introduction to American Law.** (2 cr.; A-F only; Every Fall)
This course introduces law students and lawyers from other legal systems to the basics of the U.S. legal system and its legal institutions. The course will include legal research exercises designed to develop legal research skills.

**LAW 6021. LL.M. Legal Writing and Legal Skills I.** (3 cr.; A-F only; Every Fall)
The fall course introduces legal writing and focuses on legal analysis. Students will draft and edit letters and office memoranda and engage in exercises such as mock client meetings and professional presentations. The focus of the fall semester is predictive legal writing. Some time will also be spent discussing how to prepare for and take law school exams.

**LAW 6022. LL.M. Legal Writing and Legal Skills II.** (3 cr.; A-F only; Every Spring)
The spring semester course continues to build upon the foundation presented in the fall semester and to examine the fundamentals of U.S. legal analysis and legal writing. The focus of the second semester is persuasive legal writing and students will draft and edit a legal memorandum for motion practice in litigation as well as professional correspondence. To accomplish these goals, students act as attorneys in fictitious law firms, representing either the plaintiff or the defendant in a litigation matter. Students will also engage in simulated oral exercises such as mock client meetings and mock oral arguments. We will also spend time examining how to improve legal writing by doing editing and revising exercises and by analyzing samples of good (and bad) legal writing.

**LAW 6023. LL.M. Contract Drafting.** (2 cr. [max 3 cr.]; A-F only; Every Fall)
This seminar will cover general contract principles and build upon them in a practical way. Students will review and revise contracts, draft sample provisions, draft contracts from “scratch” and discuss options for managing risk through effective drafting.

**LAW 6024. LL.M. Trial Practice.** (3 cr.; A-F only; Periodic Spring)
Selected problems in litigation. Exercises in jury selection, introduction of evidence, expert testimony, direct and cross examination and impeachment of witnesses, opening statements.
and closing arguments. Prerequisite: LL.M. student

LAW 6025. Wrongful Convictions. (2 cr.; A-F only; Every Fall)
Wrongful Convictions is run in conjunction with the Innocence Project of Minnesota. Its purpose is to educate students about the causes of wrongful convictions as well as provide students with an opportunity to work on hypothetical courtroom situations in a classroom setting. The reading materials and classroom discussion will cover such topics as unreliable eyewitness identifications, false confessions, jailhouse informant testimony, ineffective assistance of counsel, government misconduct, problematic forensic science, and racial bias in the court system. We will also discuss how DNA testing works and its application in the courtroom. Students are expected to perform in-class exercises such as examination of witnesses making eyewitness identification, challenging confessions, cross-examine a cooperating witness and conduct voir dire on racial bias. Finally, students will be required to evaluate inmate applications for assistance submitted to the Innocence Project of Minnesota as part of their midterm sample assignment and final assignment.

LAW 6026. Gaming Law. (3 cr.; A-F only; Periodic Spring)
This course covers the law related to one of the fastest growing and most regulated industries in the United States. It will focus on the $28 billion a year industry of Indian gaming and the issues tribes frequently face. The core of the course will develop an understanding of the relationship between federal, tribal, and state gaming regulatory schemes. It also reaches several substantive law fields, including administrative law, constitutional law, contracts, federal Indian law, labor law, and tribal law. Students do not need a background in federal Indian law or tribal law to successfully complete this course.

LAW 6027. Law of the Sea. (2 cr.; A-F only; Periodic Fall)
This course will examine the United Nations Convention on the Law of the Sea (UNCLOS). UNCLOS has been established as arguably the most comprehensive expression of multilateral treaty negotiation and practical application since it entered into force in 1994. The Convention is the definitive word on the use of seas and oceans as well as the innovations that have ushered in, which include: the high seas as well as the rights of innocent passage; archipelagic states; the exclusive economic zone; the continental shelf; access by landlocked states to the resources of the sea; geographically disadvantaged states; protection of the environment; the high seas and the resources thereof for the common heritage of mankind; the international seabed authority; maritime delimitation and the dispute settlement arrangements through the International Tribunal of the Law of the Sea, among others. The course will also study the wealth of case law affecting the development of international law of the sea. The course will adopt a practical approach to enhance skills in the drafting of treaties pursuant to UNCLOS, such as arrangements between coastal states and landlocked states for the sharing of EEZ resources. Students will be exposed to "mock" maritime boundary delimitations and guest lecturers/visiting professors will facilitate this simulation.

LAW 6028. LL.M. Judicial Observation. (1-2 cr.; S-N only; Every Spring)
Students work with a judge and observe how our court systems work in the United States. Prerequisite: LL.M. student

LAW 6029. Introduction to Roman Law. (3 cr.; A-F only; Periodic Spring)
Introduction to Roman private law, focusing particularly on the law of property. The initial part of the semester will be spent introducing the sources of Roman law, Roman legal procedure, and the post-antique reception(s) of Roman law.

LAW 6030. Contemporary Problems in Freedom of Speech and Press. (3 cr.; A-F only; Every Fall)
Most of us use devices like Smartphones, GPS, streaming services, or hands-free speakers like Amazon's Echo that connect to online voice services like Alexa without thinking about them very much. But, what kind of information are they collecting? Are merchants allowed to gather your shopping history and use it to send you targeted advertising, or to sell it to other companies for profit? Should other people be able to post your personal information or photos online without your consent? Can the government read your emails, track your online browsing, or intercept your text messages? This course considers how growing concerns about privacy and national security after the First Amendment and the rights of journalists to gather and report the news. We will read significant court decisions and take a look at current statutory and regulatory initiatives both in the United States and abroad. You can expect lively debates and discussion, and the opportunity to explore a privacy or national security issue in depth in a substantial research paper.

LAW 6031. Smart Growth. (2 cr. [max 3 cr.]; A-F only; Periodic Spring)
This class examines emerging legal strategies to address the fiscal, environmental, and social impacts of urban sprawl. Topics include: inequalities in access to housing, jobs, and educational opportunities; local fiscal competition; local, state, and regional regulatory responses to metropolitan development; environmental impacts of metropolitan development; and evolving legal structure of regional governance in America's large metropolitan areas.

LAW 6034. Sem: Women's Legal History. (2-3 cr.; A-F only; Periodic Spring)
Passage of National Historic Preservation Act (NHPA) as watershed in cultural property law. NHPA direction of federal government to protect/preserve cultural property.

LAW 6035. Corporate Externship. (3 cr.; P-F only; Periodic Summer)
In this program, students are placed in company law departments to experience the work of in-house counsel. The student will receive 3 credits for 150 hours, to be completed over a 6 to 8 week period, working on substantive areas of law such as corporate policies and codes of conduct, employment law, vendor and supplier agreements, SEC filings and documents, international and comparative law, finance, and intellectual property. Students will also participate in or sit in on meetings, telephone or video conferences, and company events to experience day-to-day work of in house counsel and the flow of work and life in the corporate world. The instructor matches students and companies using a questionnaire. Students also attend up to two on-campus workshops and complete written assignments, including journals of their experiences. There is a required orientation meeting at the beginning of the semester.

LAW 6036. Reproductive Rights. (3 cr.; A-F only; Every Fall)
The age-old debate on the rights of individuals to sexual determination and reproductive autonomy rages on. It grows more contentious as new technology and heated political confrontations alter the playing field. This course, using cases, statutes, and ancient and contemporary critical writings, examines the legal foundations and social implications of regulating contraception, abortion, pregnancy, childbirth, and assisted reproduction. It addresses access, funding, the rights of men, women, minors, fetuses, and government. It also explores ethical considerations and international perspectives.

LAW 6037. Emerging Sciences and Technologies: Law, Ethics and Policy. (3 cr.; A-F only; Periodic Fall)
This interdisciplinary course will examine issues at the nexus of law, ethics, public policy, and emerging sciences and technologies (ES&T) including nanotechnology, genetic and biomedical engineering, cognitive science, synthetic biology, and robotics. Topics will explore include the role of science and technology as both a tool for and the subject of law and policy; the legal, ethical, economic, and policy implications of ES&T research and development; environmental and human health risk analysis and regulation (e.g., EPA, FDA, OSHA, and state and local regulatory mechanisms); intellectual property issues; liability issues; and global impacts. Topics will be approached from the perspective of different stakeholder (e.g., federal agencies, industry, academic researchers, the environment, international organizations, and the public) and in the context of different application areas (e.g., drugs, devices, food, agriculture, energy, environmental remediation) using a variety of interdisciplinary approaches. Students with a
broad range of interests are encouraged to enroll.

**LAW 6038. Biomedical Ethics.** (3 cr.; A-F only; Periodic Fall)
Topics in biomedical ethics. Patients' rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, allocation of medical resources.

**LAW 6039. Great Cases.** (3 cr.; A-F only; Periodic Spring)
Eighteen U.S. Supreme Court cases that have shaped our nation. Five nationally publicized trial court cases. Historical, political, and legal context.

**LAW 6040. Perspectives on the Law.** (3 cr.; A-F only; Every Spring)
This course, offered in first-year and upper-year sections, is team-taught by faculty who approach the law from three different disciplinary perspectives. The disciplines presented will vary from year to year.

**LAW 6041. Investment Management Law.** (2 cr.; A-F only; Periodic Spring)
This course will cover policy and regulation governing pooled investment vehicles and their managers. We will engage in a close study of the Investment Company Act of 1940 and its companion statute, the Investment Advisers Act of 1940. The primary focus will be the regulation of mutual funds, but attention will also be given to alternative investment vehicles, such as hedge funds, private equity funds and exchange-traded funds.

**LAW 6042. Nonprofits and Public Sectors Externships.** (3 cr.; A-F only; Periodic Summer)
Legal experience in nonprofit and public sectors. Under supervision of practicing attorneys. With classroom seminar.

**LAW 6043. Nonprofit and Public Sector Externship.** (2 cr.; P-F only; Periodic Summer)
Externships for nonprofit/public sectors.

**LAW 6043. Nonprofit and Public Sector Externship.** (2 cr.; P-F only; Periodic Summer)
Externships for nonprofit/public sectors.

**LAW 6044. Immigration Law Externship - Center for New Americans.** (2-3 cr. [max 6 cr.]; P-F only; Every Fall & Spring)
Externship in immigration law with Center for New Americans.

**LAW 6046. Human Trafficking.** (2 cr.; A-F only; Periodic Spring)
Seminar will examine the breadth and depth of efforts to combat and raise awareness about human trafficking, a form of modern-day slavery in which people are compelled through force, fraud, coercion, or other means to engage in commercial sexual exploitation or forced labor. An optional two-credit externship, Law 6047, is available.

**LAW 6047. Human Trafficking Externship.** (2 cr.; A-F only; Periodic Spring)
Registration in the Law 6046 Sem: Human Trafficking is required to enroll in this externship. Students gain a practical experience by participating in an externship at a human trafficking-related placement and apply the classroom lessons in the legal work place.

**LAW 6048. Unincorporated Business Associations.** (3 cr.; A-F only; Every Fall)
This course introduces students to the main features of leading forms of unincorporated business associations, including limited liability companies (LLCs), partnerships, limited partnerships, and limited liability partnerships. Topics covered include authority and management structure, fiduciary duty, financial rights, transfer rights, and dissolution and dissolution. The course is structured around a series of exercises in which students negotiate, draft, and analyze the governing agreement for LLC. This course is strongly recommended for students who have taken the 1L Corporations elective.

**LAW 6050. Commercial Paper.** (2-3 cr.; A-F or Audit; Every Fall & Spring)
Commercial payments and credit devices, such as checks, drafts, and promissory notes, and applicable commercial and banking practices. Articles 3 and 4 of the Uniform Commercial Code.

**LAW 6051. Business Associations/Corporations.** (4 cr.; A-F only; Every Fall)
The initial part of this course is an introduction to the general law of multi-person unincorporated business organizations, principally partnerships, limited partnerships and limited liability companies. Matters covered include the procedures for forming such organizations and the rights and obligations of the participants as among themselves and with respect to third persons. The remaining class hours constitute the first portion of the basic Corporations course, and will cover such matters as corporate organization; the distribution of powers among the corporate board of directors, its officers and its stockholders; the proxy system; control devices in the close corporation; and the fiduciary duties of directors, officers and controlling shareholders. Matters dealing with corporate finance? (issuance of shares, payment of dividends, and corporate reorganizations) are covered in Advanced Corporate Law.

**LAW 6052. Sales Law.** (3 cr.; A-F only; Periodic Spring)

**LAW 6053. Analytical Methods for Lawyers: An Introduction.** (3 cr.; A-F only; Periodic Spring)
The course provides the analytical foundations for legal practice in the modern world: a world in which sound legal advice requires the mastery of the techniques and language of disciplines such as economics, decision theory and game theory. After a brief review of the methodology of law and economics, this course exposes students to a broad survey of microeconomics, decision-theory, and game-theory concepts. These analytical methods play a crucial role in the design and understanding of legal rules. The second part of the course builds on these premises to study the economic structure of several areas of law. Through this course students will develop a framework for the analysis of legal rules that will aid them in the remainder of their legal studies and professional life.

**LAW 6055. Advanced Corporate Law.** (3 cr.; A-F only; Every Spring)
This course will focus on corporate finance and reorganization. Specifically, the course will explore: methods of financing the corporate enterprise including capital stock structures with preferred and common stock, as well as debt types and obligations; payments to stockholders by way of dividends, redemptions, purchase of shares or spin offs; and reorganizations including mergers, sales of assets, and recapitalizations. The evaluation is by way of final essay exam.

**LAW 6057. Judicial Externship.** (2-3 cr. [max 6 cr.]; P-F only; Every Fall, Spring & Summer)
The Judicial Externship class provides an opportunity for students to learn about both lawyering and judging by observing and participating in the work of a judge and his or her staff. Which judges and courts participate varies each term, but externships are typically available with federal magistrate-judges and with judges at the federal district court, federal court of appeals, federal bankruptcy court, state trial court, state court of appeals, state tax court, and American Indian tribal courts. State trial court placements are with judges handling criminal, civil, family, or juvenile court matters and with problem-solving courts (e.g., drug court). Externships may also be available at the Office of Administrative Hearings and with the federal Immigration Court. Separate application to those courts is required; watch for notice about placement possibilities through the Career Office. Federal court placements (Federal District Court, Federal Magistrate-Judges, and Federal Court of Appeals) are made using an application process that occurs a few months before the start of the term. Notification will be sent to all students about deadlines for applying. For the rest of the placements, students registered for the class will be asked to complete a form specifying their preferences and to submit a resume, transcript, and cover letter to be used in the placement process. Students will be assigned based on their requests and the judges' needs. After placement, each student arranges a work schedule with the assigned judge and his or her staff. Students are encouraged to arrange their schedules to have several large blocks of time available for fieldwork; free mornings are especially important for attending court hearings. Fieldwork in chambers generally includes both substantive assignments in research and writing and observation of court proceedings.
proceedings. Substantive assignments will depend upon the nature of the court’s calendar and may include such work as preparing a memorandum or proposed order and decision on a summary judgment motion, summarizing and evaluating deposition testimony, or researching substantive legal issues raised in a motion, trial, or appeal. Students may observe a variety of proceedings, ranging from settlement conferences to motions hearings to trials to appellate arguments. They may be proceedings conducted in cases for which the student is performing research or they may be part of unrelated cases. The precise nature of the assignments and observation opportunities in chambers is at the discretion of the judge and the judge’s staff.

**LAW 6058. Human Rights Advocacy.** (3 cr.; A-F only; Every Fall)

This course will study the histories, philosophies and activities of human rights activists and organizations. The course examines the theoretical basis of the human rights movement, the principles underlying key organizations in the human rights field, as well as their strategies, tactics, and programs. The class will use case studies and other active methods to understand and to evaluate the work of human rights activists. Topics to be considered include fact-finding and documentation, campaigns on human rights issues, cultural relativism, economic rights, and corporate responsibility for human rights. Students will consider the basic organizational structure and fundraising needs of NGOs. Students will design and present a research project based on their selection of in-class topics. Readings include material on the history of NGOs; roots and development of the human rights movement; analysis of key NGOs; and reports and publications from NGOs working in the field.

**LAW 6059. Constitutional Law - Theories of Freedom of Expression.** (3 cr.; A-F only; Periodic Spring)

This course will survey the evolution of First Amendment law as it affects the legal rights and privileges of the print and electronic media. Topics will include prior restraints, libel, privacy, reporter’s privilege, access to courts (including free press/fair trial), commercial speech, and obscenity/incest. The course will examine the statutory and common law rights of access to information and will consider the constitutional implications of government regulation of media content, including the new media. We will read court opinions as well as seminal scholarly articles on the historical origins and philosophical foundations of freedom of press and speech and review doctrinal themes.

**LAW 6060. Assisted Reproduction and the Family.** (3 cr.; A-F only; Every Fall)

Study of Assisted Reproduction/how laws work for family.

**LAW 6061. Financial Regulation.** (3 cr.; A-F only; Periodic Spring)

This course will be a high-level overview of several different areas of financial regulation: banking regulation, insurance regulation, and elements of securities regulation (particularly broker-dealer and investment company regulation).

**LAW 6062. Energy Law.** (3 cr.; A-F only; Every Spring)

This course provides an introduction to U.S. energy law. The first portion of the course introduces the nation’s primary sources of energy: coal, oil, biofuels, natural gas, hydropower, nuclear, wind, solar, and geothermal energy. In doing so, it explores the physical, market, and legal structures within which these energy sources are extracted, transported, and converted into energy. The second portion of the course turns to the two major sectors of our energy economy--electricity and transportation--and the full range of federal and state regulation of each sector. The third portion of the course explores case studies of hot topics in energy law and policy that highlight the complex transitions taking place in the energy system. These topics include electric grid modernization, electric vehicles, risks and benefits associated with hydraulic fracturing and deepwater drilling for oil and gas, and the continued role of nuclear energy. In addition to traditional textbook reading and class discussion, the course will include industry, government, and nonprofit guest speaker presentations. Grading will be based on a final exam given at the end of the semester as well as class discussion and weekly written postings on the TWEN site for the course.

**LAW 6063. Law and Neuroscience.** (2 cr.; A-F only; Every Fall)

What are adolescents, psychopaths, and white-collar fraud artists thinking? Why does emotional trauma for victims of abuse last so long? Why is eye-witness memory so poor? Do violent video games lead to violent children? How can you get into the heads of the judge and jury? Lawyers and courts, including the US Supreme Court, are already integrating neuroscience research into their arguments and opinions on questions such as these. This Law and Neuroscience course will introduce the exciting new field of ?neurolaw? by covering issues such as the neuroscience of criminal culpability, brain-based lie detection, cognitive enhancement, emotions, decision making, and much more. Along the way we’ll discuss how the legal system can and should respond to new insights on topics such as adolescent brain development, addiction, psychopathy, Alzheimer’s, the effects of combat on soldiers? brains, and concussions from sports injuries. New in the 2017 version of the course is a ?Bridge to Practice? track, which emphasizes the real-world brief writing related to the use of neuroscientific evidence in practice. (Note that all scientific material in the class will be presented in an accessible manner, so no previous science background is required.)

**LAW 6066. Saeks Public Interest Residency.** (2 cr. [max 4 cr.]; A-F only; Every Fall)

The Saeks Public Interest Residency Program is a new program established by Allen (56) and Linda Saeks that connects leading public interest and government organizations with high-achieving 3L students. Students work full-time during their third year of law school for a nonprofit or government agency and have a guaranteed, full-time, paid legal position with the same organization the year following graduation. This innovative model provides students with valuable legal training while providing the organizations with much-needed legal work. This classroom component will complement the externship. Residents will meet as a group, weekly to discuss lawyering skills, learn from public interest speakers, and gain insight into their work. prerequisite: JD Students only; 6219 prereq or coreq; concurrent enrollment in 6067 required

**LAW 6067. Saeks Public Interest Residency Externship.** (8 cr. [max 16 cr.]; P-F only; Every Fall)

The Saeks Public Interest Residency Program is a new program established by Allen (56) and Linda Saeks that connects leading public interest and government organizations with high-achieving 3L students. Students work full-time during their third year of law school for a nonprofit or government agency and have a guaranteed, full-time, paid legal position with the same organization the year following graduation. This innovative model provides students with valuable legal training while providing the organizations with much-needed legal work. prerequisite: JD Students only; 6219 prereq or coreq; concurrent enrollment in 6066 required

**LAW 6068. Information Access Practicum.** (3 cr.; P-F only; Periodic Spring)

This course will expose students to the theory and practice of government secrecy law at the state and federal levels. The heart of the course will be practice-based. Students will be paired with non-governmental organizations to assist those organizations with government secrecy related legal, policy, and public education work. The exact work and mix of organizations may change somewhat from year to year. The organizations most likely will include the Minnesota Coalition for Government Information and Public Record Media. Students will assist the groups on projects ranging from litigation appealing the denial of information under the Minnesota Data Practices Act or the federal Freedom of Information Act, lobbying the Minnesota state legislature regarding amendments to the Data Practices Act, and preparing white papers or other public education and advocacy materials.

**LAW 6071. International Law.** (3 cr.; A-F only; Every Spring)

The course is an introduction to public international law. It will examine the sources and history of the law of nations and how international law is formed, interpreted, and (sometimes) enforced. It will also provide a brief introduction to the law of international organizations (specifically the United Nations), concepts of jurisdiction and conflicts of jurisdiction among nation states, international protection of human rights, the law of war, international criminal law, and the control of
the use of force (including peacekeeping and related topics). prerequisite: Upper division students only

LAW 6075. Civil Procedure II. (3 cr.; A-F only; Every Spring) This course builds on Civil Procedure I by examining additional facets of civil litigation. Topics may include personal jurisdiction, subject matter jurisdiction, venue, preliminary injunctions and temporary restraining orders, the Erie doctrine, appeals, and class actions. prerequisite: Upper division students only

LAW 6076. Essentials of Business for Lawyers. (3 cr.; A-F only; Every Fall & Spring) This course will teach you how to: (1) Understand basic accounting principles; (2) Read an annual report and analyze financial statements; (3) Look beyond numbers to gauge the financial performance and strength of an entity; (4) Employ cash flow analysis to value a business or determine the potential financial rewards of an investment opportunity; and (5) Understand the strategic questions that business managers must confront in governing their companies. The course surveys foundational concepts, analytical techniques and practices related to finance, accounting and strategic management issues lawyers confront when working with business executives either as an outside consulting attorney or as an inside corporate counsel. It may also consider other concepts used by business executives, including organizational behavior, marketing and quantitative analysis. The aim of the course is to help law students better appreciate the broader business context of legal decision-making so that they can contribute more effectively as a member of a firm's top management team or as outside counsel.

LAW 6078. Legislation and Regulation. (3 cr.; A-F only; Every Fall & Spring) This course explores lawmaking in the administrative state. Topics include: the legislative process, delegation of legislative authority to administrative agencies, the rulemaking process, statutory interpretation by courts and agencies, and judicial review of agency decisions. The course will focus on how statutes structure and constrain judicial and administrative decisionmaking.

LAW 6081. Constitutional Law: 14th Amendment. (3 cr.; A-F only; Every Fall & Spring) This course offers an overview of civil liberties and civil rights under the United States Constitution. It will cover First Amendment freedoms, including freedom of speech and of the press, freedom of assembly and association, and religious freedoms (prohibition on establishment of religion and protection of the free exercise of religion). It will also cover rights protected by the Fourteenth Amendment, including due process of law and equal protection of the laws. A few other individual rights and liberties guaranteed by the Constitution will be briefly discussed (taking, contract clause, Second Amendment gun rights, Ninth Amendment ?privacy? rights). It does not cover constitutional rights in criminal law matters, which are covered in the Criminal Procedure course.

LAW 6082. Constitutional Law: Civil Rights and Liberties Survey. (3 cr.; A-F only; Periodic Fall & Spring) This course includes coverage both of civil rights (Fourteenth Amendment protection of due process and of equal protection) and of civil liberties (First Amendment protection of speech and of religion), as well as limited coverage of other constitutionally protected rights and liberties. The First Amendment portion of this course includes an examination of freedom of speech and the press, as well as the Establishment Clause and Free Exercise Clause protections of freedom of religion. The Fourteenth Amendment portion deals with due process of law (procedural due process, substantive due process, the incorporation of the Bill of Rights protections to limit the powers of states and municipalities) and with equal protection of the laws (examining racial discrimination, gender discrimination, other classifications). Rights of privacy and personal autonomy will also be considered. The course will also examine other constitutional rights, including the right to keep and bear arms (Second Amendment), the protection of private property (Fifth and Fourteenth Amendments), and other provisions.

LAW 6083. First Amendment. (3 cr.; A-F only; Every Fall) An in-depth inquiry into the First Amendment, including both the doctrine and theory of free expression. Topics may include political incitement, commercial speech, hate speech, school prayer, parochial school vouchers and religious exemptions.

LAW 6084. Equal Protection and Civil Rights Acts. (3 cr.; A-F only; Periodic Fall & Spring) The course will cover the equal protection clause of the 14th Amendment and the three major civil rights acts passed in the 1960s to give content to that clause. The Choper casebook will be used for the equal protection clause and provide materials about the legislative histories and regulatory and statutory constructions of the major provisions of the 1964, 65, and 68 Civil Rights Acts.

LAW 6085. Criminal Procedure. (3 cr.; A-F only; Every Fall & Spring) This course explores key Supreme Court cases interpreting the 4th, 5th and 6th Amendments that form our constitutional criminal procedure law defining the boundary between the individual and the state. Topics include: search and seizure, stop and frisk, self-incrimination, involuntary confessions, line-ups, the right to counsel, and the role of defense counsel and prosecutors in an adversarial system. To bring our criminal into the 21st Century, we will consider three important progressions that the Supreme Court is slowly acknowledging: the steady transformation of our adversarial system into an inquisitorial one focused on guilty pleas; the rapid rise in technology that has exponentially increased the possibilities for criminal law violation and detection; and the explosion of social science literature that informs the fundamentally human processes and interactions at the heart of encounters between citizens and police. The course will invite several guest speakers who, through their work in the trenches, have developed expertise in specific criminal justice areas.

LAW 6100. Taxation I. (3 cr.; A-F only; Every Fall, Spring & Summer) This basic course in federal income taxation introduces the student to the Internal Revenue Code and the income taxation of individuals through the following topics: definition of income, relevant accounting concepts, exclusions, deductions, income splitting, sales and dispositions of property, amortization, capital losses, and current issues of tax policy.

LAW 6102. Mergers and Acquisitions. (3 cr.; A-F only; Periodic Spring) This class will cover the theory behind, the Federal and state law governing, and the practice of, mergers and acquisitions. Our main focus will be what a transactional lawyer would want and need to know as to why mergers and acquisitions might occur and how and why companies or shareholders would embrace or disfavor them, how the transactions are documented and how disclosure requirements are met, and what the present cases say.

LAW 6103. Data Privacy Law. (3 cr.; A-F only; Periodic Spring) Every single day, the newspaper contains stories?plural intended?about data privacy and security. Whether they concern the National Security Agency, Facebook, or a data breach at a small business, the handling of personal information has become a central concern of our time. In response, a complex law of data privacy has emerged and now it is a fast growing area of legal practice. This course will equip students to counsel clients about an array of federal, state, and international legal requirements while also analyzing them critically and thinking about the societal challenges posed by new information technology. Assessment will include group projects and a take-home final.

LAW 6104. Legal Writing II. (1 cr.; A-F only; Every Fall) This course provides additional instruction in the legal analysis and legal writing concepts covered in the first-year legal research and writing course. Students will meet individually and in groups with the instructor and will have multiple short assignments.

LAW 6105. Advanced Statutory Interpretation. (2-3 cr.; A-F only; Every Spring) General principles that courts/lawyers use in interpreting statutes. Canons that refer to statutory text, legislative history, administrative agency interpretation, various sources of public policy.

LAW 6106. Federal Tax Procedure. (2 cr.; A-F only; Every Fall & Spring) Overview of all major IRS functions including returns selection, examinations, administrative appeals, tax litigation, collection activities
(liens and levies), bankruptcy, and criminal tax enforcement. Effective representation of clients in all phases of IRS encounters.

**LAW 6107. Bankruptcy.** (3 cr.; A-F only; Every Spring) After surveying the rights of creditors and debtors under state law, this course will consider the impact of bankruptcy upon secured and unsecured creditors and stockholders. The bankruptcy trustee's avoiding powers will be studied. Chapters 7, 11, and 13 liquidations and reorganizations will be surveyed with selected topics considered in-depth. The negotiated settlements and ? workout agreements? which characterize this area of practice will be emphasized.

**LAW 6109. Creditors' Remedies/Secured Transactions.** (3 cr.; A-F only; Every Fall & Spring) This three-hour course examines the full array of state-law remedies available to secured and unsecured creditors in the collection of debts and also examines the correlative procedural and substantive rights of debtors in shielding their assets from creditors? claims. The course focuses, however, on the rights and duties of parties to secured transactions under Article 9 of the Uniform Commercial Code. Primary attention is given to the ordering of claims when the debtor has insufficient assets to satisfy all of her debts and also when she files, or is forced into, bankruptcy. Throughout the course students will practice statutory interpretation; consider the relationship among sources of law (including the law of the parties? agreement, enacted law, and common law); argue about the proper roles of the legislator and judge in making law; and debate a variety of other jurisprudential issues (and some social/policy issues, too) that transcend the substance of the law of creditors? rights.

**LAW 6111. Lawyers in Film.** (2 cr.; A-F only; Periodic Spring) Influence Hollywood has had on how society perceives lawyers, legal profession, ethical standards of the legal profession. Critically evaluate films/television programs, identify ethical issues, gain increased understanding of role in society played by lawyers/legal system.

**LAW 6113. Construction Law.** (2 cr.; A-F only; Periodic Fall) The construction industry, comprised of owners, lenders, architects and engineers, contractors and subcontractors, material suppliers, sureties and insurers, by many measures is the largest production industry in the U.S. This industry-oriented course will address (1) the complex world of construction, (2) the climate that leads to controversies, (3) the application of legal principles to the complex factual contexts of the construction process, (4) contract formation and administration issues involved in the process, including project delivery methods, contract types, allocation of risk, implied warranties, competitive bidding and contractor selection procedures, changes and extras, differing site conditions, schedule delay and disruption, bonds and suretyship, insurance, and claims of many types, and (5) how disputes are resolved through mediation, litigation, and arbitration.

**LAW 6114. Partnership Taxation.** (3 cr.; A-F only; Every Spring) Federal income taxation of partnerships and limited liability companies including formation, operation and management, distributions, allocations, sales and liquidations of entity interests, and terminations.

**LAW 6115. Civil Litigation: Case Development and Discovery.** (2 cr.; A-F only; Periodic Spring) Much of what civil litigators do involves case development. Case development is a form of storytelling. The story, of course, should be persuasive, but it must also satisfy the requirements of applicable law, and it must be based upon admissible evidence. An integral part of case development is discovery. The Rules of Civil Procedure, specifically Rules 26 through 37, set forth the scope and types of discovery that may be conducted. Yet, depending upon the nature of the case, questions relating to what forms of discovery are appropriate, in what order, and for what purposes cannot be found in the rules. The goal of this course is to teach the student how to think both strategically and tactically with regard to case development and discovery. You will be introduced to basic (and some advanced) concepts and skills relating to ? designing? and ?building? the case, including through discovery practice. In addition, you will participate in a number of skills-related exercises.

**LAW 6116. Pretrial Skills.** (2 cr.; A-F only; Every Spring) This course focuses on pre-trial advocacy skills. Practically every lawyer interviews and counsels clients and engages in negotiation of transactions or resolution of disputes. Theoretical and practical exploration of these topics and other topics including fact development and case planning, alternative dispute resolution, discovery and motion practice form the basis for this course. Each topic will be explored with readings and simulated exercises. Specific topics may vary from year to year.

**LAW 6119. Sem: Criminal Prosecution Appeals.** (2-3 cr.; A-F only; Every Fall) Basics of appellate practice pursuant to MN Rules of Criminal/Appellate Procedure. Present oral arguments to panel of experienced appellate practitioners. Course taught by County Attorney representing state of MN in criminal appeal pending before MN Court of Appeals.


**LAW 6126. Water Law.** (3 cr.; A-F only; Periodic Spring) This course examines the legal mechanisms by which society allocates and protects its most vital natural resource: water. The primary emphasis is on current legal and policy issues, but the course also addresses the historical development of water policy and water law in the United States. Topics include: the riparian and prior appropriation doctrines and modern administrative permitting schemes governing private uses of surface water and groundwater; public rights in water resources; federal and state water resource development, allocation, and control; alternative means of responding to the growing scarcity of fresh water and adapting to changes in the hydrological cycle due to climate change; the appropriate role for market-based approaches; allocation and protection of groundwater resources; environmental limits on water development, including the Endangered Species Act, Clean Water Act, and public trust doctrine; tribal water rights; the doctrine of federal reserved water rights; mechanisms for resolving or avoiding conflicts over transboundary water resources.

**LAW 6133. Data Compliance Practicum.** (1 cr.; S-N only; Periodic Spring) The enormous growth in the importance of data privacy law over the past ten years has created opportunities for attorneys with expertise in this fascinating and fast-moving field. The Data Privacy Practicum aims to prepare students who may wish to specialize in the area with real-world exposure to practice and credentials that demonstrate readiness for its challenges. Students will 1) study for and take an exam overseen by the International Association of Privacy Professionals that will entitle them to become Certified Information Privacy Professionals?many attorneys working in this area display the ?CIPP? credential proudly on their business cards and bios, demonstrating its reputational value; 2) shadow a privacy professional in the Twin Cities working in organizations such as Target, 3M, US Bank, Cargill, Optum Health, and major law firms; 3) attend six proseminar sessions with guest speakers practicing in the field; and 4) research and write a short paper tackling an important problem in current data privacy law.

**LAW 6151. Estate Planning.** (3 cr.; A-F only; Periodic Fall & Spring) This course will cover both tax and non-tax considerations in estate planning. In light of the doubling of the federal estate tax exemption to $11,180,000 in the 2017 tax reform act, the course will cover the changes that may need to be made in many existing estate plans to adapt to the new provisions. Other topics covered include use of revocable trusts, retirement benefit planning, life insurance planning, charitable gift planning, and ethical considerations in estate planning.

**LAW 6152. Federal Jurisdiction.** (3 cr.; A-F only; Periodic Fall & Spring) This three-credit course will cover approximately half of a traditional five- or six-credit "Federal Courts? curriculum; the other half is covered in LAW 6120 Federal and State Courts. Students may take either course or both courses, in any order. This course will explore issues that were raised in Constitutional Law and Civil Procedure regarding federal courts and the interactions
between the federal and state judicial systems. Topics discussed may include Congressional power over jurisdiction, legislative courts, justiciability, appellate jurisdiction, Supreme Court review over state court decisions, and general principles of federal subject matter jurisdiction. This course is important for anyone planning a judicial clerkship or a legal career that includes litigation in federal courts.

**LAW 6153. Wills and Trusts.** (3 cr.; A-F only; Every Fall)
This course is about people, living and dead, their relationships, and their property. More specifically, it is about the rights of property owners to pass their property on to others when they die. This is the law of succession. American law on this subject is based on the principle that you can’t take your property with you when you die, you are free to direct what happens to it thereafter. The course is a survey of the law and policy supporting that principle and the limits on it. It aims to acquaint you with the pleasures and pitfalls of practicing in this area and therefore we will be interested in drafting and professional responsibility as those issues arise throughout the course.

**LAW 6159. Education Law and Policy.** (3 cr.; A-F only; Periodic Fall)
The Supreme Court has famously said that education is perhaps the most important function of state and local governments. And Americans consistently rank K-12 education as one of the most important issues they want policymakers to address. Yet K-12 education is also one of the nation’s most contentious policy arenas. Education law stands at the center of these policy debates, and in this seminar students will be exposed to the many ways in which K-12 education is shaped by law and policy. Topics to be covered include: the structure of education law and governance; school finance; the interplay of federal, state, and local laws; and union and public schooling: charter schools and school choice vouchers; school boards; segregation; students’ rights; and teachers’ rights and teacher unions. In addition to case law, students will consider policy perspectives on school reform. Several guest speakers are planned. Students will be required to complete a paper (minimum 25 pages), as well as be active participants in course discussions.

**LAW 6200. Remedies.** (3 cr.; A-F only; Periodic Fall)
This is an extremely practical course. It is about what will make you, as a lawyer, valuable to your clients. Plaintiff litigates to get a remedy; defendant litigates to avoid having to provide one. Clients will consult you and pay for your services because of your ability to achieve results for them. This course tells you what a court can do for a client who wins and what the court can do to a client who loses. In it, we will explore the fundamental remedies -- damages, injunctions, restitution, and declaratory relief. The questions we will ask throughout are what can the plaintiff (or the defendant) get? Why that and not something else? Which of the available remedies or defenses is best? What are the strategic and practical ways to achieve the desired result? Remedies integrates threads from different parts of the law school curriculum and is a good vehicle for testing theories of what law is all about.

**LAW 6201. Land Use Planning.** (3 cr.; A-F only; Every Fall)
Public control of land use and development and its constitutional limitations.

**LAW 6202. Conflict of Laws.** (3 cr.; A-F only; Every Fall & Spring)
Suppose a company in Minnesota contracts with a company in California to do some work on a construction site in New York and the laws of the three states are different on a critical issue of contract law? How would a court decide which state’s law would govern? Does it matter in which state the lawsuit is brought? Would the considerations instead be different if the underlying issue was a matter of tort? Or property? These are issues of choice of law, the primary focus of the Conflicts course. The course also considers the circumstances under which an American court is required to enforce, without questioning the merits, a judicial decision given by another state or country. This is a vital course not only for prospective litigators but also for transactional lawyers. Lawyers who have not taken this course are unlikely even to be able to spot the critical issues.

**LAW 6203. Labor Law.** (2 cr.; A-F only; Every Fall)
This course focuses on the system of federal law regulating labor-management relations. The course examines the law and strategy of labor organizing, collective bargaining, and economic action in labor disputes as well as of contract enforcement. The course also considers emerging trends of labor law reform and the intersection with other bodies of law, including employment and international human rights law. The course further analyzes how a fundamental tension between collective rights and individual rights has shaped the evolution of doctrine as well as policy debates in labor law. The course includes simulations and experiential projects related to union elections, negotiations, and grievance arbitration.

**LAW 6207. Antitrust I.** (3 cr.; A-F only; Every Fall & Spring)
The course in Antitrust will focus on competition, how that term has been defined by the court and agencies, and the role that competition plays in society. We will study the federal antitrust statutes and the case interpretation and application of those statutes. To put antitrust in perspective, the historical debates, economic action in labor disputes as well as of contract enforcement. The course also considers emerging trends of labor law reform and the intersection with other bodies of law, including employment and international human rights law. The course further analyzes how a fundamental tension between collective rights and individual rights has shaped the evolution of doctrine as well as policy debates in labor law. The course includes simulations and experiential projects related to union elections, negotiations, and grievance arbitration.

**LAW 6212. Legal Malpractice.** (2 cr. [max 3 cr.]; A-F only; Periodic Spring)
Legal malpractice law is a specialized form of tort law that sometimes varies from classic negligence doctrine. This course will focus on teaching the substantive law and helping students recognize and avoid real life risks of legal malpractice exposure and liability.

**LAW 6213. Real Estate Transactions.** (3 cr.; A-F only; Every Fall & Summer)
The course examines the acquisition and development of real property. Topics include listing agreements, purchase agreements, conveyancing, real estate finance and security instruments, foreclosure, mechanics? liens, and forms of real estate development.

**LAW 6214. Insurance Law.** (3 cr.; A-F only; Every Fall)
Insurance is omnipresent in the practice of law because insurance is the primary means by which companies and individuals deal with risks. Lawyers, of course, often make a living either by counseling clients about how to plan for risks or by serving clients whose risks have developed into losses. This course will introduce students to fundamental principles of insurance law and regulation. It will survey the nature and function of insurance, insurance contract formation and meanings, and insurance regulation. We will also look at specific legal issues relating to different lines of insurance, such as property, life, health, and liability insurance.

**LAW 6215. Environmental Law.** (3 cr.; A-F only; Every Fall)

Legal aspects of major environmental problems with emphasis on issues that appear in various regulatory contexts, such as the degree to which environmental quality should be protected; who should bear the cost of enhancing environmental quality; allocation of responsibilities among courts, legislatures, and administrative agencies; the role of citizens; groups; and environmental litigation.

**LAW 6216. European Union Law.** (3 cr.; A-F only; Periodic Spring) International law/issues.

**LAW 6217. Securities Litigation.** (3 cr.; A-F only; Periodic Spring)
This course focuses on SEC enforcement of the federal securities laws and on the express and implied private rights of action under the federal securities laws, including the procedural rules for class action securities litigation. Students will read and critique federal cases, draft complaints, answers, motions to dismiss and other pleadings, and participate in a mock oral argument on their written pleadings. Evaluation will be based on class participation, written pleadings, the oral argument, and a final exam.

**LAW 6219. Evidence.** (3 cr.; A-F only; Every Fall, Spring & Summer)
This course provides an introduction to the use of evidence in litigation, with an emphasis on the Federal Rules of Evidence. Topics may include admission and exclusion of evidence, direct and cross examination, judicial notice, hearsay, expert testimony, burdens of proof and presumptions, and privileged communications.

**LAW 6220. Poverty Law.** (3 cr.; A-F only; Every Fall)
This course reviews constitutional, federal, state, and municipal law as they specifically affect low income persons. Poverty Law I and II cover complementary aspects of the subject. They may be taken independently or in any order. Poverty Law I focuses on government benefits programs and landlord-tenant law, with additional topics including consumer and elder law. Poverty Law II covers complementary areas including consumer and elder law. There will also be discussions about the law for both those students intending to specialize in poverty law and those whose general practice may include public housing law and legal aid office, or serving in public law.

**LAW 6224. Patents.** (3 cr.; A-F only; Every Fall)
This course offers an overview of patent law for both those students intending to specialize in patent prosecution and those whose general practice may include patent litigation and licensing. Topics to be covered include the requirements for patentable subject matter; standards of novelty, utility, and non-obviousness; statutory bars; conception, priority, enablement, and written description requirements in patent procurement; direct and vicarious patent infringement; claims interpretation.

**LAW 6225. Winning Patent Litigation.** (2 cr.; A-F only; Every Spring)
The course focuses on practical litigation strategy in the context of patent litigation. It uses patent litigation as a vehicle for seeing how parties develop a winning strategy for a variety of complex legal issues, including choice of law, personal jurisdiction, subject matter jurisdiction, venue, and certain patent-specific issues, such as claim construction. A general understanding of patent law is helpful but not mandatory.

**LAW 6226. Juvenile Justice.** (3 cr.; A-F only; Every Fall)
Legal, sociological, and philosophical bases of the principal agencies responsible for the control of youthful deviance. Emphasis on the juvenile courts, delinquency jurisdiction, and the procedural and substantive limitations on the courts’ authority to dispose of juvenile offenders.

**LAW 6227. Products Liability.** (2 cr.; A-F only; Every Spring)
This seminar will address all main areas of potential liability in the U.S. before and after the product is sold. This includes design defects, manufacturing defects, defects in warnings and instructions and post-sale negligence. There will also be discussions about product safety regulation in the U.S. and the development of product liability and product safety regulation around the world. Lastly, there will be discussions of liability prevention techniques throughout the course.

**LAW 6228. American Legal History.** (3 cr.; A-F only; Periodic Spring)
This course explores the interaction between law, politics, and culture in American society, concentrating on the period from the Revolution through the New Deal. Topics include: democracy and the rule of law; slavery; the public-private distinction; Civil War and Reconstruction; industrialization; expansion of the federal administrative state; law and the human sciences; crime and punishment; legal education and the role of the lawyer in the American polity. Readings will include primary legal sources, such as treatises, statutes, constitutions, and landmark cases, as well as contemporary religious, scientific, and literary works, which will help to situate the legal materials in broader cultural context. Several secondary sources will also be considered, both for insights into the topics covered, and to illustrate various approaches to legal-historical analysis. The course will encourage critical examination of these sources with the aim of clarifying how law has figured in the history and historiography of the United States. No previous background in American history is assumed.

**LAW 6229. Criminal Process: From Bail to Jail.** (3 cr.; A-F only; Periodic Spring)
Criminal Process examines a variety of procedures governing the prosecution of crime. It covers, in essence, criminal procedure from the time that the police have received a case over to the lawyers. Major topics include: prosecutorial charging discretion, judicial screening, the grand jury, discovery, speedy trial, double jeopardy, plea bargaining, jury selection, jury deliberations, sentencing, appeals, and habeas. This class is sometimes known as ?Criminal Procedure II? because it picks up chronologically where Criminal Procedure ends. Criminal Procedure, however, is not a prerequisite. prereq: Criminal procedure recommended

**LAW 6230. Advanced Torts.** (3 cr.; A-F only; Every Fall)
Study of injuries to relational interests, including defamation, privacy (a relational interest in some contexts, not in others), misuse of legal procedure, business torts, interference with family relations, wrongful death actions, and time permits, no-fault auto compensation system in Minnesota. prereq: Torts

**LAW 6231. Patent Prosecution Practice I.** (2 cr.; A-F only; Every Fall)
Patent Prosecution Practice I is recommended for all students interested in intellectual property and patent law, including students considering practicing in the areas of patent prosecution, litigation, licensing, technology commercialization, and patent portfolio management. The course focuses on U.S. patent practice and is designed to extend the student’s skills. Throughout the semester each student will complete two projects: (1) formulate and draft patent claims for a number of different inventions in view of prior art, (2) develop strategies for responding to a patent examiner according to rules of the U.S. Patent Office, arguing patentability and allowance of a patent application over cited prior art. Each student will be paired with a senior practicing attorney who will act as a mentor, including reviewing drafts and providing candid feedback to the student. Lectures and discussion topics include: Organization and structure of the U.S. Patent Office, - The U.S. patent process including the entire life cycle of a patent from application preparation and filing through examination and
grant, - Formulating patent claims in view of prior art and potential infringers, - Architecting patent portfolios including all types of U.S. patent applications, such as provisional, utilities, continuations and divisions, - Examination of patent applications including responding to Office Actions issued by the U.S. Patent Office, - Inventorship and ownership determination and legal ramifications flowing therefrom, and - U.S. law and regulations governing patent prosecution practice. A technical background is not required to take this course.

**LAW 6232. Patent Prosecution Practice II.** (3 cr.; A-F only; Every Spring)

Patent Prosecution Practice II is recommended for all students interested in intellectual property and, in particular, students interested in advancing their skills and understanding of patent law and practice. Throughout the semester each student will complete three practical and diverse assignments designed to develop the student's skills. Each student will be paired with a senior practicing attorney who will act as a mentor, including reviewing drafts and providing candid feedback to the student. Specifically, in this class, each student will: (1) prepare a complete U.S. Patent Application based on a real invention, (2) write an appeal brief according to rules of the U.S. Patent Trial and Appeal Board, arguing patentability and reversal of the patent examiner in view of an examination history by the U.S. Patent Office, and (3) provide clearance counseling to a client about to launch a new product, including reviewing issued U.S. patents and developing a full non-infringement / invalidity opinion for the client. The course grade is primarily based on these three projects in lieu of a final exam. Lectures and discussion topics throughout the semester include: - skills and strategies for writing patent applications, - appeal practice including brief writing before the Patent Trial and Appeals Board (PTAB) at the U.S. Patent Office, - clearance analysis including invalidity and non-infringement counseling and opinions, - foreign practice including national filings in foreign countries and international filings using the Patent Cooperation Treaty (PCT), including leveraging patent prosecution highways for accelerated examination, - eligible subject matter issues including recent case law and claim drafting tips, - accelerated examination procedures within the U.S. Patent and Trademark Office, - legal and practical considerations of infringement counseling including formulating invalidity and non-infringement opinions, - post grant review and other mechanisms for challenging issued patents before the U.S. Patent and Trademark Office, - patent prosecution related considerations that arise in relation to participation in industry standards organizations, - patent prosecution related considerations that arise in the context of universities and technology licensing organizations, and - design patents.

**LAW 6234. Public Lands and Natural Resources.** (3 cr.; A-F only; Periodic Spring)

Public Lands and Natural Resources studies the expansive body of federal and state constitutional provisions, statutes, rules, customs, and processes that govern the ways individuals, corporations, and federal, state, and local governments interact with federal public lands, state lands, private lands, water, air, wildlife, minerals, and other natural resources. We will study: (1) the history and statutes of U.S. federal public lands, and the past and present conflicts governing those lands; (2) the laws and regulations governing national parks, national monuments, national forests, grazing lands, energy resources, wildlife, and other natural resources; and (3) ownership interests and rights relating to public and private lands and resources. The course will help students gain an appreciation of our relationship with the natural environmental from cultural, historical, and economic perspectives, in addition to a legal perspective.

**LAW 6236. Indian Law.** (3 cr.; A-F only; Periodic Spring)

This course examines the evolution of Indian law from colonization onward as impacted by treaties, executive orders, congressional enactments, and the development of federal common law. Students will gain an understanding and appreciation of one of the more particularized areas of the law, and acquire the necessary tools to become able practitioners within the field. The course will also focus upon the unique historical experience of the Midwest tribal nations.

**LAW 6241. Patent Remedies.** (1 cr. [max 3 cr.]; A-F only; Periodic Spring)

This course provides in-depth coverage of issues relating to remedies for patent infringement. Specific topics may include permanent and preliminary injunctions, ITC proceedings, lost profits, reasonable royalties, FRAND royalties, enhanced damages, attorneys' fees, awards of infringer's profits for design patent infringement, patent marking, declaratory judgments of noninfringement or invalidity, and comparative remedies law.

**LAW 6243. Patent Research and Writing.** (2 cr.; A-F only; Every Fall)

Patent lawyers and agents spend their entire professional careers communicating with clients, patent examiners, judges, colleagues no matter what their individual career paths may be. This course is about the process of research and communicating about patents. In other words, the goal of the course is to teach the building blocks of patent research and communication through multiple practice exercises so the student may repeat the process independently after successful completion of this course. This course leverages free, patent office, and commercial research tools. Deliverables and works include: patent landscape search and report, patentability search and opinion, patent risk search and assessment, patent invalidity search and opinion. Recommended prerequisite: Patents (5224/6224), Patent Prosecution Practice I (5231/6231) or Patent Portfolio Management (5250/6250). Prereq: Law 6224 or 5224

**LAW 6244. Employee Benefits.** (3 cr.; A-F only; Periodic Fall & Spring)

Qualified pension and profit-sharing plans. Qualification, nondiscrimination, limitations on contributions/benefits, treatment of participants/beneficiaries. Emphasizes federal income tax aspects of qualified plans.

**LAW 6245. Interviewing, Counseling, and Negotiating.** (3 cr.; A-F only; Every Fall & Spring)

This course will focus on basic skills necessary for all lawyers. We will discuss and do simulated exercises in each of the skills, focusing on skill development and self-reflection to improve skills. The course will emphasize planning, performance and reflection over a range of civil and criminal cases.

**LAW 6247. Depositions.** (2 cr.; A-F only; Periodic Fall & Spring)

Skills necessary to prepare for, defend, and take depositions in civil litigation under federal rules of civil procedure. Learn-by-doing, skills simulation course.

**LAW 6248. Advanced Patents.** (2 cr.; A-F only; Periodic Spring)

This course will be a continuation of the three-credit Patent Law course. The course will provide in-depth coverage of topics such as remedies (injunctions, lost profits and reasonable royalties, enhanced damages, declaratory judgments, and issues relating to patent marking); appellate review of USPTO decisions; reissue and reexamination; inequitable conduct; inventorship and ownership; double patenting; and patent misuse and related antitrust claims.

**LAW 6249. Evidence Drafting.** (1 cr.; A-F only; Every Fall, Spring & Summer)

This one-credit course is an optional supplement to the 3-credit Evidence course offered as LAW 6219. Students may enroll in this course only if concurrently enrolled in LAW 6219 with the same instructor. The course will provide an opportunity for students to write about evidence issues in various formats (e.g., motions, memos). Prereq: concurrent registration in 6219.

**LAW 6250. Patent Portfolio Management.** (2 cr.; A-F only; Every Fall)

Patent portfolio management is the art of aligning patent strategy with business objectives. In general, the successful portfolio manager must have the ability to transform complex patent information into actionable insights that provide decision-making value to a wide variety of stakeholders. This course introduces students to the various practices and skills that go into building, implementing, and managing a patent portfolio whether from the point of view of a small, innovative, start-up company or a Fortune 500 company in a highly competitive market space.

**LAW 6400. International Environmental Law.** (2 cr.; A-F only; Every Spring)

This seminar will examine issues of international environmental law. Although there is a limited body of older law, most of the topic has emerged during the past half century.

**LAW 6402. Food and Drug Law.** (3 cr.; A-F only; Periodic Fall)
The primary focus of the class will be on the Food, Drug and Cosmetic Act and the FDA. In addition, time will be spent on specific food and drug aspects of other areas of the law. For example, the class will review the special rules and cases in the product liability field relating to food and drugs and the interface between food and drug regulation and subjects such as environmental law, the practice of medicine, and free choice in medical care.

**LAW 6403. Environmental Law Capstone: Brownfields Redevelopment and Litigation.** (4 cr.; A-F only; Periodic Spring)
Legal/practical issues surrounding redevelopment of and litigation over underutilized real property that has been subject to environmental contamination.

**LAW 6405. Labor and Employment Law Capstone.** (5 cr.; A-F only; Periodic Spring)
The course is largely simulation-based. It will provide students with experience integrating diverse areas of workplace law with practice skills and professional ethics. Students will work in teams representing a particular client. The roles of clients and witnesses will be played by a combination of actors and volunteers. Real arbitrators and mediators will play those roles. Claims may include unfair labor practice proceedings before the National Labor Relations Board, employment discrimination and sexual harassment charges before the EEOC, arbitration of employee discipline under a collective bargaining agreement, arbitration under non-union employment contracts, defamation, and claims under FMLA and ERISA. Students may experience interviewing and counseling clients, filing claims with administrative agencies, conducting research, drafting pleadings and legal memoranda, negotiations, discovery, and representing clients in arbitration, mediation and litigation motion practice.

**LAW 6408. Climate Change and Clean Energy Capstone.** (4-5 cr.; A-F only; Periodic Fall)

**LAW 6409. Twin Cities Regional Planning Capstone.** (4-5 cr.; A-F only; Periodic Spring)
Regional development challenges/legal regional regulatory frameworks in areas of housing, transportation, water, air, parks, airports.

**LAW 6411. Legislative Process Capstone.** (5 cr.; A-F only; Periodic Spring)
Field work course designed to teach law students about how the state legislature operates and makes law. It is good preparation for careers in government as legislative staff, agency lawyers, or as elected officials or for work in the private sector in fields where legislative relations are relevant.

**LAW 6412. Environmental and Energy Justice Capstone.** (4 cr.; A-F only; Periodic Spring)
Course focuses on the complex justice issues surrounding (1) environmental harms and benefits and (2) the production and use of energy. These two topics are considered individually, and how they are interrelated.

**LAW 6413. Family Law Capstone.** (3 cr.; A-F only; Periodic Spring)
This capstone course is designed to expose students to the ways in which family law concepts are implemented practically and procedurally. The course will touch on traditional family law topics such as premarital agreements, custody, and property divisions in the contexts that practicing attorneys are likely to encounter these topics. The course will accordingly focus on interviewing potential clients, retaining and using experts, incorporating financial planners and therapists in family dispute resolution, conducting a mediation, and drafting documents such as cohabitation agreements, divorce petitions, settlement decrees, and parenting plans. Assignments will be designed both to prepare students for practice and to capture the way that family law practice is changing to deal with the realities of modern families. The course will offer rigorous practical experience and advanced theoretical and policy discussion.

**LAW 6414. Civil Rights and Social Justice Capstone.** (4 cr.; A-F only; Periodic Spring)
The United States has made significant progress in addressing de facto discrimination, but persistent de facto discrimination and inequality remain. This class focuses on the role of law in making progress against both subtle and overt forms of discrimination in a variety of spheres and settings based on race, ethnicity, class, national origin, gender, sexual orientation, age, disability, and religion. Topics may include the segregation of neighborhoods and schools by race and class; encounters with the police and criminal justice system; how poverty limits access to crucial social goods; the location of environmental harms near low-income communities and communities of color; unequal pay and opportunities for advancement for women in the workplace; access to adequate child care for working parents; barriers to marriage; and treatment of migrants.

**LAW 6490. Patent Law Capstone: Innovation.** (3 cr.; A-F only; Every Spring)
This capstone course introduces students to the principles of successful innovation and the integral role of patents in this process. This is a course in innovation. There are no right or wrong answers. Large companies with very smart people often launch products that fail. Venture capitalists seeking to invest in winners more-often-than-not end up investing in losers. Innovation is an art not a science. There is no "secret formula" that guarantees success. There are simply different tools, skills, methods of analysis and approaches that may or may not work better than others. We will explore the art of innovation and the integral role that patents play in turning an idea into an innovation. Goals: Students will learn how to research complex subject matter across the intersecting domains of business, finance, marketing, science, technology and intellectual property. Students will then develop the ability to present their findings in a clear and concise manner that is understandable to and can be acted upon by a cross-functional audience of high-level decision makers.

**LAW 6601. International Business Transactions.** (3 cr.; A-F only; Periodic Fall & Spring)
International Business Transactions is a three-credit course whose main focus of discussion and study is the private law aspects pertaining to international business transactions, rather than issues of national and international trade regulation. Thus, the course is primarily concerned with private international business law. We examine three basic methods of doing business abroad, namely, the sales of goods (export) transaction, licensing and franchising, and foreign direct investment. The course materials touch upon substantive law in areas as diverse as commercial transactions and the uniform commercial code, antitrust, intellectual property, conflict of laws, civil procedure, contracts, bankruptcy, taxation, and international law. While knowledge or background in these areas is certainly helpful it is not necessary for success in the course and for dealing with the issues raised in the readings or in class.

**LAW 6603. Intellectual Property.** (3 cr.; A-F only; Every Fall)
The intellectual property survey course presents an overview of patent, copyright, and trademark law. At the professor's discretion, the course also may include some coverage of trade secrets, unfair competition, or federal preemption of state intellectual property laws. The course provides an opportunity for students to acquaint themselves with the major branches of intellectual property law, and may be most useful for students who intend to pursue careers in general business law or civil litigation; (2) to specialize in one of the major branches of intellectual property law, such as patents, but who want to develop a basic understanding of the other branches as well; or (3) are interested in learning something about the field before committing to further in-depth study of one or more of its branches.

**LAW 6604. Family Law.** (3 cr.; A-F only; Every Fall, Spring & Summer)
This course examines how the law creates family relationships, regulates their dissolution, and defines the rights and responsibilities of family members. Topics include: limits on who may marry and who may adopt children, divorce and its economic consequences, dissolution of nonmarital relationships, termination of parental rights, child custody and support, surrogate motherhood, domestic violence, and child abuse.

**LAW 6605. Health Law.** (3 cr.; A-F only; Periodic Fall)
This course is a comprehensive introduction to health law. We will investigate the organization of health care delivery in the United States; the nature of the physician-patient relationship;
methods of quality control; responses to harm and error, including through medical malpractice litigation; problems of access to health care; and approaches to cost control. We will also analyze proposals for health care reform.

LAW 6608. Trademarks. (3 cr.; A-F only; Periodic Fall)
The course will focus on U.S. federal trademark law, but will also look at state and international trademark law as well as related areas such as false advertising, publicity rights, and cybersquatting. This course will provide a solid foundation for students interested in practicing trademark law (application, enforcement, licensing, or litigation) or more general intellectual property law. It will also be useful to attorneys who do any work with trademark-dependent industries such as retail sales, advertising, or media and entertainment. Finally and more generally, trademark law offers excellent case studies of the interaction between law, culture, and technology, and of the evolution of traditional doctrine under pressure from rapid changes in surrounding circumstances.

LAW 6609. International Intellectual Property. (3 cr.; A-F only; Periodic Spring)
This course provides an overview of international intellectual property law. Likely topics include (1) a comparison of US and foreign law relating to patents, copyrights, and trademarks; (2) the principal multinational agreements relating to intellectual property, including the Paris Convention, Berne Convention, and the TRIPS Agreement, as well as the implementation of these agreements within the domestic law of the United States and other countries; and (3) other topics such as the protection of indigenous knowledge and the law of judgments, jurisdiction, and choice of law as it relates to intellectual property disputes. It is highly recommended that students enrolling in this course have taken, or be in the process of taking, at least one other intellectual property course. prerequisite: One prior or concurrent intellectual property course.

LAW 6610. Unfair Competition. (2 cr. [max 3 cr.]; A-F only; Every Spring)
This course provides an overview of false advertising and product disparagement under the Lanham Act; the right of publicity; and trade secret law. The course does not provide comprehensive coverage of antitrust, trademarks or trade dress, or consumer protection law.

LAW 6612. Antitrust and Intellectual Property. (2 cr.; A-F only; Every Spring)
This course will address the intersection of antitrust and intellectual property (IP) law, from the early twentieth century to the important disputes of the present day. Topics to be considered will include, among others, Walker Process and sham litigation claims involving IP; tying and bundling of IP rights; unilateral refusals to deal; deceptive conduct before standard setting organizations; patent pools and package licensing; and pharmaceutical patent settlements involving reverse payments. Students are strongly urged, though not required, to have taken or be in the process of taking, either antitrust or an intellectual property course, before enrolling in this course.

LAW 6613. Copyright. (3 cr.; A-F only; Periodic Spring)
This course provides a detailed introduction to the basic law of copyright—traditional copyright subject matter, the concept of originality and authorship, copyright transfers (and terminations of transfers), infringement, and fair use. Copyright law is now important well beyond the entertainment industry, although many of the decisions we study derive from that genre (Humphrey Bogart, George Harrison, J.D. Salinger, Superman, Mickey Mouse, and many other luminaries make cameo appearances in our cases). Copyright has increasingly become a necessary tool of the general practitioner due to the explosive growth in economic value of information-based products, such as computer software, digital networks, and databases. A lawyer ignorant of basic copyright principles will be increasingly handicapped in many areas of practice, such as negotiating technology transfers, drafting contractual rights, developing schemes of protection and privacy, distinguishing criminal from non-criminal behavior, and in litigation. But more important than all that, the cases and materials are lots of fun!

LAW 6614. American Legal Profession. (2-3 cr.; A-F only; Periodic Fall)
Study of American legal profession compared to legal profession in other countries.

LAW 6615. Jurisprudence. (3 cr.; A-F only; Every Fall & Spring)
This course will be a general survey course of the most important ideas, concepts, theorists, and schools of law in contemporary legal philosophy. The course will examine foundational legal questions relating to the nature of law, rights, justice, and punishment; questions relating to the connections between law and morality; and the proper understanding of legal reasoning, legal interpretation, and the role of judges. We will examine different schools of legal thought, including Natural Law Theory, Legal Positivism, Legal Realism, Feminist Legal Theory, and Critical Race Theory.

LAW 6616. Law and Entrepreneurship. (3 cr.; A-F only; Periodic Spring)
Life cycle of entrepreneurial start up business. Legal issues involved. Theoretical, statutory, common law elements. Case/statutory analysis, case studies, presentations, group exercises.

LAW 6617. Antitrust Mergers. (3 cr.; A-F only; Periodic Spring)
Antitrust merger analysis. 2010 Horizontal Merger Guidelines. Recent cases. Supermarkets, pharmaceuticals, health care, telecommunications, standard essential patents, software, insurance, airlines, financial institutions, internet.

LAW 6618. Trial Practice. (3 cr.; A-F only; Every Fall, Spring & Summer)
Selected problems in litigation. Exercises in jury selection, introduction of evidence, expert testimony, direct and cross examination and impeachment of witnesses, opening statements, and closing arguments.

LAW 6619. International Trade. (3 cr.; A-F only; Every Spring)
This course is designed to familiarize the students with the regulatory system of international trade. Through the materials discussed in the course, focusing on the case law and jurisprudence of the WTO/GATT, the course is aimed at understanding the institutional framework of that system and the ways in which it functions. In addition the course deals with a large number of substantive issues to be found on the agenda of international trade scholars and lawyers. While the course is focused on legal theory and doctrine of international trade, we will approach each and every topic from economic and social perspectives. Thus, the course is designed to follow a truly interdisciplinary tour of the relevant subject-matter.

LAW 6620. Community Policy Development. (2 cr.; A-F or Audit; Periodic Spring)
Role of lawyers in community. Complex interactions among legal service providers, nonprofit community-based organizations, community activists in addressing systemic problems.

LAW 6621. Civil Rights: Citizenship and Human Rights. (3 cr.; A-F only; Every Spring)
This course explores an emerging, interdisciplinary field of inquiry that focuses on the relationships between Civil Rights Law in the United States and International Human Rights Law in the global context. Although the two areas represent distinct bodies of law, they also share many important features, objectives, and impediments. By examining the historical emergence of (1) Civil Rights Law in the United States, and (2) International Human Rights Law in the global context, students will gain a better understanding of the critical relationships and intersections between these two important areas of public law. Through an examination of the seminal cases and controversies in these areas, this course will explore the differences between various categories of rights; America’s “exceptionalism” why the United States pursues a strong human rights agenda abroad that is rarely applied in the domestic context; the gains (and losses) that the domestic civil rights movement has experienced in recent decades, among other topics.

LAW 6622. International Business Operation and Negotiation. (3 cr.; A-F only; Periodic Spring)
The course surveys foundational concepts, analytical techniques and practices related to organization and strategic management of multinational firms and cross-border transactions they negotiate with host country governments, firms and non-governmental organizations. The overall aim of the course is to give law students basic proficiency in theories, practices and analytical techniques for understanding why and how multinational firms emerge and organize operations differently, negotiate cross-border transactions
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

**LAW 6623. Integrative Leadership: From Theory to Practice.** (3 cr.; A-F only; Periodic Spring)

Leaders with different skills and from different sectors need to be able to collaborate in new ways to meet challenges ranging from improving public education, to writing smarter and more consistent regulations for healthcare delivery, to humane and effective approaches to current migrant. Integrative leadership is shared leadership of public, private and nonprofit actors or approaches to address complex and significant issues that cannot be effectively addressed by a single entity or technique. This course focuses on key integrative leadership questions and the diverse theories, disciplines, experiences and techniques that can help us answer them. Learning occurs through reading foundational materials, personal leadership coaching, engaging with examples from guest speakers and case materials, and developing a final group project. You will learn to recognize and address integrative leadership challenges and opportunities, and build your own capacity to contribute to integrative leadership through group work and through being exposed to a range of boundary work practices.

**LAW 6624. Strategic Management of Intellectual Property.** (2-3 cr.; A-F only; Periodic Spring)


**LAW 6625. Disability in the Workplace.** (3 cr.; A-F only; Periodic Spring)

This class explores legal issues relating to physical and mental disabilities in the contexts of employment, governmental services, public accommodations, and education. The principal regulatory focus is on the Americans with Disabilities Act. Legal issues under that statute include determining who is disabled, proving discrimination, and the concepts of reasonable accommodation and undue hardship. Other statutes covered include the Family and Medical Leave Act, the Rehabilitation Act, and Individuals with Disabilities Education Act. This course has no written paper requirement, but will have a final examination. There is no prerequisite for taking this course.

**LAW 6626. Complex and Cross-Cultural Negotiations.** (2 cr.; A-F only; Periodic Spring)

Principles, role play of multi-party/-issue, team-based negotiations/conflicts. How to structure ambiguous situations, bridge national/organizational cultures (e.g., alliances, mergers), functions (R&D, finance), institutional contexts (regulators, interest groups).

**LAW 6627. International Tax.** (2 cr.; A-F only; Every Spring)

This course examines U.S. taxation of foreign individuals and corporations earning U.S. source income from activities in this country, taxation of U.S. citizens and residents abroad, taxation of business and investment activities of U.S. persons, companies and subsidiaries operating abroad, foreign tax credits, transfer pricing issues, the use and applicability of tax treaties, and the obligations under U.S. law for U.S. persons to report interests in and transactions with foreign accounts.

**LAW 6628. Advanced Trial Practice.** (3 cr.; A-F only; Every Spring)

This course will be to help students learn to recognize and anticipate a large number of important evidentiary issues which can arise during a trial and to help them learn how to deal with the issues when they arise. Students will perform direct and cross examinations, opening and closing statements, and voir dire. Students will be expected to write brief motions in limine and short memoranda on evidentiary issues to learn to present concise persuasive memoranda to a court before and during trial.

**LAW 6630. Health Care Decision-Making: Markets, Regulation and Bioethics.** (2 cr. [max 3 cr.]; A-F only; Periodic Spring)

This class will focus on health-care decision-making at the beginning and end of life, the role of informed consent, the influence of potential tort liability, the framework for the introduction of new technologies, and the growing impact of medical tourism. It explores the role of lawyers in shaping health care decisions and policy discussions.

**LAW 6631. Employment Discrimination.** (3 cr.; A-F only; Every Fall)

Employment Discrimination. This course considers the principal statutory and constitutional prohibitions on employment discrimination. It focuses most prominently on Title VII of the 1964 Civil Rights Act, which prohibits employment discrimination based on race, color, religion, sex, or national origin. The course considers the basic frameworks for proving discrimination under Title VII and the jurisprudence defining Title VII’s protected classes. The course also investigates newer Title VII fields, such as the law of sexual harassment and pregnancy discrimination. Using Title VII as a basis for comparison, the course then examines the constitutional law of employment discrimination, Title I of the Americans with Disabilities Act (ADA), the Age Discrimination in Employment Act (ADEA), and various state and local statutes addressing emerging issues in employment discrimination law, such as employment discrimination based on weight or attractiveness.

**LAW 6632. Employment Law.** (3 cr.; A-F only; Periodic Fall & Spring)

This course explores the rapidly expanding body of law governing the workplace. The Employment Law course goes beyond the traditional employment fields of Labor Law (union-management relations) and Employment Discrimination to focus on a number of recurring workplace issues. Topics include medical and drug screening, workplace privacy, the emerging exceptions to the employment-at-will doctrine, wage and hour regulation, and occupational safety and health.

**LAW 6633. Public Health Law & Ethics: From Prevention & Emergencies to Bioterrorism.** (3 cr.; A-F only; Periodic Fall)

This course will next focus on levels of implementation and varying points of intervention on BHR issues: a) internal corporate policies, b) socially responsible investment shareholder advocacy and divestment, c) disclosure and anti-corruption laws and sanctions, d) trade

**LAW 6634. Regulated Industries.** (2-3 cr.; A-F only; Periodic Fall)


**LAW 6635. European Union Tax Law.** (2 cr.; A-F only; Periodic Fall & Spring)

The main objective of the course is to explore the fundamentals of EU tax law, in order to give an understanding of the tensions between the objectives of the EU and the Member States’ fiscal sovereignty. Focus will be on the application of the EU law fundamental freedoms in direct tax cases. To some extent, we will also cover the legislative harmonization within the EU in the field of direct taxes. There will be a short introductory part where you will get acquainted with EU law. After that, we will have weekly discussion sessions where we closely study case law in tax matters by the European Court of Justice. You will study 40-50 of the most essential EU tax law cases. From these cases, we will examine how to conceive of EU tax law as a systematic whole.

**LAW 6636. European Human Rights Law.** (2 cr.; A-F only; Periodic Spring)

Introduction to international human rights. Law, policy, process.

**LAW 6637. Business and Human Rights.** (2 cr.; A-F only; Periodic Spring)

This seminar will explore the growing area of law and advocacy around corporate accountability and corporate social responsibility related to international human rights standards. The course has several goals: 1) We will examine the development and content of international human rights standards pertaining to corporations and corporate officers, including state, national and international and regional laws and principles including the UN Guiding Principles on Human Rights and Business. 2) We will next focus on levels of implementation and varying points of intervention on BHR issues: a) internal corporate policies, b) socially responsible investment shareholder advocacy and divestment, c) disclosure and anti-corruption laws and sanctions, d) trade
Feminist theories, critiques, and models for application. Feminist history. Legal issues of relevance to women. Impact of law upon women. Means by which law can be used to redress inequality in larger social arena.

**LAW 6646. Law, Technology, Inequality and Opportunity.** (3 cr.; A-F only; Periodic Spring)
Examine competing arguments followed by examination of particular technological developments/their impact on inequality.

**LAW 6648. International Criminal Law.** (3 cr.; A-F only; Periodic Spring)
This course will cover developments in the prosecution of mass atrocity by international and hybrid criminal tribunals. It will discuss the history and development of the field of international criminal law from Nuremberg to the ICC; the sources of international criminal law; and jurisdiction over the investigation and prosecution of international crimes. The course will examine the elements of the international crimes of genocide, war crimes, crimes against humanity, and aggression. It will also analyze recent developments in international criminal justice, including victim participation, sentencing, and reparations.

**LAW 6650. Advanced Administrative Law.** (3 cr.; A-F only; Every Spring)
This course will study laws and doctrines governing the administrative practices of federal government agencies and judicial review thereof. The course will cover topics including privatization of government functions, presidential supervision and control of agency officials, and various doctrines limiting judicial review of agency actions.

**LAW 6661. Professional Responsibility - General.** (3 cr.; A-F only; Periodic Fall, Spring & Summer)
This course examines the ethical issues that lawyers confront in diverse areas of practice. The primary focus will be on the Model Rules of Professional Conduct and state law. Students will also explore a broader set of ethical questions including how attorney ethics are defined, how they are depicted in pop culture, and what type of conduct lawyers should aspire to in their practice. The course will also consider strategies for reconciling personal values, the law, and the rules of lawyering.

**LAW 6662. Professional Responsibility - Business.** (3 cr.; A-F only; Periodic Fall)
This course is a survey of rules of professional responsibility for lawyers with an emphasis on the rules that apply to lawyers in corporate and transactional practice. Issues covered include client conflicts, representing close corporations and partnerships, representing venture capitalists and entrepreneurs in start-ups, taking stock in lieu of legal fees, representing public companies, Securities Exchange Commission rules of professional responsibility for lawyers under the Sarbanes-Oxley Act, representing banks and other regulated companies, the role of in-house counsel, the responsibility of lawyers for client conduct, and malpractice liability for business lawyers.

**LAW 6663. Professional Responsibility - Civil Trial Lawyer.** (3 cr.; A-F only; Periodic Fall & Spring)
The goal of this class is to learn the Model Rules of Professional Conduct and be able to apply them to situations involving ethical issues, with an emphasis on (but not completely limited to) civil litigation situations.

**LAW 6664. Professional Responsibility - Criminal Law Ethics.** (3 cr.; A-F only; Periodic Fall)
The primary objective of this course is to educate you about the ethical problems facing lawyers and judges in criminal investigations and lawsuits. You will study the lawyer’s morality, the adversary system and the duties of the criminal defense lawyer, client autonomy, the duty and limits of zealous representation, lawyer-client trust and confidence, perjury and the search for the truth, counseling and preparing witnesses, the ethics of cross-examination, judges’ Ethics, conflicts of interest, and prosecutors’ ethics.

**LAW 6665. Professional Responsibility - Government.** (3 cr.; A-F only; Periodic Fall)
Students in this course should become familiar with the ABA Model Code of Professional Conduct and other aspects of the law governing lawyers, as well as with selected statutes and regulations governing conflicts of interest and ethical obligations of United States government employees. Throughout the course, there will be an emphasis on ethics rules, other laws, and practical considerations of importance to government lawyers.

**LAW 6667. Professional Responsibility - Legal Malpractice.** (3 cr.; A-F only; Every Fall)
This course will survey ethics rules governing lawyers with a focus on the interrelationship between the Rules of Professional Conduct and legal malpractice law, a specialized form of tort law that varies in critical aspects from classic negligence doctrine. In addition to teaching the substantive law of legal ethics and legal malpractice, the course will focus on helping students recognize and avoid real-life risks of malpractice exposure and liability.

**LAW 6700. Consortium Study.** (0-12 cr.; A-F or Audit; Every Spring & Summer)
Study at another law school. Prereq: dept consent

**LAW 6701. Criminal Law and Literature: Examining Criminal Practice & Theory through Didactic Fiction.** (3 cr.; A-F only; Periodic Spring)
The aim of this seminar is to examine classic issues in criminal law practice, theory and jurisprudence through the prism of didactic fiction. Class readings are works of fiction and the primary work product is a short story.

**LAW 6702. Legal History Workshop.** (2 cr.; A-F only; Periodic Fall)
This seminar brings in leading scholars engaged in projects at the intersection of law and history. The goal of the seminar is to provide students with an introduction to the field of legal history and an opportunity to
engage with scholars working on innovative projects that span from the ancient to the modern world, covering a range of geographical regions as well. Workshop sessions will be devoted to the presentation and discussion of works-in-progress of the guest scholars. Collectively, their works will encourage students to think comparatively about the role of law in defining the nature and limits of state power, and more broadly about the historical dynamics of law and society, with particular attention to the ways in which law has served not only as a mode of governance, but also as a cultural resource, enabling individuals to contest conventional ideas about race, class, and gender difference, and the very meaning of social justice.

LAW 6704. Seminar: Mass Torts: What They Are and How To Resolve Them. (; 2 cr.; A-F only; Periodic Fall)
Legal dilemma of finding ways to compensate the truly injured while protecting legitimate business concerns.

LAW 6705. Information Governance. (; 2 cr.; A-F only; Every Fall)
Students will explore the values placed on information in the modern corporate enterprise, as well as the risks, costs and challenges associated with governing various forms of information, given the innumerable laws and regulations that apply to information. The purpose of the broad survey is to expose students to multiple disciplines that will undoubtedly affect their careers, and help them to develop a real-world sense of options to enhance risk avoidance, cost containment, and compliance. Students will be exposed to various disciplines related to the management of information, which have traditionally been siloed? or separate ? including e-discovery, privacy, records and information management, and security ? but which increasingly are seen as parts of a greater, integrated whole.

LAW 6706. Punishing Corporations and Governments. (3 cr.; A-F or Audit; Periodic Spring)
To what extent we can be punished or be made to pay compensation, for actions other than our own, but in which we are deemed complicit.

LAW 6707. Intellectual Property Transactions. (; 2 cr.; A-F only; Every Spring)
Intellectual property rights have been described as a "sword and shield." Rights holders are thought to act aggressively by suing or threatening to sue infringers and seeking money damages, irrespective of the holders' marketing and product sales programs. Or they act defensively to protect their current or future market positions by having federal courts enjoin competitors. This course considers a third way: intellectual property rights are also valuable intangible assets that may be bought and sold. In this course, we will explore the principal theories and practices of intellectual property transactions. We will be considering closely the doctrines regulating the assigning and licensing of patent, copyright, trademark, and other intellectual property rights, and we will be questioning critically whether these laws and practices encourage or inhibit commercial activity and innovation. While studying specific transactions in the course, we will be examining the practical uses of intellectual property law to meet commercial objectives.

LAW 6709. Current Agriculture-Environment Issues. (; 2 cr.; A-F only; Periodic Spring)
The seminar will cover selected legal environmental issues related to agriculture. Half the semester will explore the Des Moines Water Works litigation. Filed in 2015 by a water utility, this lawsuit has attracted wide attention, in the farming and environmental communities. It seeks to hold farming accountable for dramatically increased cost of treating water to meet public health standards. Legal issues center on water quality and lead to questions of drainage, fertilizers, pesticides, erosion, irrigation, genetically modified organisms, livestock manure, and antibiotics. Also the course will consider ag/environment/legal aspects of organic farming, air quality, global warming, endangered species, and state and federal farm programs. Attorneys, scholars, and public officials will be invited classroom guests. Students will present their research topics to the class. Readings will be selected portions of texts, articles, & cases.

LAW 6710. Federalism, the Intersection of Law and History. (; 2 cr.; A-F only; Spring Even Year)
Federalism: The relationship between 50 sovereign states and the United States. From the founding of the republic to the present day, federalism issues have vexed the American people, their political institutions, and their judiciaries. Federalism decisions are often driven as much by cultural, social, and political forces as they are by any discernible legal doctrine. This seminar will enable the student to explore how historical currents have shaped the law of federalism, and how the law, in turn, has influenced historical developments. Students will be assigned Supreme Court cases and legislative enactments to research, write about, and present to the class. The topics will look at the legal theories that have informed federalism from Chisholm v. Georgia, 2 US 419 (1793)(whether individual states enjoy sovereign immunity) to Franchise Tax Board of California v. Hyatt, 136 S.Ct. 1277 (2016) (whether Nevada state court, under Nevada v. Hall, 440 U.S. 410 (1979), had jurisdiction over California tax agency).

LAW 6711. National Security Cases in Federal Courts. (; 2 cr.; A-F only; Periodic Spring)
This two-credit seminar will impart to students a good understanding of the unique investigative tools used by federal law enforcement in the investigation of national security cases, and of the ways the federal courts have adapted to the challenges of terrorism and espionage cases. Moving in chronological succession through a national security case, from investigation, to charging and trial, the seminar will cover the Foreign Intelligence Surveillance Act, the Classified Information Procedures Act, the relationship between the intelligence services and law enforcement, overseas operations by United States law enforcement agencies, and custodial interrogation of suspects in the national security context. In the seminar's last two class sessions, students will participate in a simulation of a domestic terrorist incident, at times adopting the perspective of investigators, defense lawyers, prosecutors, or judges. The seminar has no prerequisites or co-requisites. However, in the section of the seminar on custodial interrogation, students who have not completed Criminal Procedure will have to read two additional cases that students who have completed Criminal Procedure will not have to read.

LAW 6712. Complex Criminal Investigations. (; 2 cr.; A-F only; Periodic Spring)
This course examines through experiential learning the law and conduct of modern criminal investigations. In a highly-technological and globalized world, we explore how today's criminal investigations utilize cutting edge investigative techniques, adapt to the huge storage footprint of individuals and corporations, and accommodate our competing interests in personal autonomy and effective law enforcement. We will use as our lens a series of high-profile, complex investigations in the news, including, for example, the internal and criminal investigations of alleged bribery at FIFA, alleged child-endangerment at the Arch Diocese of Minneapolis and St. Paul, insider trading on Wall Street, and the alleged recruitment of teenagers to join ISIS.

LAW 6713. Comparative Legal Professions. (; 2 cr.; A-F only; Periodic Spring)
Globalization has increasingly brought American lawyers in contact with legal professionals in other countries. Most American lawyers have little understanding of how legal training in other countries differs from their own experience as law students nor how much variation in how legal professions are organized from country to country. The purpose of this course is to equip future practitioners with the knowledge and understanding that will facilitate their interactions with legal professionals from other countries. The course will involve a combination of lectures by the instructor, visits by current LL.M students who have practice experience in their home countries, and readings about lawyers in other countries.

LAW 6714. E-Discovery. (; 2 cr.; A-F only; Periodic Spring)
Familiarity with all aspects of e-discovery is no longer optional for new attorneys and courts are increasingly penalizing attorneys who fail to satisfy their e-discovery obligations. The outcomes of many cases turn on a few key electronic documents that can be missed if the e-discovery process is not carefully pursued. This seminar will follow the life cycle of a case, covering topics such as document preservation, collection, search, review, and production. Students will participate in mock client interviews and meet and confers, receive lectures on important topics such as spoliation, and observe demonstrations of available document search and review technologies.
The seminar will also include guest speakers on topics such as an in-house counsel’s perspective on gathering electronic documents.

**LAW 6715. Student Speech: Rights and Regulations.** (; 2 cr.; P-F only; Periodic Spring)

Legal/policy issues around student expression. Hands-on development of course.

**LAW 6716. Magna Carta and the Evolution of Anglo-American Law.** (; 2 cr.; A-F only; Periodic Fall)

This seminar will examine the origins of Magna Carta in historical context, and study its influence and legacy in English and American law. The seminar will cover the underpinnings of Magna Carta and analyze the contents of the ‘Great Charter’, before studying its status as ‘fundamental’ law in early modern England, the role it played in conflicts between monarchy and Parliament, and its formative influence on documents like the English Bill of Rights. We will proceed to analyze the significance of Magna Carta in colonial and Revolutionary America, particularly in early state constitutions, the US Constitution and the development of federalism. Students will study English and American case law relevant to Magna Carta and work with key historical sources in original published form. A unique aspect of the course will be the integration of material from the Law Library’s Arthur C. Pulling Rare Books Collection. LL.M. students may request instructor permission to enroll.

**LAW 6717. U.S. Citizenship: A Legal History.** (; 2 cr.; A-F only; Periodic Spring)

This two-credit seminar is intended to provide students with a broad historical foundation in U.S. citizenship. We will focus on five broad questions: (1) how war, economic transformation, and territorial expansion have reshaped citizenship; (2) how the relationship between state and federal citizenship has changed over the course of U.S. history; (3) how the rights and obligations of citizenship have changed over the course of U.S. history; (3) how race, gender, sexuality, disability, marital status, birthplace, religion, and poverty have shaped access to or enjoyment of citizenship; (4) how refugees and guest workers fit into a nation in which rights rest largely on citizenship.

**LAW 6718. Immigration and Criminal Law: Immigration Consequences of Crimes and Criminalizing Migration.** (; 2 cr.; A-F only; Periodic Spring)

In the last decade, there has been an increased emphasis on using the criminal justice system to help determine who is and who is not suitable to live and work in the United States. This phenomenon has had some increasingly interesting effects as the immigration apparatus has been for most of the history of the United States a civil and agency system. The increased reliance on the criminal justice system has caused some overlap of criminal justice norms including concepts of right to counsel, detention and detention and warrants. At the same time, the prosecution of federal migration crimes has skyrocketed in the same period to the point where the majority of all federal prisoners are imprisoned because of migration crimes.

**LAW 6721. Corporate Bankruptcy.** (; 2 cr.; A-F only; Periodic Spring)

After surveying the rights of creditors and debtors under state law, this course will consider the impact of federal bankruptcy law upon secured and unsecured creditors and other interested parties. We will study the basics of the bankruptcy process from filing to discharge.

**LAW 6800. International Contracts.** (; 3 cr.; A-F only; Every Spring)

Simulated negotiation of complex international sale-of-goods contract, requiring mastery of issues such as choice of law, dispute settlement, payment terms and devices, quality control terms and devices, and shipment terms.

**LAW 6801. Death Penalty.** (; 2 cr.; A-F only; Every Spring)

This seminar focuses on the substantive law of capital punishment and on the procedural aspects of post-conviction proceedings. The course will include an examination of the history of death penalty jurisprudence, the Antiterrorism and Effective Death Penalty Act of 1996, habeas corpus, and state and federal death penalty statutes.

**LAW 6803. Health Insurance and Health Care Reform.** (; 2 cr.; A-F only; Periodic Spring)

This seminar explores the role that private and social insurance play in managing and responding to health-related problems. It focuses on these issues through the lens of the Patient Protection and Affordable Care Act (ACA). The seminar is split into three units. The first unit aims to appreciate the centrality of insurance to health care. It examines how insurance underpins issues regarding access to health care, the increasing cost of health care, and responsibility for one’s health. The second, and most substantial, unit then focuses attention on the ACA. It explores the ACA’s use of public and private insurance mechanisms to attempt to alter health care in the United States. Finally, the third unit of the seminar considers alternative approaches to health insurance reform, and their costs and benefits relative to the approach embodied in the ACA.

**LAW 6804. Government Secrecy.** (; 2 cr.; A-F only; Periodic Fall)

This course introduces students to major mechanisms by which the executive branch of the federal government keeps secrets, including the classification system, the doctrines of executive privilege and state secrets privilege, and prosecuting information leakers. The course also introduces students to some of the major means by which secrecy is challenged, including the Freedom of Information Act, first amendment access and news-gathering claims, and whistleblower protection laws. Throughout the semester, we will discuss a number of recurring themes including the connection between government secrecy and constitutional theories of presidential power, the politics of secrecy and transparency and the role of constitutional discourse in the same, and the costs and benefits of secrecy and transparency.

**LAW 6807. Cooperatives and Collective Entrepreneurship: Law, Policy and Practice.** (; 2 cr.; A-F only; Periodic Fall)

Cooperative and mutual business forms have been widely used for purposes of economic development, workforce development and social innovation. Historic examples include agricultural cooperatives, rural electric cooperatives, insurance mutuals and fraternals, credit unions, health maintenance organizations, housing cooperatives and mutually organized non-profits with significant earned income. This seminar will: 1) illuminate public policy considerations for cooperative forms Explore processes related to formation, governance, operations and distribution; 2) Consider several common and not-so-common practices of this business model; and 3) Discuss and debate the merits of both economic and social ? of coops as a ?double bottom line? business form.

**LAW 6808. Street Law.** (; 2 cr.; A-F only; Every Spring)

Build your understanding of various areas of law and the legal system as you prepare classroom presentations for area high school students. By polishing your ability to explain the law to non-lawyers, Street Law will prepare you to be engaged members of your communities and more effective lawyers. During the Street Law seminar, we will focus on legal topics of interest to teens (and the general public) such as criminal law and procedure, the First Amendment, Constitutional law, the court system, and practical law (juvenile, consumer, employment, cyber). You will also learn teaching strategies including deliberation, case studies, moot court, mini-mock trials, continuums, snap debate and other engaging methods that will transform boring old civics into experiences your students will remember. Equity issues in pedagogy will be examined and tools to address issues will be presented. Street Law students will develop lessons and practice teaching (student presentations) in the seminar’s collaborative learning environment. In addition to the weekly seminar, you will partner with area teachers to share your knowledge in a win-win experience using Street Law lessons developed by you, your classmates, and past Street Law participants. Course requirements are class participation, written work: lessons for each teaching session and one short research paper, 10 hours of teaching which usually occurs during the normal school days throughout the semester. Law students may work in teams. There are no exams. By the end of this seminar you will have discovered the meaning of the education phrase ‘to teach is to learn twice.’ No teaching experience is needed.

**LAW 6809. Seminar: Advanced Intellectual Property: Special Projects.** (; 2 cr.; A-F or Audit; Periodic Fall)

Special projects in intellectual property for students with prior IP coursework.

**LAW 6811. Seminar: Complex Litigation.** (; 2-3 cr.; A-F only; Periodic Spring)
Key concepts/tools required for managing large, complex litigation.

LAW 6812. Statistics for Legal Practice. [2 cr. [max 3 cr.]; A-F only; Periodic Fall] The goal of this course is to prepare students to be knowledgeable consumers of statistics as practicing lawyers. The course will draw on a wide range of cases and other legal issues as examples of where statistics have played a role. The course will cover most core statistical methods, but it does assume some prior familiarity with basic statistics. While the emphasis will not be on the mathematics underlying the various statistical methods covered, the course does presume a willingness to deal with basic algebra. After completing this course, students will be familiar with the broad range of areas of the law and legal process where statistics have played a role, and should be able (1) to understand the kinds of issues that arise in the use of statistics, (2) to read and understand expert reports using statistics, and (3) to ask intelligent questions of their own and opposing experts.

LAW 6813. Seminar: Social Science in Law. [2 cr.; A-F only; Periodic Spring] Relationship of social science to law.

LAW 6814. Racketeering and the RICO Act: Criminal & Civil Liability. [2 cr.; A-F only; Periodic Spring] This course will consider the Racketeer Influenced and Corrupt Organizations Act (RICO), which grabs more headlines and is more sweeping in its application than practically any other federal statute. Originally intended as a weapon against the Mafia, RICO has evolved into a statute used to fight a wide variety of corrupt practices. RICO is also increasingly becoming an important aspect of international business. In 2014, Chevron brought RICO claims against a U.S. lawyer who allegedly bribed foreign officials in order to obtain a multi-billion dollar judgment in a foreign tribunal. RICO, however, has its limits. Courts are beginning to weigh in heavily against RICO’s application to extraterritorial disputes. When RICO claims were alleged in the sex abuse cases against the Catholic Church, courts struck down the claims on the basis that the plaintiffs sought compensation for personal injuries, which are not within the scope of the statute. Enterprise, pattern and causation issues under RICO present some of the most complicated legal questions that any lawyer will ever confront.

LAW 6816. State Constitutional Law. [2 cr.; A-F only; Periodic Fall] Explores the important field of state constitutions and constitutional law in the United States. Topics addressed will include the politics of state supreme court systems and the role of these courts in protection of individual rights and the definition of the American political process. Of importance will be examination of the ways state courts and constitutions adjudicate differently from the United States Supreme Court on a variety of important issues including abortion and privacy, criminal due process, education, taxation, as well as the issues of state power and governmental organization. Please note that this class is taught in very few law schools. This means that this class is a unique experience in learning more about a body of law that will have a dramatic and direct impact upon a lawyer’s daily practice of law.

LAW 6817. Practical Estate Planning. [2 cr.; A-F only; Every Spring] This course will focus on the day to day life of the estate planning lawyer, from the initial client interview and analysis of financial data to the implementation of appropriate planning techniques based upon a client’s situation and assets. Subjects addressed will include: ethical considerations; probate and methods for avoiding it; use of trusts; gift, estate and generation-skipping transfer tax planning; planning with life insurance; planning with retirement assets; planning for charitable gifts and bequests; planning for lifetime gifting to individuals; post-mortem planning and premarital agreements.

LAW 6818. White Collar/Corporate Crime. [2 cr.; A-F only; Periodic Spring] This class will consider the theory and practice of white collar litigation in the criminal arena. We will begin with a survey of basic principles and theories and then turn to the main substantive areas of white collar criminal liability, examining the most common regulatory schemes encountered in the interface between corporations and criminal law: mail and wire fraud, money laundering, RICO, and obstruction of justice. Next, we will discuss practice in white collar defense and prosecution, looking at discovery, plea negotiation and trial challenges unique to allegations of criminal malfeasance in corporate settings. We will examine federal laws, sentencing regulations, and Supreme Court pronouncements that control punishment for common white collar offenses. Finally, we will return to overarching policy questions, considering the role of federal courts in the imposition of criminal liability, and the consequences of overlapping state and federal jurisdiction over white collar offenses, particularly as revealed in the investigation and prosecution of public corruption cases.

LAW 6819. Litigation Finance. [2 cr.; A-F only; Periodic Spring] Litigation financiers provide capital to a party involved in litigation in exchange for a portion of the financial recovery from the lawsuit. For example, a finance group may agree to cover $1mm in legal expenses in exchange for $5mm of the recovery if the lawsuit is successful. If the case loses, the finance group completely loses their $1mm case investment. Litigation finance is completely changing the way lawsuits are financed, yet it is still little understood by a large percentage of the legal world. By understanding this field as a law students, the practicing lawyers will put themselves at a huge advantage going into the practice of law - whether as a solo practitioner, in-house counsel, or working at a major law firm. Further, litigation finance groups are forming every year, and they are looking to hire lawyers that understand the field. This seminar will explore third-party litigation financing from a financial and legal perspective. We will analyze the field in practical terms and from the perspectives of economic theory, public policy, and legal ethics. For the group presentation, students will pitch litigation finance to a theoretical investor and explain how it works and why an investor should supply them with capital. For the final paper, students will prepare a memorandum analyzing a legal case and determine whether or not it is a good investment opportunity from a variety of different perspectives.

LAW 6822. Legislative Process. [2 cr.; A-F or Audit; Periodic Fall & Spring] Examines and tests academic and judicial assumptions and theories about the legislative process.

LAW 6823. Investment Banking. [2 cr.; A-F only; Periodic Spring] The objective of this seminar is to provide an introduction to investment banking and private equity. We will discuss the players, the industry, and how investment banking and private equity provide capital to public and private companies. Using case studies and examples of recent transactions, we will discuss the background, process and ? art? of deals involving investment bankers and private equity professionals. We will spend time discussing the intersection of investment banking, private equity, and corporate law in the context of transactions. What are the respective roles of the lawyers and bankers? How do lawyers and bankers work together with mutual clients on deals on issues like fiduciary duty, valuation, disclosure, and regulation? The seminar will require some interest ? though not necessarily a background ? in basic finance. We will spend time on financing, accounting, and valuation concepts that are helpful for both bankers and lawyers to know in the context of a transactional practice.

LAW 6824. Genetics: Law and Ethics. [2 cr.; A-F only; Periodic Spring] This interdisciplinary seminar will examine the legal, ethical, medical, and scientific issues posed at the cutting edge of biomedical science, focusing on genetics, genomics, and assisted reproductive technologies (ART) in human beings. Topics will include the human genome project; history of eugenics; issues posed by genetic and genomic research; commercialization of genetic research, including issues raised by gene patents; genetic testing, counseling, and screening; prenatal screening and preimplantation genetic diagnosis; the use of genetics in ART; human gene therapy; pharmacogenetics; the privacy of genetic information; and issues of discrimination. Together, the class will work through the scientific, medical, legal, and ethical issues. In each instance, we will evaluate the legal, ethical, and policy challenges posed, critique current approaches, and explore alternative recommendations.

LAW 6827. Women's International Human Rights. [2 cr.; A-F only; Every Spring] This seminar addresses the history and legal context of women's human rights; the UN
Constitution on the Elimination of All Forms of Discrimination against Women (CEDAW) and its impact; gender and human rights in the international system; specific topics such as property and other economic rights, reproductive rights, and violence against women; and the role of nongovernmental organizations in making CEDAW work for women.

**LAW 6828. Law and Cultural Property** (every Fall) Collectors, museums, countries, native cultures, religious groups. New stakeholders’ uneasy fit with traditional, scholarly caretakers. Archaeologists/historians.

**LAW 6830. Corporate Counsel.** (every Fall) Participants will learn the unique challenges of working in-house as corporate counsel with public, private, or nonprofit organizations, developing perspectives and skills to think like and be effective business lawyers and leaders. Students will work individually and in teams to address simulations of problems regularly encountered by corporate counsel, including in areas of risk, compliance and ethics management, governance and the board of directors, leading in crisis, business strategy and planning, international transactions, investigations, litigation management, employment, and intellectual property. Participants may conduct research, draft agreements and memoranda, conduct interviews, negotiate, and develop papers based on practical exercises that are the backbone of the course. Students will explore the three fundamental roles of corporate counsel: a technician, wise counselor, and lawyer as leader. This course involves questions beyond what is legal? and focuses on what is right, using specific illustrations drawn from the contemporary business world.

**LAW 6831. Law, Race, and Social Psychology.** (every Fall) Study of how the law affects race and social psychology.

**LAW 6832. Cybercrime and Cybersecurity.** (every Fall, Spring) This course will cover the key constitutional, statutory, technological, and policy issues regarding computer crime, electronic-evidence gathering (including electronic surveillance), and cybersecurity. The course grade will be determined by a final paper, a brief class presentation based on the final paper, and class participation. Criminal Procedure (LAW 6085) is recommended but not required as a prerequisite.

**LAW 6833. Alternative Dispute Resolution.** (every Fall, Spring) Alternative forms of dispute resolution techniques. Validity of critiques of traditional litigation and court-based responses to these problems.

**LAW 6834. Federal Habeas Corpus.** (every Fall) This course will study the evolution of habeas corpus and how the habeas remedy is utilized in the federal court system today. This study provides students an opportunity to observe how constitutional law, criminal law and procedure, civil procedure and even trial and appellate practice all bear upon the courts’ struggle to apply habeas corpus law to individual cases. The cases studied are representative of the detentions that may be challenged in federal habeas, e.g. enemy combatants in military custody, state prisoners on death row and immigrants in Homeland Security custody.

**LAW 6835. Supreme Courts in Comparative Perspectives.** (every Fall, Spring) This seminar will consider the differences in role and powers of courts in the United States, the European Court of Justice, and other Supreme Courts of more limited jurisdiction. The course will address topics such as agenda setting, case selection, and court procedure.

**LAW 6837. Contract Drafting.** (every Fall, Spring) This seminar will take the contract principles that students learned in their first year and build upon them in a practical way. Students will review and revise contracts, draft sample provisions, draft contracts from "scratch," and discuss options for managing risk through effective drafting.

**LAW 6838. American Indian Law.** (every Fall, Spring) Study of the law and punishment theory (many writers), and Bentham onwards, in contemporary criminal systems of punishment for crime. It examines this seminar concerns normative justifications for punishment, and explores the feasibility of using some of them as agenda setting, case selection, and court procedure.

**LAW 6839. Comparative Antitrust.** (every Fall) The seminar explores the similarities and differences between U.S. and EU antitrust law (usually called "competition law? in Europe), with a focus on the differences. Topics include: 1) An overview of the U.S. and EU antitrust systems. 2) Review of microeconomics. 3) Vertical restraints. 4) Monopolization in the U.S.; abuse of dominant position in the EU. 5) Merger law. 6) Efficiencies as a merger justification. 7) Predatory pricing. 8) Price discrimination. 9) Exclusive distributorships. 10) Loyalty discounts and rebates. 11) Bundled discounts and rebates. 12) Intellectual property related antitrust issues. 13) Microsoft related issues. 14) Dynamic competition (and the ? new economy?). 15) Other matters, including judicial review and orthodoxy. The seminar is designed to assist students in: (a) developing an ability to analyze court decisions involving economic issues; (b) developing an ability to anticipate when EU authorities will substitute noneconomic values for economic ones; and (c) improving their ability to articulate complex issues involving both law and economics.

**LAW 6840. Employment and Family-Based Immigration Law.** (every Fall) Students will learn how to use business, employment, and family-based immigration law procedures and strategies in private practice. These areas comprise more than 60% of the work performed by immigration lawyers, as measured by the 2011 and 2016 American Immigration Lawyers Association Practice Surveys. Students will explore the relationship between federal and state control of immigration and benefits associated with immigration status. They will also explore how to build an evidentiary record that will carry them through administrative and judicial appeals. Students will apply ethical rules to carry them through administrative and judicial appeals. Students will apply ethical rules to carry them through administrative and judicial appeals. Students will apply ethical rules to carry them through administrative and judicial appeals.

**LAW 6842. Advanced Criminal Procedure.** (Spring) This seminar will consider the substantive, procedural, and for systems of punishment for crime. It examines literature in the philosophy of punishment from the early 19th century (e.g., Kant, Hegel, Bentham) onwards, in contemporary criminal law and punishment theory (many writers), and in social theory (e.g., Durkheim, Weber, Marx, Foucault, Waquant), concerning justifications.
for punishing at all, and whom, and how much, and functional questions about the larger social purposes that punishment serves. A focus is on the usefulness of existing paradigms for understanding and justifying such recent developments as restorative justice, community justice, therapeutic jurisprudence, and specialized drug and domestic violence courts.

**LAW 6848. Appellate Advocacy.** (3 cr.; A-F only; Periodic Spring)
This experiential learning course will provide simulation experiences for all phases of appellate advocacy, from post-trial motions through cert. petitions. We will develop case studies based on trials that present numerous issues for appeal, then use these studies as the foundation for exploration of each step of the appellate process. Students will strategize appellate choices, learn the importance of issue preservation, become conversant with Federal Rules of Appellate Procedure, and apply their brief writing and oral advocacy skills. Experienced appellate advocates will work with the students and provide insight.

**LAW 6849. Comparative Theories of Ownership.** (2 cr.; A-F only; Every Spring)
This seminar will examine different philosophies concerning property ownership and the property laws of different countries.

**LAW 6851. Practice-Ready Legal Research.** (2 cr.; A-F only; Every Fall & Spring)
Practice-Ready Legal Research is a simulation course in which students apply legal research methods and techniques to scenarios involving a hypothetical client. Over the semester, students learn legal research concepts, sources, and tools through a combination of lectures, in-class activities, and writing assignments.

**LAW 6853. Law, Biomedicine and Bioethics.** (3 cr.; A-F only; Periodic Fall)

**LAW 6854. Seminar: Biotechnology and Law.** (2-3 cr.; A-F or Audit; Every Fall & Spring)
Private law aspects of the biotechnology industry. Legal/regulatory issues faced by commercial start-ups.

**LAW 6857. Corporate Tax.** (3 cr.; A-F only; Every Fall)
An introduction to Subchapter C of the Internal Revenue Code, the ?crown jewel? of the Tax Code, and the taxation of shareholders and corporations. The class will include an indepth study of Section 351 and corporate formations; the capital structure of a corporation; nonliquidating distributions including dividends and Section 301; redemptions of corporate stock including Section 302; both taxable and tax free acquisitions, including Section 368 reorganizations; and, corporate divisions such as spin-offs under Section 355. The course will not address international transactions, but will attempt to emphasize real world, current corporate tax problems.

**LAW 6858. Principles of Corporate Governance: The Role and Responsibilities of the Corporate Board.** (2 cr.; A-F only; Periodic Fall)
This course will provide students with the tools and understanding to better advise corporate and nonprofit board clients. This course will also help students in their roles as future corporate and nonprofit board members.

**LAW 6859. Conflict Resolution.** (2 cr.; A-F only; Periodic Fall)
Conflict resolution lies at the heart of the practice of law. The temptation for practitioners, however, is to rely on superior knowledge and understanding of a substantive body of law or superior presentation and argument skills to prevail in settling disputes. A more pragmatic approach is to examine why conflict arises and how it can be effectively addressed in both individual and group contexts. This course recognizes that as lawyers all will face conflict not only in their practice, but in how that practice is lived, understood, and refined through relationships with others. Practitioners who master the art of conflict competency, defined as the ability to identify and effectively respond to conflict, will find greater success in both professional and personal realms.

**LAW 6860. Advanced Topics in Labor and Employment Law.** (2 cr.; A-F only; Periodic Fall & Spring)
During the first two months of the semester, this class will examine eight cutting-edge topics in labor and employment law. For each topic, the instructor will first provide an overview of the topic with particular focus on some of the key difficulties and shortcomings of the current legal regime. One or two students will then guide the class through a discussion of possible options for law and policy reform. The students may work as a team or as individuals presenting competing visions. Students will have the opportunity to sign-up for the topic of their choice. Students also will be expected to prepare a research paper of approximately 25 pages in length on a selected labor and employment topic. The instructor will distribute a list of suggested paper topics. Students may select from this list or, with the instructor?s permission, design a topic of their own choosing. Students will present their respective papers during the last month of the semester. The research paper will satisfy both the senior writing requirement and the Labor & Employment Law Core requirement on writing. As a prerequisite for enrollment in this course, students must have taken at least one of the following courses: Employment Law, Employment Discrimination, or Labor Law.

**LAW 6861. International Law Workshop.** (2 cr.; A-F only; Periodic Fall & Spring)
This seminar brings in nationally recognized scholars to the law school to present their current work and provide students with the opportunity to engage with cutting edge scholarship in international law. Workshop sessions will be devoted to the presentation and discussion of works-in-progress of the guest scholars on various topics in international law. The seminar is aimed at exposing students to the world of international legal scholarship and the nature of scholarly debate. Students will be encouraged to develop a thoughtful and critical approach to scholarly work through guided discussions, so as to assist them in developing skills that are necessary to produce high quality scholarship with a view to publication. The course will be assessed on the basis of short reaction papers examining the work to be presented.

**LAW 6863. Public Choice and Regulation.** (2 cr.; A-F only; Periodic Spring)
This seminar uses the methods of law and economics to examine alternative sources of law and to provide some insights on the institutional theory of lawmaking. Part 1 of the course introduces the methodology for the course and some of the fundamental theorems in public choice theory. Part 2 presents the different economic theories of regulation and optimal allocation of regulatory power. Part 3 concludes examining four different methods of lawmaking, described respectively as: (1) lawmaking through legislation (codified law); (2) lawmaking through adjudication (judge-made law); (3) lawmaking through practice (customary law); and (4) lawmaking through agreement (treaty law). The readings and class analysis aim at providing a birds-eye view on public choice and regulation theory from an economic perspective. The readings will shed new light on the important issue of the institutional design of lawmaking, emphasizing the respective advantages and proper scope of application of legislation, judge-made law, customary law, and treaty law in the creation of a legal order.

**LAW 6864. Seminar: Law of Lobbying.** (2 cr.; A-F only; Periodic Spring)
This class is intended to provide students with an understanding of the legal regulations on federal and state lobbying, as well as provide them with practical experience with the profession of lobbying.

**LAW 6865. Law and Economics Workshop.** (2 cr.; max 4 cr.; A-F only; Periodic Fall & Spring)
This seminar primarily consists of presentations by leading law and economics scholars on major issues in law and economics, with a different focus each year. After an introductory session, the seminar will consist of paper presentations by prominent scholars in the field. Students will be required to write short critiques/commentaries on the papers. Students student?s grade will be based 75% on her papers, and 25% on her class participation. As the coverage of this seminar is different each year, students may take this seminar in both their 2nd and 3rd years.

**LAW 6866. Sex Discrimination.** (2 cr.; A-F only; Periodic Fall)
Sex discrimination/legal prohibitions. Modern/historical contexts. Women's legal status before/after rise of first organized women's rights movement. Rise of second women's movement/emergence of heightened
to use what may be the most important non-written tool a communicator can possess: the doctrine of visual design. In this course, we will review: - the principles of visual design, - the fundamental skills of graphic design, - the design cycle process, and - the application of these principles to the legal practice. This course will cover specific strategies for visualizing legal arguments and concepts, including the creation of case organization tools, argumentative graphics, and trial demonstratives. Class assignments will entail drafting and revising the types of documents that you might be asked to create in practice. We will also explore the tools to make a visual advocacy by questioning judges and first-chair lawyers on the most valuable and persuasive use of visual design. We expect you will learn that visual advocacy is not about making boring things look pretty. Rather, it provides a process for enhancing legal communication by improving comprehension and engagement.

LAW 6872. Immigration Law. (3 cr.; A-F only; Every Spring)
This course deals with the history of immigration to the United States, the role of the federal government in regulating immigration, visas for non-immigrants and immigrants, procedures and grounds for removal, asylum refuge status, citizenship, discrimination against aliens, the intersection between criminal law and immigration law, and ethical issues facing immigration lawyers. The course includes in-class lawyering skill exercises such as client interviewing and counseling, participating in an immigration court hearing, and legislative advocacy on immigration reform measures. These exercises are designed to train students in the skills necessary to become successful immigration lawyers.

LAW 6873. Nonprofit Law. (2 cr.; A-F only; Periodic Spring)
This seminar covers the legal requirements and policy implications for nonprofit organizations. Course topics include state law issues related to the formation of nonprofit organizations, nonprofit governance models, director fiduciary responsibilities, liability concerns for directors and volunteers, dissolution, state attorney general oversight, and regulation of fundraising. We will also study federal tax law governing nonprofit organizations, including tax exempt status, classification of charities as private foundations or public charities, deductibility of contributions, challenges and opportunities for charitable organizations to partner with for profit entities and otherwise engage in commercial activities, limits on compensation for executives, and the ability of nonprofit organizations to engage in advocacy. Students will consider best practices for operation and governance of nonprofit organizations and ways to demonstrate accountability to donors and other stakeholders. Prerequisite or Corequisite: Law 6085 Criminal Procedure or Law 6229 Criminal Process: From Bail to Jail.

LAW 6878. Regulating Personal Health Development and Finance. (2 cr.; A-F only; Periodic Fall)
This course is intended to focus largely on the practical aspects of how energy projects are developed, financed, and ultimately put into operation. Students will explore the legal frameworks that regulate how personal health information may or may not be shared and the competing policy goals that often underlie these frameworks: protecting individual privacy enhancing the quality of care. The seminar has three components. It will survey the myriad laws, regulations, and contractual arrangements
LAW 6879. Poverty and Human Rights. (2 cr.; A-F only; Periodic Fall)
This course focuses on how the international human rights legal framework addresses the symptoms and causes of systemic poverty with an emphasis on the practical application of those norms to real-life situations. We will explore what a rights-based approach to poverty eradication means for governments and other development actors and learn how communities and advocates are leveraging human rights law to combat poverty in a variety of contexts. The class will consider a wide range of topics spanning domestic and global poverty; urban and rural contexts; the gendered dimensions of poverty; environmental justice; privatization of public services; threats to the rights to food, water, education, and housing; collective rights of indigenous peoples and peasants; the situation of human rights defenders; and reparations. Students will study primary documents and interact with practitioners working in the U.S. and abroad on litigation, policy advocacy, mobilization, and governance. The coursework consists of simulated advocacy and advisory reports. Students will finish the seminar equipped to bring a working knowledge of the international human rights system to their future roles.

LAW 6880. Campaign Finance and Election Law. (2 cr.; A-F only; Periodic Fall & Spring)
This course will provide students with an in-depth review of federal and state campaign finance and election law. We will begin with a review of the Supreme Court decisions that have shaped the current status of federal election law, most notably Buckley v. Valeo. We will review the cases like McConnell, Austin, and Wisconsin Right to Life and will conclude with Citizens United. Also, the federal component will include an overview of the Federal Election Campaign Act and a review of the powers of the Federal Election Commission and a review of some of its notable advisory opinions. Additionally, a second portion of the class will be devoted to a review of other Supreme Court Chapters 10A and 200-212, the corpus of Minnesota campaign finance and election law. We will review decisions by the Minnesota Campaign Finance Board and review decisions by the Minnesota Supreme Court, as well as those of the Minnesota Federal District Court interpreting Minnesota election law.

LAW 6881. Comparative Laws. (2 cr.; A-F only; Periodic Fall)
The aim of this course is to introduce you to the largest legal system in the world, namely the Civil Law System, which is used by most countries where Common Law doesn’t apply. We will study the basics of Contracts and Torts in the two leading countries, through the French Code Civil (CC) and the German one (BGB). We will make a short introduction to civil procedure, in order to allow you to work on Court decisions in both systems and, by the same time, we will analyze, and discuss, as usual, some Court’s decisions (in English) to familiarize yourselves with the book, in the book, will give you an overview of the subject of each class, and the courts’ decisions will allow us to understand how judges make decisions in the two systems, by comparison to Anglo-American Common Law. The goals are to make you comfortable with the main aspects of contracts and torts laws as well as with Court decisions, their reasoning, how judges justify decisions on given articles of the code and not others.

LAW 6883. Contemporary Issues Facing Courts. (2 cr.; A-F only; Periodic Fall)
This seminar, led by a former Chief Judge of the 4th Judicial District of Minnesota, will address a broad range of challenges facing courts and the innovations in judicial administration and judging that seek to advance the cause of justice. Topics include: courts as organizations; therapeutic justice; understanding case management and its impact on judging and lawyering; court funding and its impact on the delivery of justice; judicial selection and retention; wrongful conviction and other court mistakes; and public satisfaction and dissatisfaction with the courts. Students will explore the topics in class discussion and write papers analyzing one or more court challenges or innovations.

LAW 6884. Seminar: Comparative Constitutional Law. (2 cr.; A-F only; Every Fall & Spring)
Historical background/changes of rule of law, democracy, human rights, market economy. Role that legal profession can play in development of these concepts.

LAW 6885. Advanced Environmental Law. (2 cr.; A-F only; Every Spring)
This seminar will examine current environmental issues through class discussion led by leading public, private, and nonprofit environmental lawyers. Students will prepare two 2,500 word papers during the semester relating to seminar topics. There is no exam. The course will provide students with in depth knowledge of current environmental issues and also introduce them to law and practice as an environmental lawyer.

LAW 6886. International Human Rights Law. (3 cr.; A-F only; Every Fall)
Role of lawyers using procedures of the United Nations, Organization of American States, State Department, Congress, U.S. Courts, and nongovernmental organizations to address international human rights problems. Is there a law of international human rights? How is that law made, changed, and invoked? Problem method used.

LAW 6887. Law of International Organizations. (2 cr.; A-F only; Periodic Spring)
This course will examine the principal issues regarding organizations whose membership is that of states. This examination will scrutinize the legal personality and powers of such institutions; the manner in which the states parties as members participate; enforce decisions through mechanisms; dispute settlement; peace and security undertakings.

LAW 6888. Creative Legal Reasoning. (1 cr.; P-F only; Periodic Spring)
This is a discussion based seminar in which the students decide from the facts of actual cases what the law should be. They use logic, instinct, experience, common sense, and all other mental and emotional processes that are the substance of the law and very much involved in its making. The only forbidden ingredient in the discussions is known or suspected law.

LAW 6889. Laws of War. (3 cr.; A-F only; Every Spring)
This course focuses on two interrelated bodies of law: rules pertaining to the use of force in international law (known as the jus ad bellum) and rules regulating the conduct of hostilities under the laws of international and non-international armed conflict (known as international humanitarian law, the laws of armed conflict, or the jus in bello). The course will cover such issues as the Just War theory, its history and its relevance in the modern world; the general prohibition on the use of force under Article 2(4) of the UN Charter; use of force by the UN: collective security and law enforcement actions; individual and collective self-defense; humanitarian intervention; and nuclear weapons in international law. The course will also consider regulation of the means and methods of warfare focusing on the Geneva and Hague laws: the four Geneva conventions protecting the wounded, sick, and shipwrecked, prisoners of war, and civilians; the means and methods of war, including lawful and unlawful weapons and targets; the law of internal armed conflicts; and asymmetric warfare.

LAW 6890. Rule by Law in China: An Advanced Seminar. (2 cr.; A-F only; Periodic Fall)
This course will take a comparative law approach in discussing the development of legal discourse, and the ever increasing influence of Western jurisprudence, in modern and contemporary China. We will discuss at length the formation of ?Rule by Law? as a ?grand narrative? in its historical context, the controversy around different interpretations of Human Rights, and the burgeoning civil rights movements in the Mainland.

LAW 6892. Comparative Criminal Procedure. (3 cr.; A-F only; Periodic Spring)
This course will study systems in several foreign countries for the investigation, adjudication, and punishment of criminal violations. Primary emphasis will be on civil law? systems in Germany and France, but some attention will also be given to...
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requirements imposed under the European human rights convention. The seminar will analyze the major similarities and differences between American and foreign systems, with emphasis on differing foreign procedures which might be admissible to the American context, to address some of the perceived shortcomings of our system of criminal justice. Reading knowledge of a foreign language is helpful, but is not required; all course materials will be in English.

**LAW 6893. Transitional Justice.** (2 cr.; A-F only; Periodic Fall) This seminar explores many of the real-life dilemmas negotiated around the world in countries emerging from dictatorship and conflict.

**LAW 6894. Seminar: Sentencing Guidelines.** (2 cr.; A-F only; Every Fall) Sentencing purposes, structures (e.g., guidelines), and alternative forms of punishment. Emphasizes need to find effective but less costly alternatives to prison sentences.

**LAW 6895. Seminar: Offenses and Defenses.** (1-3 cr.; A-F only; Periodic Spring) Distinguishing offenses from defenses. Examine several existing criminal defenses.

**LAW 6896. Law and Artificial Intelligence.** (2 cr.; A-F only; Periodic Fall & Spring) Increasingly, the world, and even the law, is being run by self-learning algorithms, autonomous robots, and other technologies that have replaced tasks historically performed by human beings. Brain-machine interface is also on the rise, creating real-life cyborgs. This seminar will explore the many legal implications of this rise in algorithms, artificial intelligence (AI), robots, and brain-machine interface. Through assigned readings, weekly discussion, and engagement with local experts in AI, robotics, and neural engineering, students will explore the many promises and perils of AI. The course will include modules on: how AI is transforming legal practice in areas such as e-discovery; labor market impact of AI; the possibility of non-human adjudication of cases; use of AI to understand legal language; whether robots should have rights; legal and ethical dimensions of brain-machine interface; transhumanism; regulation of self-driving cars and drones; governance of autonomous weapons systems; and how law should address the risk of predictive analytics in determining liability.

**LAW 6897. Game Theory.** (2 cr.; A-F only; Periodic Fall & Spring) Game theory, the analysis of the logic of strategic behavior within interpersonal interactions, offers useful insights into how legal rules affect the way people behave. This seminar introduces what constitutes a game, payoffs, and basic solution concepts, such as the Nash Equilibrium. The seminar focuses on how various models, particularly the prisoner’s dilemma, coordination games, and chicken, can be used to study problems that arise in an array of legal fields, including but not limited to tort, contract, antitrust, bankruptcy, and environmental law.

**LAW 6898. International Bankruptcy.** (2 cr.; A-F only; Periodic Fall) Today's bankruptcy practice seldom centers around one debtor filing one case in a United States bankruptcy court. Most corporations of any size have operations and assets in more than one country. In addition, many troubled corporations are part of a corporation group that includes affiliated entities operating in numerous countries, many of which will file their own insolvency proceedings in their countries of incorporation. The most obvious example of this trend is the Lehman Brothers group of companies: approximately 80 Lehman affiliates commenced insolvency proceedings in 16 countries. International Bankruptcy is a course designed to deal with this world of multijurisdictional insolvency. The course consists of two modules, Comparative Insolvency Law and Managing Cross-Border Cases. The first module covers six cases sessions. After an introductory session explaining the role of insolvency law in national economies and setting out the framework for comparative insolvency law, the module covers insolvency laws of Canada, Brazil and Mexico, Japan and China, England and Western Europe. Common topics include prerequisites that must be satisfied before an insolvency case can be filed, whether an automatic stay of collection and other proceedings exists, how the case is administered (judicial, administrative, or other), and whether the system is focused on liquidation or permits reorganization. We will then turn to Managing Cross-Border Cases. We will devote two sessions to the European Union's insolvency regulation that co-ordinates insolvency proceedings pending in EU nations. Four sessions will analyze chapter 15 of the U.S. Bankruptcy Code. Chapter 15 facilitates cooperation among courts in countries in which related insolvency proceedings are pending. Our final session will focus on the use of chapter 11 by foreign entities.

**LAW 6904. Legal Scholarship for Equal Justice.** (3 cr.; A-F only; Periodic Spring) The Minnesota Justice Foundation (MUF) offers this seminar on applied research designed to address broad legal issues and problems of current importance to poverty lawyers and clients.

**LAW 6905. Military Law and Advocacy.** (2 cr.; A-F only; Periodic Spring) Gain practical knowledge in advocacy, argument and legal writing for civil law practice through application of federal law and regulation to selected military based client scenarios. Topics include Servicemembers Civil Relief Act (SCRA) protections, board of military corrections appeals, military line of duty determinations and appeals, special victims counsel program and client advocacy role. The course is highly practical and will include a number of drafting assignments. Military experience is not required to take this course.

**LAW 6906. Seminar: Public Law Workshop.** (2 cr.; A-F only; Periodic Fall) Public law workshop issues. Focuses on many different areas of public law.

**LAW 6909. Seminar: Criminalization.** (1-2 cr.; A-F only; Periodic Fall) Recent theoretical writings on overcriminalization. Does it exist? How can it be remedied? Douglas Husak’s Overcriminalization: The Limits of the Criminal Law. Twenty-page critical review of Husak’s book. One oral or written presentation.

**LAW 6910. Seminar: Islamic Law.** (2-3 cr.; A-F only; Periodic Fall) Islamic law if one of the oldest systems in the contemporary age. This course introduces the students to Islamic law. The origins of Islamic law, its sources, and major schools of jurisprudence.

**LAW 6911. International Commercial Arbitration.** (2 cr.; A-F only; Periodic Fall) International commercial arbitration is an increasingly important and common means of resolving disputes arising from contracts between citizens or companies from different countries. This course introduces students to the history, philosophy, advantages, process, and ethics of international commercial arbitration, with an emphasis on real cases and practical applications. The course covers differences between international arbitration and domestic arbitration/litigation, national arbitration statutes, agreements to arbitrate, arbitral jurisdiction, procedural rules, discovery/disclosure, hearings, evidence, arbitral awards, enforcement of awards, and ethical issues arising for both arbitrators and advocates in international commercial arbitration.

**LAW 6912. Law Firm Practice and Management.** (2 cr.; A-F only; Periodic Fall) The practice of law is a business as well as a profession. This seminar course provides an introduction to some of the important and developing issues in the business of practicing law, whether as a solo practitioner or in a larger law firm. The topics of study will include developing and retaining clients, finances and financial controls, trends in the legal profession, conflicts of interest and ethical compliance, case handling and administration, insurance and risk management, hiring and supervision of employees, business formation, and law firm governance. Prominent lawyers and law firm managers will serve as guest lecturers and panelists in presenting certain topics.

**LAW 6913. Seminar: Tribal Courts in the United States, an Introduction to Indigenous Peoples Law.** (2 cr.; A-F only; Periodic Summer) Facets of tribal courts in the United States, including their use of diverse legal justifications/sources.


**LAW 6918. Rule of Law.** (2 cr.; A-F only; Periodic Spring) This seminar will examine the concepts and core principles of the Rule of Law. Seminar sessions will be devoted to identifying the
meaning of the terms ?rule of law? and ?
independence of the judiciary.? The importance of a strong and independent legal profession to the rule of law will be discussed. Seminar sessions will focus on such issues as the problem of corruption and the rule of law, the relationship between human rights law and the rule of law, and the challenges of war crimes and genocide. The seminar will explore the relationship between the rule of law and economic development and alleviation of poverty. The seminar will include a discussion of the responsibility of lawyers to support and promote the rule of law within their own country and in other developing countries.

**LAW 6919. Health Care Fraud and Abuse. (; 2 cr. ; A-F only; Periodic Spring)**
Federal, state and local governments are projected to spend $2.4 trillion on health care in 2021. Total public and private healthcare expenditures currently represent approximately 17% of the US GDP. With such high spending levels, opportunities and concerns about health care fraud and abuse are understandably rampant. This course brings practitioner and academic perspectives together to focus on the major civil, administrative and criminal laws that have been used to contain health care fraud and abuse, broadly defined as actions by health care providers (e.g. physicians and physician practices, medical device and pharmaceutical manufacturers, clinical laboratories) that are inconsistent with accepted business and medical practices. These laws include the federal civil False Claims Act, the Stark Act, the federal Anti-kickback Statute and the remedies and civil and criminal penalties available to governmental entities and civil litigants. The seminar will also consider related compliance strategies and the practical compliance issues faced by healthcare providers.

**LAW 6921. Refugee and Asylum Law. (; 2 cr. ; A-F only; Periodic Spring)**
This course will introduce and explore the main concepts, laws, institutions and policies that form the international regime for the protection of refugees. In 2014 the United Nations High Commissioner for Refugees (UNHCR) estimated that there were 51.2 million forcibly displaced persons, including 16.7 million refugees and 33.3 million internally displaced persons (IDPs), a significant increase from 2013. The refugee crisis in Europe, which began in mid-2015 and continues unabated in 2016, has only increased those numbers. Human displacement continues to be one of the most important and intractable human rights issues facing the international community. The course objectives are to: - examine the assumptions, origins and evolution of refugee law and the refugee regime; - understand who is protected from serious harm by international, regional and domestic law; - explore the rights afforded refugees and other categories of forced migrants; - investigate various legal and policy impediments to asylum-seeking; - assess the scope, limits and potential of international co-operation regarding refugees. Overall, the course will examine the relationship between refugee law, international human rights law and domestic law, and will provide students with an understanding of how this relationship affects state obligations toward refugees, asylum-seekers and internally displaced persons. prereq; recommended Law 6011/6071 International Law and Law 6886 Intl Human Rights Law

**LAW 6922. Business Law Concentration. (; 1 cr. ; P-F only; Every Fall)**
This seminar is intended as an introduction and overview for students interested in completing the Business Law Concentration; students in the concentration are encouraged to take the seminar. The course will explore the careers, social roles, and professional obligations of business lawyers in a variety of specialties through readings and in panel sessions with practitioners as well as adjunct and full-time faculty at the Law School. Students will choose and meet with a mentor selected from a group of local business lawyers. Students will review the Law School's business law curriculum, both providing feedback on the courses available and receiving guidance that will help them shape their own trajectory within the concentration.

**LAW 6923. Federal Reserve System - Legal and Policy Perspectives. (; 2 cr. ; A-F only; Periodic Fall)**
The course will cover legal underpinnings of the Federal Reserve System's core responsibilities in monetary policy, supervision and regulation, financial services, and financial stability. The instructors, both lawyers from the Federal Reserve Bank of Minneapolis, will also invite senior officials and policymakers from the Federal Reserve in each of these areas to provide students current perspectives on these mission-critical functions of our central bank. The course will include review of the Federal Reserve Act, the Dodd Frank Act, and related matters, educating students on the nature and extent of Federal Reserve System authority, both as originally conceived and as it has evolved through the 100 years of the Federal Reserve's existence. There will be a particular emphasis on Federal Reserve actions taken in response to the financial crisis of 2007-08 and its aftermath. Following the course, students will have a strong understanding of the nature and extent of the Federal Reserve's authority and an enhanced perspective on banking and the national economy.

**LAW 6924. Creating Effective Legal Arguments in Litigation. (; 2 cr. ; A-F only; Periodic Fall)**
For most attorneys, the practice of law will involve the structuring of legal arguments. This course is intended to give participants the tools to make effective legal arguments by deconstructing the process through which legal arguments are developed and providing an understanding of the logical relationship between the law and the facts.

**LAW 6925. Patent Law Proseminar. (; 1 cr. ; S-N only; Every Spring)**
The field of patent law extends across the boundaries of business, technology, innovation, and law. In this course, students will be introduced to current topics and compelling issues in patent law presented by leading patent and intellectual property law professionals. Students will gain real-world insights from in-house and private practice attorneys and agents, with a focus on patent prosecution and patent litigation.

**LAW 6926. Intellectual Property and Technology Proseminar. (; 1 cr. ; S-N only; Every Fall)**
The field of intellectual property extends across the boundaries of business, technology, innovation, and law. In this course, students will be introduced to a broad range of IP related topics presented by leading practitioners working at the intersection of law and technology. Topics may include trade secrets, copyrights, trademarks, patents, IP transactions, IP litigation, emerging technologies, intellectual asset management, IP valuation and commercialization. Lecturers may include corporate and in-house counsel, firm lawyers, transactional lawyers, litigators, consultants, tech transfer officers, R&D Leaders, and CTO.

**LAW 6927. New Developments in Trust Law. (; 2 cr. ; A-F only; Periodic Spring)**
The traditional area of trust law has experienced a number of new and major developments in the last couple of years and the changes are continuing. The seminar will examine and analyze the effect of these new developments in traditional trust law, including: the New Minnesota Trust Code; the Uniform Trust Decanting Act; a Uniform Divided Trusteeships Act; the Uniform Fiduciary Access to Digital Assets Act; and the Interjurisdictional Recognition of Substitute Decision-Making Documents. This Seminar will enable students who intend to have an estate planning practice or a general practice that includes the drafting of wills and trusts to have an in-depth understanding of these new developments.

**LAW 6928. Cooperative Lawyering and Problem Solving Courts: Lawyers as Peacemakers. (; 2 cr. ; P-F only; Periodic Spring)**
This is a non-traditional seminar for students who are interested in exploring a manner of practicing law broader than the win/lose paradigm of the adversary system. The instructor is a Hennepin County judge with extensive experience in problem solving courts and with the benefits of collaborative law and restorative justice. The course will explore peacemaking opportunities for lawyers at several levels. Practicing lawyers engaged in several varieties of cooperative lawyering will make class presentations. In addition, because effective peacemaking requires personal awareness and self-control, the course will provide an introduction to mindfulness, a fundamental tool for mental health, as well as instruction in basic skills in peaceful communication. The course will examine how some of the lessons about peacemaking apply to political and religious conflict. The early class sessions will introduce students to some of the developments in neuroscience and evolutionary psychology that help explain
the dynamics of human conflict. In addition to background reading to prepare for class sessions, students in this seminar should be prepared to spend 10-15 minutes each day in mindfulness exercises, to observe two out-of-class peacemaking activities, and to participate in experiential exercises in class. Short written assignments are designed to promote growth of the student's peacemaking skills. The class requires an open mind and a willingness to share personal thoughts and experiences.

**LAW 6929. Social Enterprises.** (2 cr.; A-F only; Periodic Spring)

Is social enterprise? is a relatively new concept to describe organizations that sit somewhere between the extremes on a continuum between non-profit organizations and for-profit business corporations. The founders of and investors in social enterprises seek both to earn financial returns and also to advance particular social purposes. Many have argued that traditional legal forms of association, especially the business corporation and the non-profit corporation, do not provide good fits for the purpose of this emerging form. A variety of new legal forms are being developed, including the low-profit limited liability company (L3C), the benefit corporation, and the social purpose corporation. This course explores the challenges facing social enterprises, and how both traditional and new forms of legal associations respond to those challenges.

**LAW 6948. Sports Concussions and the Law: Neuroscience and Liability.** (2 cr.; A-F only; Periodic Spring)

As scientific knowledge about the effects of trauma on the brain has increased, the legal context surrounding brain injury in professional and youth sports has changed dramatically over the past decade. Legal action includes multiple federal class action lawsuits, new sports concussion statutes in all fifty states, new regulations in college and high school, new insurance markets, and a myriad of tort law suits in state and federal court. Many policy recommendations have been proposed, and many reforms have been enacted by sports leagues. The evolving legal landscape for sports concussions thus provides an exciting opportunity to see how law responds in response to scientific advances. This seminar? the first in the country to focus specifically on legal liability and sports concussions? will examine the emerging science, law, and policy of sports concussions. The seminar will feature a number of guest speakers, and will place an emphasis on developing students' legal research and writing skills. Students will be required to complete a 20 page research paper, and no prior knowledge of brain science or sports is required or presumed.

**LAW 6949. Biotechnology & Patent Law.** (2 cr.; A-F only; Periodic Spring)

This course emphasizes patent law principles and doctrines as applied to biotechnology, including pharmaceutical, patents. Although there will be some coverage of United States Patent and Trademark Office policies as well as biotechnology patent principles in non-U.S. jurisdictions, the focus will be on U.S. Federal Circuit and Supreme Court case law developments. Topics include patent eligibility of biotechnological inventions including diagnostics and "natural" products such as genes, claim strategies, written description, enablement, utility, best mode including requirements for biological deposits, inventorship, inherent anticipation, obviousness, infringement, and the intersection of patent and FDA regimes for small molecules and biologics.

**LAW 6960. Judicial Writing.** (3 cr.; A-F only; Every Spring)

This course focuses on developing the writing abilities and practical knowledge of prospective judicial law clerks. The class will center around six writing assignments, which will include a bench memo, jury instructions, trial court order, and several appellate opinions. Only one writing assignment will require a work product gain both 7 double-spaced pages. Most of the reading for the class will consist of materials relating to these six writing assignments, including attorneys? briefing, relevant portions of the record, key precedents, and samples of past materials. Class will also provide students with practical information about how to be an effective law clerk, drawing heavily on guest talks from local federal and state judges and law clerks. Topics will include how to rely on the case record, the importance of understanding local procedural rules, and the centrality of the standard of review.

**LAW 6999. Transfer.** (1-50 cr. [max 100 cr.]; P-F only; Every Fall, Spring & Summer)

Credits received from another law school.

**LAW 7000. CL: Civil Practice.** (3-4 cr. [max 8 cr.]; A-F only; Every Fall & Spring)

The Civil Practice Clinic offers second and third year students an opportunity to gain both practice experience and the satisfaction of representing real clients. The clinic introduces students to the practice of lawyering through a combination of instructional methods. Classroom sessions explore topics such as interviewing, negotiation, counseling, and motion practice. Simulated exercises allow students to apply classroom learning in a life-like setting. Each student handles approximately three cases involving topics such as family, employment, consumer, and administrative law. These cases provide student attorneys with the opportunity to participate in almost all aspects of the lawyering process, including court and administrative hearing appearances. The clinic course is a two semester program. The classroom portion is completed during the first semester. Students earn a total of seven credits allocated between the two semesters.

**LAW 7001. CL: Civil Practice Director.** (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)

Director for civil practice clinic. prereq: dept consent

**LAW 7003. Seminar: Student Legal Writing Instructor.** (2 cr. [max 8 cr.]; A-F only; Every Fall & Spring)

Legal writing instructors for the first-year legal writing students.

**LAW 7004. Seminar: Structured Study Group Instructors.** (2 cr. [max 8 cr.]; S-N only; Every Fall & Spring)

Instructors are assigned to work with single first-year class.

**LAW 7006. ABA Negotiation Competition Team.** (1-2 cr.; P-F only; Every Fall)

ABA Negotiation team participants receive credit for participation in regional competition and one more credit if they advance to national competition.

**LAW 7007. International Humphrey Student Instructors.** (1 cr.; A-F only; Every Fall)

Student instructors help with Law School Humphrey Fellows.

**LAW 7008. CL: Insurance Law.** (2-3 cr. [max 6 cr.]; A-F only; Every Fall)

The Insurance Law Clinic offers students an excellent opportunity to learn litigation skills and insurance basics while effectively and confidently representing individuals during all stages of an insurance claim and/or dispute with an insurer. Work includes investigating, preparing and rendering an insurance claim, writing demand letters to insurers, drafting litigation pleadings, including complaints, discovery documents, motions, briefs, settlement agreements and other court documents, dealing with clients and opposing counsel, and courtroom litigation and ADR. The clinic's coverage cases deal with many types of insurance, including: auto liability, homeowner's property, health and disability, life, and commercial general liability (CGL). Through classroom instruction and case supervision, students learn the basic concepts and legal principles involved in property and liability insurance, and they will gain experience in a broad range of practice skills, such as negotiation, legal writing, case investigation, mediation, client counseling, and state court practice.

**LAW 7009. CL: Insurance Law Directors.** (2-3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)

Students work with Insurance Law Clinic

**LAW 7010. CL: Innocence.** (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)

Students work side-by-side with staff attorneys from the Innocence Project of Minnesota (IPMN) as they investigate and litigate inmates' claims of actual innocence. These investigations go to the heart of current issues in the criminal justice system, such as the reliability of eyewitness identification, the problem of false confessions, the use of snitches and informants, government misconduct, ineffective assistance of counsel, and forensic sciences including DNA testing. Class time is devoted to training and case work. Students are assigned cases and expected to gather source materials such as police reports and transcripts. They will organize and summarize those materials. After educating themselves about their cases, students will design and implement an investigative plan with their supervisor and pursue that investigation. This may include locating evidence, experts and witnesses. If proof of innocence is developed they may
draft post-conviction motions. Interested students may also participate in policy work. This clinic puts students on the cutting edge of scientific and social science issues that affect the practice of law in the criminal justice system as well as hands-on experience in managing and analyzing large-scale cases for litigation.

LAW 7011. CL: Innocence Project Director. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall) Student director for Innocence Clinic.

LAW 7012. CL: Environment and Energy Law. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) The Environmental Law Clinic is a client-driven course based on representation of nongovernmental organizations. This Clinic will improve your skills in analyzing problems in environmental law and policy, and allow you to work directly with advocates on environmental issues. Our clients are typically nonprofits or other nongovernmental entities seeking legal advice on advocacy in the legislative or regulatory arenas related to a wide range of environmental issues, including clean water, renewable energy, utilities law and concentrated animal feeding operations. This year-long Clinic engages in projects related to achieving environmental and energy sustainability through the management of land, water and energy resources. Projects often include the following: (1) providing advice to local NGOs; (2) representation of NGOs before an administrative state body; (3) production of legal research reports; (4) support organizations participating in regulatory decision-making processes, such as the Public Utilities Commission; and (5) education or advocacy presentations to citizens and elected or appointed decision-makers. Client management skills and legal research methods are honed throughout the year-long projects.

LAW 7013. CL: Environment and Energy Law Directors. (2-3 cr. [max 6 cr.]; A-F only; Periodic Fall) Directors for environment and energy law clinic.

LAW 7015. CL: Employment Law. (2 cr. [max 3 cr.]; A-F only; Every Fall & Spring) The Employment Law Clinic provides student attorneys with a unique look at both sides of the employment relationship through litigation representation of individual employees and transactional counseling of nonprofit employers. Student attorneys are introduced to the employee's perspective through litigating unemployment insurance (UI) appeals. These appeals require full representation, including client interviewing, counseling, preparation and execution of direct and cross examination, as well as closing statements. Student attorneys interface with the DEED website on behalf of the client, represent the client in the telephonic appeal hearing, and manage every aspect of the lawyer/client relationship with the assistance of a supervising attorney well-versed in the management of these cases. Recommended course: Law 6632 Employment Law

LAW 7016. CL: Employment Law Directors. (2 cr. [max 4 cr.]; A-F only; Periodic Fall & Spring) Student directors with Employment Law Clinic and their cases.

LAW 7017. International Humphrey Fellow Student Instructor. (2 cr.; A-F only; Every Fall & Spring) Facilitate collaboration between international human rights professionals/U.S. law students. Provide students with human rights research, writing, networking. Humphrey Fellows assist twelve Hubert H. Humphrey Fellows hosted by University of Minnesota Law School/Human Rights Center.

LAW 7018. Intercollegiate Trial Team. (2 cr.; A-F only; Every Spring) Students compete in trial teams, prerequisite: Trial practice

LAW 7025. NAAC/ABA Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) The ABA/NAAC competition team is composed of four to six 3Ls, chosen from the participants in the Civil Rights/Civil Liberties Moot Court, based on performance in the Maynard Pirsig Honors Tournament. The ABA/NAAC holds regional competitions across the country and the national finals are in New York City.

LAW 7026. NAAC/ABA Competition Director. (1-2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) Director for NAAC/ABA moot court competition. prerequisite: dept consent

LAW 7027. ABA Moot Court Competition Managing Director. (1-2 cr. [max 3 cr.]; A-F only; Every Fall & Spring) Managing director for ABA moot court. prerequisite: dept consent

LAW 7028. Thurgood Marshall Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) The Civil Rights/Civil Liberties Moot Court (formerly Maynard Pirsig) focuses on practical writing and oral argument exercises common in modern litigation. In the fall, student work on portions of, and then a full, appellate brief. This work is followed by oral arguments. In the spring, students continue to work with the same law and facts in an appellate venue. They rewrite the appellate brief and advocate in three rounds of oral arguments, including one round in front of a panel of skilled Twin Cities attorneys. Recent topics have included First Amendment rights in public schools, a gay-straight alliance's ability to organize under the Equal Access Act, constitutionality of law school affirmative action programs under the Fourteenth Amendment, and search and seizure of student cellphones. Students work in five to eight small sections of about 8-10 students, each taught by an experienced attorney and a third-year student director. After participants complete the required writing and oral arguments (usually by the first week in March), directors nominate the "Best Brief" from each section for the best brief tournament. Similarly, the "Best Oralist" is selected from each section for the Maynard Pirsig Honors Oral Competition, a bracket tournament that culminates in a final oral argument in front of justices of the Minnesota Supreme Court. The Thurgood Marshall Moot Court competition team is composed of two 3Ls and two 2Ls, chosen from the participants in the Maynard Pirsig Moot Court. The 2L participants are selected during the fall of their second year; the 3L participants are selected during the spring. The 2L participants compete on the team during their second year and then direct the Competition Team in their third year. The 3L team competes in the spring of their third year. The Thurgood Marshall Moot Court is unique in that every round takes place in a courtroom in Washington D.C., and it coincides with the midyear meeting of the Federal Bar Association. prerequisite: Students must be enrolled in LAW 7055 Civil Rights/Civil Liberties Moot Court.

LAW 7030. CL: Consumer Protection. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) The Consumer Protection Clinic represents individuals who are victims of marketplace fraud or who have disputes regarding consumer credit, debt collection, motor vehicle fraud, predatory lending or similar matters. The Clinic also assists legislators, regulators, and advocacy groups in policy matters, such as drafting consumer protection legislation. The Clinic participates in impact legislation by initiating and acting as co-counsel in class action or related matters.

LAW 7031. CL: Consumer Protection Directors. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) Student instructors for consumer protection clinic.

LAW 7035. Environmental Law Moot Court. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) Introduction to appellate advocacy. Current topics in environmental law. Intramural competition leads to selection of team to represent University of Minnesota law students in the national finals are in New York City. The Clinic involves oral advocacy, writing, networking. Humphrey Fellows hosted by University of Minnesota Law School/Human Rights Center.

LAW 7036. Environmental Law Moot Court Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) Director for environmental law moot court. prerequisite: dept consent

LAW 7037. Jeffrey G. Miller National Environmental Law Moot Court Competition. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) Environmental law moot court competition team member. prerequisite: dept consent

LAW 7038. Environmental Law Moot Court Managing Director. (1-2 cr. [max 3 cr.]; A-F only; Every Fall & Spring) Environmental law moot court managing director. prerequisite: dept consent

LAW 7040. CL: Community Mediation. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) The Community Mediation Clinic offers 2Ls and 3Ls the opportunity to learn from mediation practitioners and participate as civil mediators in community and court cases, to serve as facilitators in restorative justice conferences and to create and present trainings in community conflict resolution education programs. The U is one of only a handful of the...
nation's top law schools presently offering this type of clinical program. Conflict Resolution Center (CRC), one of Minnesota’s oldest non-profit mediation organizations, offers a comprehensive mediation clinic. Students who successfully complete the Fall course will be eligible for the Minnesota Rule 114 Roster of Qualified Neutrals and enroll in the Spring clinic. This course features classroom instruction and interactive exercises. It emphasizes the facilitative model of mediation while providing a survey of other mediation styles and models. Topics covered include: conflict theory, styles of conflict resolution, statutes and rules governing mediation, ethical considerations, cultural considerations in mediation and the applicability of facilitative mediation in housing, family, and harassment courts, schools, businesses, and employment work. Classroom time is split between lecture, discussion and interactive role plays and exercises with coach/instructor feedback.

**LAW 7041. CL:Community Mediation Directors. (2-3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)**

Student directors for Mediation Clinic. Fall 3 cr; Spring 2 cr.

**LAW 7042. CL: Federal Immigration Litigation. (3-4 cr. [max 8 cr.]; A-F only; Every Fall & Spring)**

The Federal Immigration Litigation Clinic is part of the James H. Binger Center for New Americans and will teach second and third year students to effectively represent clients in federal impact immigration litigation. The clinic lasts a full academic year. Cases may include appellate litigation before the U.S. Circuit Courts of Appeals, U.S. Supreme Court, and Board of Immigration Appeals, as well as litigation before U.S. District Courts and immigration courts. Cases may deal with asylum and related issues, challenges to the unlawful detention of immigrants, as well as the intersection of immigration and criminal law. Students will also learn about the substance and process of immigration policy making, at both the legislative and administrative levels, and may engage in immigration policy outreach and advocacy projects that advance the Binger Center’s priorities for systemic change in immigration law. Through classroom instruction and case supervision, and working in case teams, students will learn substantive immigration law, administrative and federal rules of procedure, and a broad range of skills important to the effective representation of clients in federal immigration litigation, including: client contact and communication, case management, legal writing and drafting, oral advocacy, courtroom skills, legal ethics, communications and negotiations with opposing counsel, case analysis / vehicle selection, and case strategy / coordination with co-counsel, allies, amici, and media.

**LAW 7043. CL: Federal Immigration Litigation Director. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)**

Director for Federal Immigration Litigation Clinic.

**LAW 7045. ABA Journal of Labor and Employment Law Editors. (2 cr. [max 4 cr.]; S-N only; Every Fall & Spring)**

Intensive instruction in brief writing, appellate advocacy in context of labor/employment law. Students direct work of second-year students and participate in national competition held annually in New York. prereq: 3rd yr, dept consent

**LAW 7046. ABA Journal of Labor & Employment Law: Research & Writing. (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring)**

This course provides an opportunity to research and write a journal note under faculty supervision. Each student will write an outline and at least three drafts, and will also orally present and answer questions about their note. The course is required for and open only to staff members of ABA Journal of Labor & Employment Law.

**LAW 7047. Wagner Moot Court Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

National Wagner Moot Court competition in New York Law School.

**LAW 7055. Civil Rights/Civil Liberties Moot Court. (1 cr. [max 2 cr.]; A-F only; Every Fall)**

Students prepare memoranda, briefs, and arguments in a moot court case. Tutorial instruction in legal analysis, legal writing, and oral argument. Intramural moot court competition judged by prominent members of bench/bar. Team of students selected to represent the University in ABA Moot Court Competition. prereq: JD student

**LAW 7056. Civil Rights/Civil Liberties Moot Court Directors. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Director for Civil Rights/Civil Liberties Moot Court. prereq: dept consent

**LAW 7057. Civil Rights/Civil Liberties Moot Court Research Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Research director for Civil Rights/Civil Liberties moot court. prereq: dept consent

**LAW 7058. Civil Rights/Civil Liberties Moot Court Managing Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Director of Civil Rights/Civil Liberties Moot Court team.

**LAW 7065. National Moot Court. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Preparation, substantial editing, and rewriting of appellate brief. Oral advocacy training with coaches. Intramural oral competition leads to selection of team to represent the University in National Moot Court Competition. prereq: dept consent

**LAW 7066. National Moot Court Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Director for national moot court. prereq: dept consent

**LAW 7068. National Moot Court Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

The competition team is a group of six 3Ls selected from the second year program. Team members research and write two briefs, and prepare oral arguments. They compete at the regional competition, and if successful they go on to the nationals in New York City in January. prereq: Law 6002/6003 and students must have completed or be enrolled in Law 7065

**LAW 7075. International Moot Court. (1 cr. [max 2 cr.]; A-F only; Every Fall)**

International law/policies. Preparation of brief in moot case before International Court of Justice. Substantial editing/rewriting. Oral advocacy training with coaches. Intramural oral argument competition leads to selection of team to represent the University in the Jessup International Law Moot Court Competition of the American Society of International Law. prereq: dept consent

**LAW 7076. International Moot Court Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Director for international moot court.

**LAW 7077. International Moot Court Administrative Director. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Administrative director for international moot court. prereq: dept consent

**LAW 7078. Philip C. Jessup International Moot Court Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)**

Each year, one to three students carry over from the previous year’s Jessup team and one to two students are added from the previous year’s U-M International Moot Court competition to form the core of the current year’s Jessup team. Additional positions on the Jessup team are filled at the end of week five of the first semester. Prior to the finalization of the Jessup team, IMC students complete a legal memorandum on a matter with international legal implications and participate in two nights of oral arguments. Selection to the Jessup team is based, in large part, on student performance in these exercises. prereq: Law 6002/6003 and students must have completed or be enrolled in Law 7085

**LAW 7079. International Moot Court Competition Team. (1 cr. [max 2 cr.]; A-F only; Every Fall)**

Each year, the Law School fields a competition team that travels abroad. Competitions vary annually.

**LAW 7085. Intellectual Property Moot Court. (1 cr. [max 2 cr.]; A-F only; Every Fall)**

Preparation, substantial editing, and rewriting of an appellate brief on a case involving patents, copyrights, or trademarks. Preparation of oral arguments. Leads to participation on a University team in the Giles Sutherland Rich Intellectual Property Moot Court Competition. prereq: dept consent
LAW 7086. Intellectual Property Moot Court Competition Team. (; 1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)
The I.P. Moot Court Competition Team is composed of the two student directors who help run the I.P. Moot Court program. Students are selected based on their overall performance during their second year as well as a written statement as to why they want to be a director and on the competition team. They write the team briefs and attend the regional competition, usually in the third week of March. The top two teams at the regional competitions qualify for nationals in Washington D.C. held in early April. The team also participates in the Minnesota Intellectual Property Law Association Cup Competition. prereq: Law 6002/6003 and students must have completed or be enrolled in Law 7085

LAW 7087. Intellectual Property Moot Court Director. (; 1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)
Director for intellectual property moot court. prereq: dept consent

LAW 7088. CL: Intellectual Property and Entrepreneurship. (2 cr.; A-F only; Every Fall)
The IP and Entrepreneurship Clinic is a one-semester course (Fall Semester - 2 Credits). Students will attend class weekly and each class session involves a mixture of lecture, interviewing and counseling exercises, and writing exercises. The lectures cover core legal topics and questions frequently encountered in an IP and entrepreneurship related legal practice in order to prepare students for interactions with clients. At least three classes consist of drop-in workshops where student attorneys interview limited-representation clients, and engage in problem solving and counseling during the course of each workshop. Each workshop will be followed by in-class roundtable discussions of intellectual property issues encountered and the counseling given. Evaluation of student performance turns on classroom engagement, participation, performance in oral and written exercises, and attendance at workshops. The clinic will not take on cases or establish ongoing client relationships. Instead, students will meet with clients at workshops where the clients will sign an Acknowledgement of Limited Representation. Most of the work will occur at the workshop. Depending on the complexity of the matters presented, clients may opt to return to a later workshop or may be referred elsewhere for representation. Prereq: previous or concurrent registration in 6224, or 6603, or 6608, or 6613.

LAW 7092. CL: Bankruptcy Clinic. (; 3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)
This clinic is grounded in the development of practical skills necessary to effectively advise and represent individuals in serious financial difficulty. The Bankruptcy Clinic includes a classroom component, which prepares the students to counsel clients about consumer bankruptcy, introduces important portions of the Bankruptcy Code and Rules, and discusses the students’ cases in a group setting. This classroom component also features guest speakers, such as bankruptcy judges, panel trustees, and location practitioners. Students will receive training from Bankruptcy Court staff in electronic filing. Students in the Bankruptcy Clinic can expect to be advising clients of their options, communicating with their creditors, filing Chapter 7 bankruptcy cases, and representing clients at the meeting of creditors. Students may also have the opportunity to represent clients in adversary proceedings, including discovery and trial as well as settlement negotiations with both creditors and the U.S. Trustees. Occasionally, students represent individual creditors as well.

LAW 7093. CL: Bankruptcy Clinic Director. (; 2-3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)
Director for bankruptcy clinic. prereq: dept consent

LAW 7094. Civil Rights Moot Court Administrative Director. (; 1-2 cr.; A-F only; Every Fall & Spring)
Administrative director for civil rights moot court program.

LAW 7097. William McGee Civil Rights Moot Court Competition Team. (; 1 cr. [max 4 cr.]; A-F only; Every Fall & Spring)
The Law School reserves places on the McGee moot court competition team(s) for students on a law journal. Tryouts are typically held during the first week of school. Team members are selected on the basis of a writing sample, an oral argument tryout, and a recommendation from a writing instructor. The McGee coaches and the legal writing director will field up to two McGee teams of two or three students each (for a total of 6 students). We aim to select four 2L staffers and two 3L editors.

LAW 7098. CL: Indian Child Welfare Act. (; 2 cr. [max 4 cr.]; A-F only; Every Fall)
The Indian Child Welfare Act Clinic (the “ICWA Clinic”) is a full academic year, four credit program beginning in the fall semester. The casework focuses on litigation involving the Indian Child Welfare Act (ICWA) and Tribal Code. During the fall semester, class sessions will focus on the historical context, present day application and future implications of ICWA. This will include a focus on understanding ICWA in the broader context of Indian Law. Classes will include guest lecturers, who are leaders in the American Indian Community. The class will include guided discussion and analysis of the historical context and role of courts in the lives of American Indian families. The class will provide a context to consider the effectiveness and equity of the child protection system in the lives of American Indian families. Students will work through a federal civil rights investigation and litigation of cases in the U.S. District Court for the District of Minnesota. The clinical team is composed of the two student directors and the administrative director for civil rights moot court program.

LAW 7099. CL: Indian Child Welfare Clinic Director. (; 2 cr. [max 4 cr.]; A-F only; Every Fall)
Director for Indian child welfare clinic. prereq: dept consent

LAW 7100. Law Review Editors. (; 2 cr. [max 12 cr.]; S-N only; Every Fall & Spring)
Credit given without grade for satisfactory participation. prereq: instr consent

LAW 7101. Law Review Associate Editors. (; 3 cr. [max 6 cr.]; S-N only; Every Fall & Spring)
Associate editor for Minnesota Law Review.

LAW 7102. Law Review: Research & Writing. (1 cr. [max 2 cr.]; P-F only; Every Fall & Spring)
This course provides an opportunity to research and write a journal note under faculty supervision. Each student will write an outline and at least three drafts, and will also orally present and answer questions about their note. The course is required for and open only to staff members of Minnesota Law Review.

LAW 7117. CL: Civil Rights Enforcement. (2-3 cr. [max 6 cr.]; A-F only; Every Fall & Spring)
The Civil Rights Enforcement Clinic offers students the opportunity to enforce the civil rights laws of the US by assisting in the investigation and litigation of cases in the US Attorney's Office for the District of Minnesota in Minneapolis. The clinic includes both classroom seminars and fieldwork. Classroom instruction focuses on the Civil Rights Act, the Fair Housing Act, the Americans with Disabilities Act, the Equal Educational Opportunities Act, the Uniformed Service Members Employment and Reemployment Rights Act and the Matthew Shepard and James Byrd Jr. Hate Crimes Prevention Act, along with statutory interpretation and federal investigation techniques and procedure. Following the initial class instruction in the fall, students will be assigned in the spring pending federal civil rights investigations and cases. They will work closely with assistant US attorneys, investigators and paralegals on investigation tactics, evidence gathering, pleading drafting, deposition preparation, document review, legal research, litigation strategy, and settlement negotiations.

LAW 7200. Law and Inequality Journal. (2 cr. [max 8 cr.]; S-N only; Every Fall & Spring)
Credit given without grade for satisfactory participation. prereq: instr consent

LAW 7201. Law and Inequality Journal Associate Editor. (; 2 cr. [max 4 cr.]; S-N only; Every Fall & Spring)
Associate editor for Law and Inequality Journal.

LAW 7202. Law & Inequality Journal: Research & Writing. (1 cr. [max 2 cr.]; P-F only; Every Fall & Spring)
This course provides an opportunity to research and write a journal note under faculty supervision. Each student will write an outline and at least three drafts, and will also orally present and answer questions about their note. The course is required for and open only to staff members of Law and Inequality: A Journal of Theory and Practice.

LAW 7246. CL: Housing Law. (; 3 cr.; A-F only; Every Fall & Spring)
The Housing Law Clinic is a one-semester clinic on landlord-tenant law. Housing attorneys from Mid-Minnesota Legal Aid supervise students in representing tenants facing housing repair problems, utility shutoff and lockouts, and eviction cases in their rental history in Hennepin County Housing Court. The clinic provides an opportunity to handle cases from beginning to end. The cases may include interviewing, investigation, drafting pleadings, discovery, motion and trial practice, and appeals. Some cases may involve the delicate act of advising a client that does not have a good case. Each student may handle two to five cases during the semester. The classroom component includes interviewing, conflict computer network training, professional responsibility, housing law topics concerning the types of actions handled in the clinic, and case simulations patterned after real housing cases. Students convene for staff meetings and round table discussions to discuss issues and cases, as well as for meetings with student directors and the supervising attorneys in preparation for cases.

LAW 7247. CL: Housing Clinic Director. (1-4 cr.; A-F only; Every Fall & Spring) Director for housing clinic. prereq: dept consent

LAW 7300. Minnesota Journal of International Law Editor. (2 cr.; max 8 cr.; S-N only; Every Fall & Spring) By selection only. Credit given without grade for satisfactory participation.

LAW 7302. Journal of International Law: Research & Writing. (1 cr.; max 2 cr.; P-F only; Every Fall & Spring) This course provides an opportunity to research and write a journal note under faculty supervision. Each student will write an outline and at least three drafts, and will also orally present and answer questions about their note. The course is required for and open only to staff members of Minnesota Journal of International Law.

LAW 7400. CL: Human Rights Litigation and International Legal Advocacy. (3-4 cr.; max 8 cr.; A-F only; Every Fall) This clinic provides students with experience in human rights advocacy which may include litigation in federal or state courts and advocacy before the United Nations, the federal and state legislative and executive branches, and working in coalitions of nongovernmental organizations. The clinic provides participation in clinical projects and skill-building exercises. The process will facilitate discussion of the pros and cons of various advocacy mechanisms, possible conflicting strategies among stakeholders, and how particular strategies are chosen and implemented. The clinic's class component includes core lawyering skills such as interviewing, counseling, negotiation, and legal ethics in practice, and subjects such as how to practice before international human rights systems, how to use international law sources in legal arguments before U.S. courts, working with clients with Post-Traumatic Stress Syndrome, the different types of oral advocacy and writing in human rights advocacy, and the use of education, outreach, and the media in advancing a strategy.

LAW 7401. CL: Human Rights Litigation and International Legal Advocacy Directors. (3 cr.; max 6 cr.; A-F only; Every Fall & Spring) Directors for Human Rights Litigation/International Legal Advocacy Clinic. prereq: dept consent

LAW 7420. CL: Family Law. (3-4 cr.; max 8 cr.; A-F only; Every Fall) This clinic is grounded in the development of practical skills necessary to effectively develop and move family law cases from initial client interview to Judgment and Decree. Of the twelve classes in fall semester, two classes consist of simulated learning and the other ten consist of lecture with in-class exercises, such as, calculating child support, answering paternity hypotheticals, and a class on professional responsibility. The two simulations include: client interview for a dissolution with children (which prepares students for their first client file); and a default hearing. The simulations are grounded in one fictional family law case file. The Family Law Clinic may or may not offer students an opportunity to participate in trial. To obtain trial advocacy skills applicable in any litigation setting, students are advised but not required to enroll in Evidence and Trial Practice.

LAW 7421. CL: Family Law Directors. (3 cr.; max 6 cr.; A-F only; Every Fall & Spring) Family Law clinic student directors.

LAW 7500. CL: Criminal Defense. (2 cr.; max 4 cr.; A-F only; Every Fall) In the Criminal Defense Clinic, you will have a challenging and rewarding experience working as a student-attorney defending clients in Hennepin County District Court. Through your classroom and courtroom work, you will develop client-centered trial skills that will serve you well as you embark on your career as a lawyer. You will also be challenged to think critically and creatively about the criminal justice system, the role of defense lawyers, legal ethics, and criminal law and procedure. The course will involve a combination of classroom work and supervised student representation of clients charged with petty misdemeanor offenses in Hennepin County District Court. Student lawyers will represent clients at all stages of the criminal process, including arraignments, pretrial conferences, and trials. The focus of the course will be to develop the skills to provide client-centered representation in criminal cases. Prereq: Law 6219

LAW 7501. CL: Criminal Defense Directors. (2 cr.; max 4 cr.; A-F only; Every Fall & Spring) Director for criminal defense clinic. prereq: dept consent

LAW 7550. CL: Misdemeanor Prosecution. (3 cr.; A-F only; Every Fall) The primary goal of the Prosecution Clinic is to provide students with the opportunity to develop the substantive and practical skills to function as an effective and ethical prosecutor in the criminal justice system. The prosecution clinic course will involve a combination of classroom work and supervised student prosecution of individuals charged with petty misdemeanor, misdemeanor, and gross misdemeanor offenses in Hennepin, Ramsey, and Anoka County District Courts. Students handle cases at all stages of the criminal process including arraignments, pre-trial conferences, and court trials. There is also a seminar component that includes lectures on substantive criminal law and procedure, criminal justice policy issues, simulation exercises, role playing, skills training exercises, and self-evaluation. prereq: Law 6219 Evidence (or co-reg)

LAW 7571. CL: Criminal Justice. (3 cr.; max 6 cr.; A-F only; Every Fall & Spring) The Criminal Justice Clinic is a year-long clinic in which students will have the unique opportunity to prosecute criminal cases during the fall semester and serve as a criminal defense attorney during the spring semester. Students in the Criminal Justice Clinic will have a challenging and rewarding experience working as student-attorneys practicing law in courts throughout the metro area. Through classroom and courtroom work, students will develop the fundamental litigation and legal skills that will serve them well as they embark on their careers as practicing attorneys. They also will be challenged to think critically and creatively about the criminal justice system, the role of prosecutors and defense attorneys, legal ethics, and criminal law and procedure.

LAW 7570. CL: Federal Prosecution. (2-3 cr.; A-F only; Periodic Fall & Spring) Students assist in prosecution of federal criminal cases under supervision of assistant U.S. attorneys and faculty supervisor.

LAW 7571. CL: Federal Prosecution Clinic Director. (2-3 cr.; A-F only; Periodic Spring) Director for federal prosecution clinic.

LAW 7572. CL: Federal Defense. (3 cr.; A-F only; Every Spring) In this clinical seminar, students assist in the defense of indigent persons charged with federal crimes, under the supervision of the Federal Public Defender for the District of Minnesota and assistant federal public defenders. Fieldwork includes assignments such as research and writing of Eighth Circuit appeal briefs, memoranda in support of or response to motions, and legal research on a wide variety of topics. When cases are available, students may also be given various second-chair assignments in the preparation for and conduct of court and jury trials. If consistent with assignment deadlines, students are encouraged to observe other trials and federal criminal court proceedings. In addition to regular conferences, students work about twelve hours per week on clinic assignments. Each student will arrange a regular weekly schedule for their clinic work at the Federal Public Defenders Office in Minneapolis. prereq: LAW 6085 Criminal Procedure (formerly LAW 6218) and LAW 6009 Criminal Law and LAW 6219 Evidence. LAW 6219 Evidence may be taken concurrently. NOTE: This course
requires certification pursuant to the student practice rule and is open to JD students only.

**LAW 7600. Minnesota Journal of Law, Science, and Technology Editor.** (2 cr. [max 8 cr.]; S-N only; Every Fall & Spring) Scholarly publication addressing legal issues that arise from emerging technologies in areas such as copyrights, trademarks, patents.

**LAW 7602. Journal of Law, Science & Technology: Research & Writing.** (1 cr. [max 2 cr.]; P-F only; Every Fall & Spring) This course provides an opportunity to research and write a journal note under faculty supervision. Each student will write an outline and at least three drafts, and will also orally present and answer questions about their note. The course is required for and open only to staff members of Minnesota Journal of Law, Science & Technology.

**LAW 7606. Independent Research and Writing.** (1-2 cr. [max 8 cr.]; A-F only; Every Fall, Spring & Summer) Note: Law 7606 and 7608 both provide credit for independent writing projects; the difference is that 7606 satisfies the J.D. Upper Division Writing Requirement, while 7608 does not (except on a case-by-case basis before fall 2016). The registrar will assign students to 7606 or 7608 based on whether the student seeks, and the supervisor approves, upper division writing credit. Students may earn 1 or 2 credits (and in exceptional circumstances, 3 credits) for researching and writing a note, article, memo, or other paper on a legal topic. At least 5,000 words are required for one credit, at least 7,500 for two credits, and at least 11,250 for three credits. Students must consult with their faculty supervisor on their topic and research plan and receive feedback from their supervisor on the drafting process. To register, the student should confer with a supervising faculty member, draft a description of the proposed project, and complete the online Independent Research form.

**LAW 7608. Independent Research and Writing.** (1-2 cr. [max 8 cr.]; A-F only; Every Fall, Spring & Summer) Law 7606 and 7608 provide credit for independent writing projects; the difference is that 7606 satisfies the J.D. upper division writing requirement, while 7608 does not (except on a case-by-case basis before fall 2016). The registrar will assign students to 7606 or 7608 based on whether the student seeks and the supervisor approves upper division writing credit. Students may earn 1 or 2 credits (and in exceptional circumstances 3 credits) for researching and writing a note, article, memo, or other paper on a legal topic. At least 3,750 words are required for one credit, at least 7,500 for two credits, and at least 11,250 for three credits. To register, the student should confer with a supervising faculty member, draft a description of the proposed project, and complete the online Independent Research form.

**LAW 7609. Independent Field Placement.** (1-3 cr.; S-N only; Every Fall, Spring & Summer) Note: Law 7607 and 7609 both provide credit for independent field placements; the difference is that 7607 satisfies the Experiential Learning Requirement, while 7609 does not. The registrar will assign students to 7607 or 7609 based on whether the student seeks and the supervisor approves experiential learning credit. Students may earn up to three credits in a semester for unpaid work in a legal practice setting under the supervision of a qualified field supervisor and a faculty advisor. At least 50 hours of law-related activities are required per credit. The student is responsible for identifying a field placement setting and supervisor, finding a faculty advisor, and completing the Independent Field Placement Enrollment and Independent Field Placement Supervisor Forms. The signed forms must be submitted by email to lawcurr@umn.edu for approval by the Associate Dean of Academic Affairs prior to enrollment.

**LAW 7620. Field Work: Clemency Project.** (2-3 cr.; P-F only; Periodic Fall, Spring & Summer) In early 2014, President Obama announced an initiative to grant clemency to long-term federal inmates meeting certain criteria: they had served at least 10 years in prison, their offense was low-level and non-violent, they had no history of violence or ties to organized crime, their conduct in prison was good, and their sentence would be lower today by operation of law or policy. He called on lawyers and law students across the country to volunteer to share and assess the experience. Prior to enrolling, students should contact the instructor directly to identify a potential host organization that would fit the student's background and interests. Recommended Prerequisite: Civil Rights Law.

**LAW 7621. Immigration Law Field Placement.** (1-3 cr.; S-N only; Periodic Fall & Spring) This course provides an opportunity for law students interested in Immigration Law to work alongside practitioners. The instructor and student will work together to find an appropriate placement that matches the student's interests and host's needs. Due to the limited number of placements available and the need to match students with available hosts, enrollment will occur through an application outside of the lottery process. If you are interested in applying, please contact the instructor. In some cases HP/P/LP/F grading may be possible. Previously taking LAW 6872 Immigration Law is not required, but preferred.

**LAW 7622. Public Interest Field Placement.** (2 cr.; P-F only; Every Fall) This course provides an opportunity for students to work with and learn from lawyers in government agencies, nonprofit organizations, and public interest law firms. The instructor and student will work together to find an appropriate placement that matches the student's interests and host's needs. Students who have already secured field placements in the public interest can also enroll.

**LAW 7632. Human Rights Law Field Placement.** (2 cr. [max 3 cr.]; P-F only; Every Fall & Spring) This course allows students to learn about human rights law in practice by working directly with organizations and practitioners in the field. In addition to the supervised placement work, students in this course will meet periodically throughout the semester to share and assess the experience. Prior to enrolling, students should contact the instructor directly to identify a potential host organization that would fit the student's background and interests. Recommended Prerequisite: Law 6886 International Human Rights Law or Law 6011/6071 International Law.

**LAW 7633. Immigration Law Field Placement.** (10 cr. ; P-F only; Every Fall & Spring) The Remote Semester Program gives students the opportunity to gain valuable experience in the legal profession and in public service while earning credits toward their law degree. Students will work for a government or nonprofit organization and earn 10 credits (H/P/LP/F) for work performed. Externship hours and assignments must be completed between the fall semester's first day of classes and the last day of final exams. Students will also be required to earn 2 additional credits by enrolling in the Independent Research & Writing Paper.

**LAW 7640. Remote Semester Field Placement.** (10 cr.; P-F only; Every Fall & Spring) The Remote Semester Program gives students the opportunity to gain valuable experience in the legal profession and in public service while earning credits toward their law degree. Students will work for a government or nonprofit organization and earn 10 credits (H/P/LP/F) for work performed. Externship hours and assignments must be completed between the semester's first day of classes and the last day of final exams. Students will also be required to earn 2 additional credits by enrolling in the Independent Research & Writing Paper.

**LAW 7675. CL: Child Advocacy and Juvenile Justice.** (3-4 cr. [max 8 cr.]; A-F only; Every Fall) The Child Advocacy and Juvenile Justice Clinic (the 'CAC') is a full academic year, seven-credit program beginning in the fall semester in which students represent indigent clients in juvenile delinquency and child welfare matters.
before the Hennepin County Juvenile Court and custody cases before the Hennepin County Family Court. Students have previously been actively involved in two cutting edge areas of the law: the defense of unaccompanied immigrant minors under the Special Immigrant Juvenile Status federal statute, and they have represented inmates serving life without parole (LWOP) in Minnesota prisons for offenses they committed as juveniles. In connection with their LWOP cases, students have represented clients in extensive proceedings before state and federal courts, including the District of Minnesota and the Eighth Circuit.

LAW 7676. CL: Child Advocacy Director. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) Director for child advocacy clinic. prereq: dept consent

LAW 7700. Off-Campus Legal Studies. (3-0-18 cr. [max 36 cr.]; S-N only; Every Fall & Spring) Study at another law school. prereq: dept consent

LAW 7701. Off-Campus Legal Studies-Beijing, China. (5 cr.; A-F or Aud; Every Summer) Students attend Renmin University of China Law School in Beijing, China.

LAW 7702. Off-Campus Legal Studies in Europe: Barcelona, Florence, London or Paris. (4-6 cr.; P-F only; Every Summer) Law School/University of San Diego have partnered to offer summer program in Barcelona, Florence, London or Paris.

LAW 7750. CL: Community Legal Partnership for Health. (2-3 cr. [max 6 cr.]; A-F only; Every Fall) Students in this clinic will provide legal services at the Phillips Neighborhood Clinic, the Community University Health Care Clinic and Hope Lodge to help identify and resolve legal issues affecting patients care and wellbeing. Students will develop skills that can be used in any number of practice settings, including interviewing and counseling, case management, problem-solving, persuasive fact analysis, legal drafting, negotiation, effective oral communication, and interdisciplinary collaboration. Through participation in this course, students will be given the opportunity to change clients’ lives by helping them assert their rights and obtain necessary benefits and services. Students will learn about legal issues that affect people with health issues, the complex intersection of law and health, the medical-legal partnership (MLP) model of legal services delivery, and client-centered and holistic approaches to the lawyer-client relationship. Students will learn their own style of lawyering and ways to improve time management, client management, and communication and advocacy skills.

LAW 7751. CL: Community Legal Partnership for Health Directors. (2-3 cr. [max 6 cr.]; A-F only; Every Fall) Students in this clinic will work with various health service students at the Phillips Neighborhood Clinic to identify and resolve legal issues affecting patients care and wellbeing. Students will develop skills that can be used in any number of practice settings, including interviewing and counseling, case management, problem-solving, persuasive fact analysis, legal drafting, negotiation, effective oral communication, and interdisciplinary collaboration. Through participation in this course, students will be given the opportunity to change clients’ lives by helping them assert their rights and obtain necessary benefits and services. Students will learn about legal issues that affect people with health issues, the complex intersection of law and health, the medical-legal partnership (MLP) model of legal services delivery, and client-centered and holistic approaches to the lawyer-client relationship. Students will learn their own style of lawyering and ways to improve time management, client management, and communication and advocacy skills.
a tax controversy. Tax cases generally include audits of tax returns, filing and trying cases in Tax Court and Federal District Court, and bringing taxpayers into collection compliance. Since the Earned Income Credit and refundable Child Tax credits are now the major form of public welfare benefits for low-income workers and, thus, often an important component of tax controversies, the Clinic offers opportunities to work on these issues with clients. Clinic students do not generally prepare tax returns unless it is required to resolve the controversy. Clinic students participate in a clinic seminar during the fall semester, which provides training in clinic office procedures, lawyering skills and professional responsibility with an emphasis on those relevant to tax practice, and tax procedure and law relevant to representing low-income taxpayers. Guest speakers from the IRS, MN Department of Revenue and practicing bar provide useful information about the practice of tax law. Students who would benefit from enrollment include those that have an interest in tax, business or bankruptcy practice who will find it helpful to understand the workings of the tax administration authority (i.e. IRS/MNDOOR); who are interested in pursuing a career in public interest law; who have an interest in administrative and statutory law practice; have an interest in assisting immigrants meet the tax requirements for citizenship; or students who just want to make a difference in the lives of poor, immigrant or disabled individuals. Prereq or coreq Law 6106; Recommend Law 6100

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<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>LS 5100</td>
<td>Liberal Studies Seminar</td>
<td>1-4 cr.</td>
<td>Interdisciplinary topics. Prereq: dept consent</td>
</tr>
<tr>
<td>LS 5125</td>
<td>Field Experience</td>
<td>1-8 cr.</td>
<td>Off-campus observation, experience, and evaluation in interdisciplinary field of study. Prereq: MLS student or instr consent</td>
</tr>
<tr>
<td>LS 5950</td>
<td>Special Topics</td>
<td>1-4 cr.</td>
<td>Interdisciplinary topics. Prereq: dept consent</td>
</tr>
<tr>
<td>LS 5993</td>
<td>Directed Studies</td>
<td>1-4 cr.</td>
<td>Guided individual reading or study. Prereq: Grad student, dept consent</td>
</tr>
<tr>
<td>LS 5994</td>
<td>Directed Research</td>
<td>1-4 cr.</td>
<td>Tutorial for qualified graduate students. Prereq: instr consent</td>
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### Linguistics (LING)

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<tr>
<th>Course Code</th>
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<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>LING 5001</td>
<td>Introduction to Linguistics</td>
<td>4 cr.</td>
<td>Scientific study of human language. Methods, questions, findings, and perspectives of modern linguistics. Components of the language system (phonetics/phonology, syntax, semantics/pragmatics); language acquisition; language and social variables; language and cognition; language change; language processing; language and public policy; language and cognition.</td>
</tr>
<tr>
<td>LING 5105</td>
<td>Field Methods in Linguistics I</td>
<td>4 cr.</td>
<td>Techniques for obtaining/analyzing linguistic data from unfamiliar languages through direct interaction with a native speaker. Prereq: [4201 or 5201], [4302W or 5302] or instr consent</td>
</tr>
<tr>
<td>LING 5106</td>
<td>Field Methods in Linguistics II</td>
<td>4 cr.</td>
<td>Transcribing/analyzing talk and movement related to talk. Applying concepts to recorded conversations. Prereq: 3001 or 3001H or 5001 or instr consent</td>
</tr>
</tbody>
</table>

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
reconstruction. Genetic relationship among languages. prereq: 3001 or 3011H or 5001
LING 5801. Introduction to Computational Linguistics. (3 cr.; Student Option; Spring Odd Year)
Methods/issues in computer understanding of natural language. Programming languages, their linguistic applications. Lab projects. prereq: [4201 or 5201] or programming experience or instr consent
LING 5900. Topics in Linguistics. (1-4 cr.; [max 12 cr.]; Student Option; Every Fall & Spring)
Topics vary. See Class Schedule.
LING 5993. Directed Study. (1-3 cr.; [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
Directed study for Linguistics. Prereq instr consent, dept consent, college consent.
LING 8005. Research Paper Workshop. (3 cr.; [max 12 cr.]; S-N or Audit; Every Spring)
Workshop on research methodology/writing in linguistics. prereq: [5105, 5202, 5205, [4302W or 5302]] or [instr consent, grad ling major]
LING 8105. Field Methods in Linguistics I. (4 cr.; [max 8 cr.]; Student Option; Every Fall)
Techniques and practice in obtaining/analyzing linguistic data from an unfamiliar language through direct interaction with a native speaker. Study of a language by elicitation of speech samples/analysis of patterns that emerge. prereq: [5001, 5201, 5302, grad linguistics major] or instr consent
LING 8106. Field Methods in Linguistics II. (4 cr.; [max 8 cr.]; Student Option; Every Spring)
Continued analysis through work with a native speaker of language begun in 8105. Greater emphasis on analysis of recorded texts of various kinds. Some grammars of the language/contents compared with field notes from previous semester. prereq: 8105 (taken in same academic yr)
LING 8200. Topics in Syntax and Semantics. (3 cr.; [max 9 cr.]; Student Option; Periodic Fall)
Syntax and semantics of natural language, with particular emphasis on the interface between the two. prereq: 5202, 5205 or instr consent
LING 8210. Seminar in Syntax. (3 cr.; [max 9 cr.]; Student Option; Periodic Fall)
Current issues in syntactic theory. Topics vary. prereq: 5202, 5205 or instr consent
LING 8300. Topics in Phonetics and Phonology. (3 cr.; [max 9 cr.]; Student Option; Periodic Fall)
N/A prereq: 5303 or instr consent
LING 8333. FTE: Master’s. (1 cr.; [No Grade Associated; Every Fall, Spring & Summer])
No description) prereq: Master’s student, adviser and DGS consent
LING 8444. FTE: Doctoral. (1 cr.; [No Grade Associated; Every Fall, Spring & Summer])
(No description) prereq: Doctoral student, adviser and DGS consent
LING 8500. Topics in Second Language Acquisition. (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)
tbd prereq: 5001, 5505
LING 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; [max 12 cr.]; No Grade Associated; Every Fall, Every Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr
LING 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]
LING 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required
LING 8888W. Thesis Credit Dissertation Seminar. (1-3 cr. [max 24 cr.]; No Grade Associated; Every Fall & Spring)
A means for students to make progress on the dissertation in a structured setting. Brings together students writing on related topics. Credits are applied to doctoral thesis credits. Contact instructor for description. prereq: Doctoral student who has passed oral prelims
LING 8900. Seminar: Topics in Linguistics. (3 cr.; [max 9 cr.]; Student Option; Every Fall & Spring)
Topics vary. See Class Schedule. prereq: instr consent
LING 8921. Seminar in Language and Cognition. (3 cr.; [max 6 cr.]; Student Option; Every Fall & Spring)
Language-related issues in cognitive science from a linguistic perspective. Serves as elective for cognitive science minors; may be taken by ALP graduates. prereq: instr consent
LING 8991. Independent Study. (1-4 cr.; [max 15 cr.]; Student Option; Every Fall & Spring)
Independent Study prereq: instr consent

Logistics Management (LM)

LM 8892. Readings in Logistics Management. (1-8 cr.; [max 16 cr.]; Student Option; Every Fall & Spring)
Readings useful to student's individual program or objectives that are not available in regular courses. prereq: Adviser consent or instr consent

MSID 5001. International Development: Critical Perspectives on Theory and Practice. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5002. MSID Country Analysis. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5003. Community Engagement in the Global South. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5004. Case Studies in International Development. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5005. Advanced International Development Internship. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5006. Applied Field Methods. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.
MSID 5007. MSID Directed Research. (3 cr.; [max 6 cr.]; A-F only; Every Fall & Spring)
Study abroad course.

Management (MGMT)

MGMT 5102. StartUp: Customer Development and Testing. (2 cr.; A-F only; Every Fall & Spring)
Provides a structured process with faculty and mentor oversight for students at any level and from any college at the University to learn the initial process of customer development by testing market acceptance of a specific new business concept. Students primarily take this course individually and must have an idea or technology that they are interested in pursuing.
The goal of the course is to teach the process to quickly and efficiently test the value and market fit for a new concept.
MGMT 5480. Topics in Natural Resources. (3 cr.; A-F only; Periodic Spring)
Specific topic for each offering.
MGMT 6004. Negotiation Strategies. (2 cr.; A-F only; Every Fall, Spring & Summer)
Art/science of securing agreements between two or more parties who are interdependent and seek to maximize their own outcomes. Individual, group, organizational behavior. Theory/process of negotiations applied to problems faced by managers/professionals. prereq: MBA student
MGMT 6031. Industry Analysis and Competitive Strategy. (4 cr.; A-F only; Every Fall, Spring & Summer)
Processes by which firms maximize long-term returns in face of competition, uncertainty, changing market/technological conditions. Resource commitments to gain sustainable advantage. Choices to leverage resources. prereq: MBA 6300, MBA student
MGMT 6032. Strategic Alliances. (2 cr.; A-F only; Periodic Fall & Spring)

MGMT 6033. Managing the Strategy Process. (2 cr.; A-F only; Periodic Fall & Spring)
How successful strategy is shaped/implemented throughout organization. Leadership challenge of continually renewing strategy/leading change to meet competitive challenges. prereq: MBA student

MGMT 6034. Strategic Leadership. (2 cr.; A-F or Audit; Periodic Fall & Spring)
Role of leadership in making strategy a reality while maintaining learning/adaptive organization capable of meeting competitive challenges. Students prepare project set in an organization. Advanced materials, complex cases. prereq: 6033; MBA student

MGMT 6035. Complex and Cross-Cultural Negotiations. (2 cr.; A-F or Audit; Periodic Fall & Spring)
Principles, role play of multi-party/issue, team-based negotiation/conflicts. How to structure ambiguous situations, bridge national/organizational cultures (e.g., alliances, mergers), functions (R&D, finance), and institutional contexts (regulators, interest groups). prereq: [6004, MBA student] or instr consent

MGMT 6040. International Strategy and Organization. (2 cr.; A-F or Audit; Every Fall & Spring)
Dealing with enormous complexity in competitive environment, in strategy, and in organizations. Focuses on strategic/organizational issues in managing across borders. prereq: MBA student

MGMT 6050. Management of Innovation and Change. (2 cr.; A-F only; Periodic Fall & Spring)
How organizations innovate/change. Focuses on innovation in wide variety of new technology/innovation, programs, and services. What paths likely to lead to success/failure. prereq: MBA student

MGMT 6051. Managing Organizational Innovation and Change. (2 cr.; A-F or Audit; Periodic Fall)
How innovation typically unfolds in wide variety of new technologies, products, programs, and services. What paths are likely to lead to success/failure. Diagnostic skills/principles. prereq: Credit will not be granted if credit has been received for: 5051; 6050

MGMT 6070. Technology Strategy. (2 cr.; A-F only; Periodic Spring)
Evaluating short/long term competitive effects of e-business models using frameworks drawn from strategy, information economics. Strategies to establish, grow, manage e-business. Evaluating strategies of different firms. Lectures, cases, hands-on learning from Web. Grade based on written analyses of two cases, class participation, group project evaluating an existing or new e-business idea.

MGMT 6082. New Business Development. (4 cr.; A-F only;)
Understanding how to develop a new business; analyzing the opportunities and managing the constraints; structuring the venture, obtaining the resources, and writing the business plan; course covers main factors needed to start a successful business—the key operations, marketing, financial, legal, and competitive issues; topics covered are relevant to buyouts, franchises, and the family firm.

MGMT 6083. Consulting. (4 cr.; A-F only; Periodic Fall)
Management consulting. Engaging the client. Problem definition, proposal formulation. Establishing project schedules, work plans. Coordinating work, writing reports, doing presentations. Evaluating the product. Professional learning, career development, balancing work/family. Field projects. prereq: MBA student

MGMT 6084. Management of Groups. (2 cr.; A-F only; Every Fall, Spring & Summer)
Factors that influence performance and well-being of groups in organizations. Group dynamics, norms, culture, structure, leadership, decision-making, and problem-solving. Managing dynamics, learning, performance, and creativity of groups. Intergroup relations, incentives, and effect of environment.

MGMT 6085. Corporate Strategy. (4 cr.; A-F only; Periodic Fall)

MGMT 6086. Technology and Strategy. (4 cr.; A-F only; Periodic Fall)
Limitations/strengths of various strategy models in different technology contexts. Innovation vs. imitation. Vertical/horizontal integration in high tech industries. Aligning technology strategy with business strategy. Renewing, sharing, leveraging corporate technology competencies across business units. Roles of CEO/CTO in technology intensive businesses. prereq: MBA student

MGMT 6100. Topics in Management. (2-4 cr.; max 8 cr.; A-F only; Periodic Fall & Spring)
Topics vary. prereq: CSOM grad student or instr consent

MGMT 6101. Independent Study in Strategic Management and Organization. (1-8 cr.; max 16 cr.; A-F or Audit; Every Fall, Spring & Summer)
Students contract with faculty on independent studies. prereq: instr consent or dept consent

MGMT 6110. Managing People and Organizations. (2 cr.; A-F only; Every Fall & Spring)
Behavioral science theory of employee behavior in organizations. Theory applied to practical situations. Motivation, cultural differences in management, ethical dilemmas, decision-making, leadership, timing. prereq: MBA student

MGMT 6305. The International Environment of Business. (4 cr.; A-F only; Every Fall, Spring & Summer)
Introduction to international trade/finance theory and political economy. Institutional governance of international trade/monetary policy, differences in political-economic/sociocultural systems, implications for managerial decision-making. prereq: MBA student

MGMT 6310. Cross-Cultural Management: Developing Intercultural Competence. (2 cr.; A-F only; Every Spring)
The emphasis of this course is on people-related (i.e., psychological and behavioral) issues that arise when managing across cultures. Through the use of cases and interactive experiential activities, this course will develop your intellectual ability to critically examine, analyze, and deal with cross-cultural problems in business contexts, while also cultivating a tolerance for ambiguity that is necessary in the global workplace. The combination of materials and experiences will allow you to evaluate your cross-cultural savvy, understand and appreciate the nuances of cultural identities and the impact these have on work relationships, and create a plan to increase your intercultural competence.

MGMT 6402. Integrative Leadership: From Theory to Practice. (3 cr.; A-F only; Every Spring)
Seminar. Strategic challenges linking business, government, and society locally/globally. Co-led by faculty from Carlson and Humphrey Schools. International network of leaders/organizations participate. Case studies as part of capstone projects. prereq: MBA student

MGMT 6410. Corporate Responsibility. (2 cr.; A-F only; Every Fall)
Managing with appreciation for corporate responsibility. Corporate responsibility/how executives think about it. Factors that make assessing corporate responsibility complex. Need for business leaders to understand/make choices with respect to corporate responsibility issues. prereq: MBA 6300, CSOM grad student

MGMT 8101. Theory Building and Research Design. (4 cr.; Student Option; Periodic Spring)
Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences. prereq: Business admin PhD student or instr consent

MGMT 8202. Seminar in International Management. (4 cr.; Student Option; Periodic Fall & Spring)
Overview of the field of international management research. prereq: Business admin PhD student or instr consent

MGMT 8301. Seminar in Organizational Behavior. (4 cr.; Student Option; Periodic Fall & Spring)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Major theories and current research on individual behavior and group processes in organizations from a micro perspective. prereq: Business admin PhD student or instr consent

MGMT 8302. Seminar in Organizations Theory. (1-4 cr.; Student Option; Periodic Fall & Spring)
Major theories and current research on organizational and interpersonal topics from a macro perspective. prereq: Business admin PhD student or instr consent

MGMT 8304. Topics in Organizations I. (1-2 cr.; A-F or Audit; Periodic Fall & Spring)
Topics vary. prereq: PhD student or instr consent

MGMT 8305. Topics in Organizations II. (1-2 cr.; A-F or Audit; Periodic Fall & Spring)
Topics vary. prereq: PhD student or instr consent

MGMT 8401. Seminar in Strategy Content. (2-4 cr.; Student Option; Periodic Fall & Spring)
Review of research in strategy formulation. prereq: Business admin PhD student or instr consent

MGMT 8402. Seminar in Behavioral Strategy. (2-4 cr.; Student Option; Periodic Fall & Spring)
Tickets vary with each offering. prereq: Business admin PhD student or instr consent

MGMT 8404. Topics in Strategy 1. (2-4 cr.; Student Option; Periodic Fall & Spring)
Tickets will vary with each offering, prereq: Business admin PhD student or instr consent

MGMT 8405. Topics in Strategy II. (2-4 cr. [max 8 cr.]; A-F or Audit; Spring Even Year)
Topics vary. prereq: PhD student or instr consent

MGMT 8501. Seminar in Entrepreneurship. (4 cr.; A-F only; Spring Even Year)
This seminar provides a broad introduction to the field of entrepreneurship. It helps students develop the skills and knowledge needed to conduct their own research within this domain. It introduces them to the theoretical and empirical foundations of the field of entrepreneurship as a scholarly discipline. It will familiarize students with key debates in the field. It will also sharpen students’ conceptual and analytical skills, and help them develop their research agenda.

MGMT 8892. Readings in Management Theory and Administration. (1-8 cr. [max 16 cr.]; Student Option; Every Fall & Spring)
Intensive research on a management topic; major term paper. prereq: Business admin PhD student or instr consent, adviser consent

MGMT 8894. Graduate Research in Management Theory and Administration. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer)
Research project on a management problem of interest to student; may be completed in cooperation with a business firm. prereq: Business admin PhD student or instr consent, adviser consent

Management of Technology (MOT)

MOT 5001. Technological Business Fundamentals. (2 cr.; A-F only; Every Fall)
Basics of operations, strategy, decision-making in technology-driven business. Market opportunity assessment, finance/financial decision-making, organizational roles. Work in teams to analyze aspects of business opportunity. prereq: Degree seeking or non-degree graduate students

MOT 5002. Creating Technological Innovation. (2 cr.; A-F only; Every Spring)
Course provides students with techniques to create new ideas, and lead an organization to bring them successfully to market. It will include examples of the dynamics of technological industries, and technology strategies. Topics include effective practices to generate ideas, processes to move them to market, and intellectual property. Students will work in teams to develop a strategy to commercialize a new technology. prereq: Degree seeking or non-degree graduate students

MOT 5003. Technological Business Planning Workshop. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)
Applies lessons of 5001 or 5002 directly to technology of the student’s choosing, possibly thesis topic. Aspects of strategic technology plan or business plan, culminating in presentation of plan. Must be taken in parallel with 5001 or 5002. prereq: Degree seeking or non-degree graduate students. Student must also enroll for MOT 5001 or MOT 5002

MOT 5991. MOT Independent Study. (1-3 cr. [max 1 cr.]; S-N or Audit; Periodic Fall)
Independent study in MOT-related topic. prereq: MOT grad student

MOT 8111. Marketing Management for Technology-based Organizations. (2 cr.; A-F or Audit; Every Fall & Spring)
Function of marketing strategy in technology-based organizations. Emphasizes marketing industrial products. Issues in product strategy, including pricing, promotion, product mix, and sales/distribution decisions. prereq: Grad MOT major

MOT 8112. Accounting for Decision Making. (1.5 cr. [max 2 cr.]; A-F or Audit; Every Fall)
Introduction to methods for estimating/analyzing product costs and for using cost information to make product mix and pricing decisions. Cases from technology-oriented firms illustrate principles of activity-based costing. Uses of cost data in managerial decision making, budgeting/control, and financial statement analysis. prereq: Grad MOT major

MOT 8113. Operations Management for Competitive Advantage. (1.5 cr. [max 2 cr.]; A-F or Audit; Every Spring)
Overview of operations functions. Impact of operation management on a firm’s competitiveness and network of trading partners. Key relationships between operations and other value chain functions. Integrating operations decisions to achieve objectives. Product-process design, quality management, supply chain management, technology management, work force issues, prereq: Grad MOT major

MOT 8114. Strategic Technology Analysis. (1.5 cr. [max 2 cr.]; A-F only; Every Fall)
Technology, its creation, history, and dynamics/interaction with economics, industry, and society. Role of technology in business and management. Tools/techniques for analysis of technologies. Emerging technologies, their significance. prereq: Grad MOT major

MOT 8121. Managing Organizations in a Technological Environment. (2 cr.; A-F or Audit; Every Fall & Spring)
General management principles for organizations, people, and business systems in technology-intensive industries. Application of managerial approaches to project, business, and corporate levels of organizations and to demands entrepreneurial/established technology firms. prereq: Grad MOT major

MOT 8122. Financial Management for Technology-based Organizations. (2 cr.; A-F or Audit; Every Spring)
Creating value within the organization. Financial methods important to managers of technology-based organizations. Budgeting capital, projecting financial needs, and managing working capital. prereq: Grad MOT major

MOT 8133. Managerial Communication for Technological Leaders: Persuasive Writing and Speaking. (2 cr.; A-F or Audit; Every Fall & Spring)
Oral and written communication. Introductory and specialized workshops on topics such as presentation skills, memo and report writing, listening skills, and visual aid design and integration. prereq: Grad MOT major

MOT 8212. Developing New Technology Products. (2 cr.; A-F or Audit; Every Fall & Spring)
Review of methods and organizational strategies for development of new technology products. Product development strategy. Necessary organizational interactions between research/development, operations, marketing, and intellectual property strategy in design/delivery. prereq: Grad MOT major

MOT 8213. Macroenvironment of Technology. (1.5 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring)
Development of scenarios of anticipated social, political, governmental, and economic forces affecting technological change. Use of scenarios to respond to institutional pressures, opportunities, and uncertainties. Corporate strategies, including building alliances for
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global competitiveness. prereq: Grad MOT major

**MOT 8214. Technology Foresight and Forecasting.** (2 cr.; A-F; Every Fall) Tools/techniques for technology forecasting, assessment, and strategic foresight for decision making in business/government. Technology dynamics, R&D strategy, portfolio management, resource allocation. prereq: Grad MOT major

**MOT 8221. Project and Knowledge Management.** (1.5 cr. [max 2 cr.]; A-F or Audit; Every Spring) Survey/application of project and knowledge management in management of technology. Business/engineering project/knowledge management. Planning, scheduling, controlling, Budgeting, staffing, task/cost control. Communicating with, motivating, leading, and managing conflict among team members. Cross-functional development of concepts/processes. prereq: Grad MOT major

**MOT 8224. Pivotal Technologies.** (1 cr.; max 2 cr.; A-F or Audit; Every Fall) Technologies expected to play pivotal roles in future industrial development. State-of-the-art for each technology. Barriers/opportunities for commercialization. Guest expert lectures. Students analyze potential applications of technologies to industry. prereq: MOT grad major

**MOT 8231. Managing Information Resources in Technology-based Organizations.** (1 cr.; A-F or Audit; Every Fall & Spring) Managing information resources/technology in an organization where technology is a critical part of value chain. Database management systems, electronic commerce. Managerial issues: strategic planning for IT/IS, infrastructure, outsourcing, competitive value, implementation. prereq: Grad MOT major

**MOT 8232. Managing Technological Innovation.** (2 cr.; A-F or Audit; Every Spring) How technological innovation is important to business success, can be managed, and may drive business strategy. Organizational dynamics of innovation, how it may be enhanced. Bringing innovations to marketplace in existing businesses and new ventures.

**MOT 8233. Strategic Management of Technology.** (2 cr.; A-F or Audit; Every Fall & Spring) Identifying key issues, formulating strategies for situations involving business/technology. Industry dynamics, competitive challenges for improving corporate performance and leveraging technological competence. prereq: Grad MOT major

**MOT 8234. Capstone Project.** (0.5-2.5 cr.; A-F or Audit; Every Fall, Spring & Summer) Applied research activity, specifically related to management of technology, in cooperation with participant's home organization. Working with a faculty adviser and work mentor, students address an industry-based management of technology project, venture, process, or challenge. Formal presentation to capstone committee is required. prereq: Completion of two semesters, grad MOT major

**MOT 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall & Summer) (No description) prereq: Master's student, adviser and DGS consent

**MOT 8500. Innovation Leadership and Organizational Effectiveness.** (0.5-2 cr.; A-F only; Every Fall & Spring) Made up of four credits, this course is designed to provide students with the tools and techniques to successfully lead and manage innovation processes and programs in organizations. prereq: MOT major

**MOT 8501. Leading Individual & Team Performance.** (1.5 cr.; A-F only; Every Fall) Develop the context and capability innovation leaders need to optimize engagement and performance at the individual and team levels. Emphasis is placed on foundational principles, capabilities and practices that help leaders self-manage, engage and influence diverse team members, and generate shared commitment for team and project success. prereq: MOT grad major

**MOT 8502. Innovation Leadership and Organizational Effectiveness.** (1 cr.; A-F only; Every Spring) The MOT 8501 and 8502 sequence provides emerging and mid-career technology professionals with the leadership mindset, tool set, and skill set needed to focus, align, and engage multi-disciplinary individuals and teams in translating technology assets and foresight into customer solutions that generate profitable growth. MOT 8502 explores the role of outstanding leaders as developers of innovation strategy and architects of the organizational capability and team commitment needed to execute strategic choices. Emphasis is placed on principles and practices that help leaders focus on the right strategies, build the organizational capability required to execute a strategy, foster continuous improvement in individual and business performance, and lead change initiatives to sustain commitment versus compliance across diverse stakeholders. Students will practice improving their team effectiveness and develop a change leadership plan to support implementation of a key business initiative.

**MOT 8900. Conflict Management.** (0.5 cr.; Student Option; Every Fall) Theory and methods for applying conflict management techniques in organizations. Cooperative and competitive models of conflict, basics of bargaining, conflict strategies, communication styles, listening skills, dispute resolution, third-party mediation, and use of computers for conflict mediation. prereq: Grad MOT major

**MOT 8910. Corporate Responsibility.** (1 cr.; A-F or Audit; Every Fall & Spring) Principles of stakeholder management. Ethical framework for responsible management of investors, employees, suppliers, customers, and external community. Moral leadership, trust in organizations, and reputation control. New metaphors and techniques for managing the socially responsible organization. prereq: Grad MOT major

**MOT 8920. Science and Technology Policy.** (1.5 cr.; A-F or Audit; Every Fall) Role of government in science/technology. Impact of policy on economy/society. Ways companies/individuals may influence science/technology policy. Technology-related public policy in the United States, elsewhere. prereq: MOT grad student

**MOT 8921. Global Management of Technology.** (0.5 cr.; A-F only; Every Spring) Global management of technology. prereq: MOT student

**MOT 8930. Topics in Emerging Technologies.** (0.5 cr.; S-N or Audit; Every Spring) Invited speakers give half- or full-day seminars on special topics in emerging technologies (e.g., energy systems, tissue engineering, thermal spray coating technology). prereq: MOT grad student

**MOT 8940. Managing Intellectual Property.** (0.5-1 cr.; A-F only; Every Spring) Characteristics of Intellectual Property (IP), its role in technology enterprises. Law of patents, trade secrets, trademarks, copyrights, know-how and other IP. Effect of IP rights acquisition and asset valuation on company competitiveness. IP protection/licensing strategy. prereq: MOT grad student

**MOT 8950. International Management of Technology Project.** (2 cr.; A-F or Audit; Every Spring) On-site residency in international locations for up to two weeks. Visits to local, technology-intensive companies. Lectures/discussions with company executives, government officials, and university faculty. Comparative analysis of management of technology concepts/issues in an international business context: social, economic, cultural, and governmental perspectives. Written assignment required. prereq: MOT grad student

**MOT 8960. Seminars in Management of Technology (MOT) and Innovation.** (1 cr.; max 2 cr.; S-N only; Every Fall & Spring) Seminars on emerging topics in technology management and innovation. prereq: MOT grad major

**MCOM 5400. Managerial Communications (MCOM).** **MCOM 5500. Enhancing Your Executive Image in Business Communications.** (2 cr. [max 4 cr.]; A-F only; Every Fall) Techniques to project executive presence in all business communications. prereq: MBA student...
Marketing (MKTG)

MKTG 6020. Advanced Logistics and Supply Chain Management. (2 cr.; A-F only; Every Fall & Spring) Analyzes flow of physical product through channels of distribution. Linkages between process of controlling physical flows, major functions of firm (e.g., finance, marketing, operations). Managing logistical interactions between firms to develop integrative supply chain management strategy. Simulation exercise. prereq: MBA 6210, MBA student

MKTG 6050. Business Research Methods. (2 cr.; A-F only; Every Spring) Business Research Methods - The main goal of the course is to teach students both some fundamental business management concepts and methods of quantitative analytics. The course will focus on applications of analytic techniques, while the traditional MR will be analytics and/or modeling driven.

MKTG 6051. Marketing Research. (4 cr.; A-F only; Every Fall & Spring) Methods for collecting/analyzing data to solve marketing problems. Survey research techniques. Research design, secondary/primary data collection, sample design, data analysis. Application of techniques to marketing problems, marketing research projects. prereq: MBA 6210, MBA student

MKTG 6055. Buyer Behavior. (4 cr.; A-F only; Every Fall & Spring) Application of behavioral sciences to understanding buyer behavior. Perceptions, memory, affect, learning, persuasion, motivation, behavioral decision theory, social/cultural influences, managerial implications. Emphasizes class discussion. prereq: MBA 6210, MBA student

MKTG 6060. Marketing Channels. (2 cr.; max 4 cr.; A-F only; Every Fall) This class focuses on designing go-to-market routes that align with customer purchase journeys, including the selection of channel partners, and fashioning the right channel incentives. We will pay particular attention to contemporary challenges arising from channel fragmentation and addition of online routes-to-market. prereq: MBA 6210, MBA student

MKTG 6065. Strategic Supply Chain Management. (2 cr.; A-F only; Every Spring) Internal/inter-organizational design, strategic sourcing, alliances/partnerships, impact of technology on supply chain effectiveness. Managing flows, creating/sharing customer value, measuring competitive impact from supply chain excellence. prereq: [6060 or OMS 6056, or IDS 6442 or IDS 6423], 2nd yr MBA student


MKTG 6073. Marketing in High Tech Settings. (2 cr.; A-F only; Every Fall) This class will focus on contemporary markets where the products and services are built on a significant base of intellectual property. Using cases and readings, we will examine major issues such as a) diffusion of multiple generations (e.g., iPhone 7 8, 10, etc.), b) back-and-forth compatibility choices (e.g., Windows XP, 7, and 10), c) revenue model decisions (e.g., license a drug patent versus launching the realized drug) and d) user-centered design (e.g., Nest versus Honeywell thermostats). prereq: [MBA 6210 or equiv], MBA student or dept consent

MKTG 6075. Pricing Strategy. (4 cr.; A-F only; Every Fall & Spring) Framework for assessing pricing decisions. Pricing in business-to-business markets, consumer goods markets, services, and not-for-profit companies. prereq: MBA 6210, MBA student

MKTG 6078. Advertising & Promotion. (4 cr.; A-F only; Every Fall & Spring) Managing communication. Advertising, sales promotion, public relations, direct marketing. Setting communications objectives and budgets, media selection, creative strategy, sales promotion techniques. prereq: MBA 6210

MKTG 6080. Internet Marketing. (2 cr.; A-F only; Every Fall) Concepts, processes, decisions associated with marketing through the Internet. Emphasizes profitability. Customer persuasion, building a customer base digitally, pricing, customer retention, channel/distribution issues. prereq: MBA 6210, MBA student


MKTG 6084. Persuasion and Influence. (2 cr.; A-F only; Every Summer) Successful marketers, leaders and communicators must not only make the right decisions-they must also influence others. Successfully managing other people depends on managing the influence process. Doing this effectively requires understanding the psychology of persuasion. This course is about the science of influence & persuasion. Through deeper understanding of human psychology, you will learn scientifically-tested and practical tools to become more influential in your dealings with consumers, clients, coworkers, & managers. Through a mix of lecture, discussion, reading, reflection, and experiential exercises, you will master the tools to be able to mobilize others by strategically crafting your communications. prereq: MBA 6210, MBA student

MKTG 6085. Harnessing Consumer Irrationality. (2 cr.; A-F only; Periodic Fall, Spring & Summer) People do surprising and funny things. Business leaders, policy makers, and scientists long have been interested in why people do what they do, and for a long time that interest has fallen under the rubric of a ‘rational man’ model. It is now clear that the rational model is imperfect, at best. This course takes a look at the less rational side of life, studying the shortcuts, the low road, and the error-prone processes that enable people to feel, decide, and act efficiently? despite costs to rationality. For most of the past 200 years, most of what organizations, politicians, and well-meaning people did in order to make consumers change their behavior consisted of what might be called ?shoves??heavy-handed, choice-restricting, highly-incentivized, information-dense treatments that basically told consumers what to do (or else!). Those, by and large, do not work. Not only do they not work, they are costly and can even make the unwanted behavior emerge even more than before the shove by creating boomerang or counterproductive effects.

MKTG 6086. Digital Marketing. (2 cr.; A-F only; Periodic Fall & Spring) Marketing practices have dramatically shifted with the rise of social media and the proliferation of devices, platforms, and applications. This rapidly changing environment presents new opportunities and challenges for marketers. Through a combination of case studies, best practice examples, current news items, and assignments, students learn how the elements of a digital strategy work together with traditional media to attract prospective customers. Specifically, students learn best practices for social media marketing, content marketing, organic and paid search, search engine optimization, e-mail marketing, landing pages and display advertising. Students discuss strategies for reputation management in a world where information is disseminated virally and discover how social media monitoring and data analysis can be used to improve marketing and product development activities. The importance of establishing digital marketing goals and analytics is covered as well as how to measure return on investment for digital activities.

MKTG 6088. Strategic Marketing. (2 cr.; A-F only; Every Fall, Spring & Summer) Determining product-markets where organization should compete. Sustainable
competitive advantage. Matching marketing strategy with environment. Coordinating marketing, other business functions. Organizing marketing function/management. prereq: MBA 6210, MBA student

MKTG 6090. Marketing Topics. (1-4 cr. [max 8 cr.]; A-F only; Every Fall, Spring & Summer) Selected topics/problems of current interest considered in depth. prereq: MBA 6210, MBA students

MKTG 6101. Independent Study. (1-4 cr. [max 8 cr.]; A-F only; Periodic Fall & Spring) Independent directed reading/research.

MKTG 6801. Independent Study. (1-8 cr.; A-F or Audit; Every Fall, Spring & Summer)

MKTG 8809. Consumer Behavior Research Methods. (2 cr.; A-F or Audit; Periodic Fall & Spring) Seminar. Topics related to conceptual theories/arguments about experimental design and statistical analysis of experiments. How to design experimental research for testing hypotheses and drawing conclusions. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8810. Consumer Behavior Special Topics. (2 cr.; max 8 cr.; A-F or Audit; Periodic Fall & Spring) Theories of consumer categorization. Literature on brand categories, category measurement, brand extensions/dilution/affect. Readings from branding literature. Theoretical analysis. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8811. Consumer Attitudes and Persuasion I. (2 cr.; Student Option; Fall Odd, Spring Even Year) Reading, discussing, and evaluating theories of consumer attitudes and persuasion. Theoretical analysis, rather than practitioner focus. prereq: [MBA 6210 or equiv], business admin PhD student or instr consent

MKTG 8812. Consumer Attitudes and Persuasion II. (2 cr.; A-F or Audit; Fall Odd, Spring Even Year) Science of persuasion. Principles of stickiness--universal principles that lead messages to succeed rather than fail. Principles of influence--universal psychological principles that motivate a person to say "yes." prereq: Doctoral student or instr consent

MKTG 8813. Consumer Judgment and Decision Making I. (2 cr.; A-F or Audit; Periodic Fall & Spring) Different theoretical approaches taken in judgment and decision-making research. Heuristics/biases, affect in decision making, judgments/decisions over time. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8814. Consumer Judgment and Decision Making II. (2 cr.; A-F or Audit; Periodic Fall & Spring) Draws from work on prospect theory and its derivatives. Anomalous choice. Emphasizes on applications to Marketing theory, from inter-temporal choice to regret and counterfactual thinking in consumers/managers. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8831. Seminar: Inter-Organizational Relations. (4 cr.; Student Option; Periodic Fall & Spring) From an efficiency perspective, inter-organizational networks involved in task of moving goods and services from point of production to point of consumption. Literature covering the functional, institutional, analytical, and methodological traditions, as well as the behavioral school of thought and transaction cost and relational contracting. prereq: MBA 6210 or equiv, business admin PhD student or instr consent

MKTG 8842. Quantitative Modeling I. (2-4 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/empirical research in marketing, econometrics, and industrial organization. Classic/contemporary articles. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8843. Quantitative Modeling II. (2 cr.; A-F or Audit; Periodic Fall & Spring) Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/empirical research streams in marketing, econometrics, and industrial organization. Classic/contemporary articles. prereq: Doctoral student or [master's program student, instr consent]

MKTG 8851. Seminar: Marketing Management and Strategy I. (2 cr.; Student Option; Periodic Fall & Spring) Topics in marketing management and formulation and implementation of marketing strategies. Diversity of thought, within marketing and strategic management literature. prereq: [MBA 6210 or equiv], business admin PhD student) or instr consent

MKTG 8852. Marketing Management & Strategy II. (2 cr.; Student Option; Periodic Fall & Spring) PhD seminar. Role of branding within the organization, its business strategy, and its success. Brand management. Critically evaluate fundamental ideas and more recent developments. prereq: Business admin PhD student or instr consent

MKTG 8894. Graduate Research in Marketing. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Individual research on an approved topic appropriate to student's program and objectives. prereq: MBA 6210 or equiv, business admin PhD student or instr consent

MBA 5200. Directed Studies for Curricular Practical Training (International Full-Time MBA Students Only). (1-3 cr.; S-N only; Every Fall & Spring) CPT is work authorization which allows a student to work in a job directly related to the student's major area of study before degree completion. prereq: International FT MBA student with approval from the MBA Office

MBA 6030. Financial Accounting. (3 cr.; A-F only; Every Fall, Spring & Summer) Basic principles of financial accounting, involving the consecution/interpretation of corporate financial statements. prereq: MBA Student

MBA 6035. Managerial Accounting. (3 cr.; A-F only; Every Fall, Spring & Summer) Cost systems introduced as potential sources of sustainable competitive advantage. Focuses on designing cost systems to provide manager with accurate, relevant, and timely information. prereq: 6030, 6230, MBA student


MBA 6110. Leading Others. (2 cr.; A-F only; Every Fall, Spring & Summer) Achieving organizational goals by leading in ways that create motivation, engagement, commitment, positive social interactions, and job performance. Understanding and managing the characteristics of organizations, work groups, and individuals. The role of group dynamics, decision making, cooperation, conflict, and power in leading others.

MBA 6112. Leading Organizations. (0-1 cr. [max 3 cr.]; A-F only; Every Fall, Spring & Summer) Leverage leadership journey of full-time MBA program through Enterprise experience. Course integrated with work of MBA Enterprise teams as they set vision and strategy, translate strategy for optimal team functioning, and execute strategy for clients. Exercises, assessments, role-playing, discussions.

MBA 6120. Data Analysis and Statistics for Managers. (3 cr.; A-F only; Every Fall, Spring & Summer) Concepts/principles of business statistics, data analysis and presentation of results. Topics: exploratory data analysis, basic inferential procedures, statistical process control, time series/regression analysis, and analysis of
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MBA 6140. Managerial Economics. (2 cr.; A-F only; Every Fall & Spring) How markets work, how positive economic rents (profits) are made, and how strategic behavior affects profits. Four major topical areas include market micro-structure, industrial structure, uncertainty, and incentives and firm governance. prereq: MBA student

MBA 6150. Managerial Communications. (1 cr.; A-F only; Every Fall) Thinking strategically about communication. Writing/presentation skills. Communications best practices, guidelines from research/experience. Opportunity to practice/strengthen skills. prereq: MBA student

MBA 6210. Marketing Management. (3 cr.; A-F only; Every Fall, Spring & Summer) Management of the marketing function including understanding the basic foundational marketing concepts and skills in strategy development and planning of operational and strategic levels pertaining to product offering decisions, distribution channels, pricing and communication. prereq: MBA student

MBA 6220. Supply Chain & Operations. (3 cr.; A-F only; Every Fall, Spring & Summer) Introduction to fundamental operations management principles and concepts. The course takes a strategic view of operations in both a manufacturing and service context and stresses linkages to other functional areas. Many of the cases in the course take an international perspective. prereq: MBA student

MBA 6235. Managerial Accounting. (2 cr.; max 3 cr.; A-F only; Every Fall, Spring & Summer) Cost systems introduced as potential sources of sustainable competitive advantage. Course focuses on designing cost systems to provide manager with accurate, relevant, and timely information. Taught as part of an integrated functional core. prereq: MBA student

MBA 6240. Competing in a Data-Driven Digital Age. (2 cr.; A-F only; Every Spring) Contemporary managers must understand how the convergence of mobility, analytics, social media, cloud computing, and embedded devices are transforming firms, industries, markets and society. Using the foundation of data-driven business analytics, this course provides tools and frameworks for competing in the digital age. Students will learn general state-of-the-art analytics skills in the context of new platform based business models, digital search, big-data, social networks, social media and open innovation that pervade competition in the digital age. These will include the fundamentals of predictive modeling, large scale A/B testing, social networks analysis and an exposure to the work-horse tools of data-driven classification and prediction to explore patterns in rich datasets (such as k-nearest neighbors, classification trees and the design of recommendation systems). While this course will use case studies in the digital domain, the methods taught here have a wide range of applicability across functions and verticals in modern business environments. prereq: FT MBA student

MBA 6300. Strategic Management. (3 cr.; A-F only; Every Fall & Spring) Introduction to the concepts and techniques used to create and implement a sense of corporate direction; choices about products and markets that involve the integration of different functional areas; positioning a business to increase returns for shareholders and stakeholders; the skills involved in identifying issues, evaluating options, and implementing business plans. prereq: MBA student

MBA 6315. The Ethical Environment of Business. (2 cr.; A-F only; Every Fall, Spring & Summer) Analysis of ethical dilemmas and development of appropriate responses; relationship of ethical management to the law; implications for corporate profitability; managing shareholders vs. managing stakeholders; issues such as protection of the environment, workplace safety, product liability, regulation, and fiduciary obligations. prereq: MBA student

MBA 6402. Technology Industry. (2 cr.; A-F only; Periodic Fall) This course focuses on firms engaged in three major sub-areas of technology including e-commerce, defense, and manufacturing subsectors. Cases and live case studies to focus on firms ranging from 3M, Lockheed, Amazon, and Google. Federal agency oversight focus includes the Departments of Defense, Transportation, Commerce, and Education.

MBA 6403. Energy Industry. (2 cr.; A-F only; Periodic Fall) Energy companies are in the midst of making a transition into an unknown future. They face disruption that arises from such factors as electric and autonomous vehicles, fracking for oil and natural gas, a growth in renewable power, and increasing global action on climate change. This course is about exercising foresight in this industry. How should managers make long term expensive capital intensive, and often irreversible investment decisions under conditions of great uncertainty?

MBA 6500. MBA Projects. (2-4 cr.; max 6 cr.; A-F only; Every Fall & Spring) Interdisciplinary team approach to formulation/execution of an actual business problem. Teams work on problems currently faced by business, nonprofit, and government organizations in the Twin Cities metropolitan area. prereq: MBA student, instr consent

MBA 6501. Carlson Funds Enterprise: Growth. (1-4 cr.; max 12 cr.; A-F only; Every Fall & Spring) Lectures, assignments, modules. Hands-on real-money experience through Golden Gopher Growth Fund. prereq: MBA student or [applied to or accepted in] spring of 1st yr; [6031, ACCT 6100, ACCT 6160, MBA student, emphasis in finance mgmt] recommended

MBA 6502. Carlson Funds Enterprise: Fixed Income. (1-4 cr.; max 12 cr.; A-F only; Every Fall & Spring) Lectures, assignments, modules. Hands-on real-money experience through Golden Gopher Fixed Income Fund. prereq: [Applied to or accepted in] spring-A of 1st yr to begin in spring-B; [6031, ACCT 6100, ACCT 6160, MBA student, emphasis in finance mgmt] recommended

MBA 6503. Carlson Ventures Enterprise. (2-4 cr.; max 12 cr.; Student Option No Audit; Every Fall & Spring) Modeled after early-stage venture capital funds. Due diligence process. Starting/growing high-growth ventures. Exposure to University-based technologies, start-up companies, and experts. Business analysis/development. Assistance to non-University-based start-up companies seeking initial equity capital. prereq: MBA student, approved application, interview

MBA 6504. Carlson Consulting Enterprise. (2-4 cr.; max 12 cr.; Student Option No Audit; Every Fall & Spring) Connects cutting-edge ideas/technologies from classroom to real problems presented by clients. Students work collaboratively with clients to integrate strategy/technology. How to lead complex change initiatives. prereq: MBA student, approved application, interview

MBA 6505. Carlson Brand Enterprise. (2-4 cr.; max 12 cr.; Student Option No Audit; Every Fall & Spring) Students assist companies/organizations with marketing/brand challenges; apply theory, industry best practices. Work collaboratively in real-world environment. Critical thinking, applied marketing skills. prereq: MBA student, approved application, interview

MBA 6990. MBA Topics. (2 cr.; max 8 cr.; A-F only; Periodic Fall, Spring & Summer) Various topics.

Master of Business Taxation (MBT)

MBT 5200. Tax Accounting Methods I. (2 cr.; A-F or Audit; Every Spring) This course covers the federal income tax rules for when income and expense should be recognized. The purpose of this course is to provide students the statutory and regulatory framework for analyzing and explaining the federal income tax consequences of tax accounting methods and periods issues. prereq: ACCT 5135, MBT student

MBT 5201. Tax Accounting Methods II. (A-F or Audit; Every Spring) This course covers special topics within the tax accounting methods area, including changes in accounting methods, accounting periods, installment sales and inventory concepts. The purpose of this course is to provide
Students statutory and regulatory framework for analyzing and explaining the federal income tax consequences of special tax accounting methods issues. Prereq: MBT 5220


MBT 5223. Tax-exempt Organizations. (2 cr.; A-F or Audit; Spring Odd Year) Tax laws/issues concerning Section 501(c)(3) and other tax-exempt organizations. Qualification, procedures. Unrelated business income, private foundations (including intermediate sanctions), joint ventures. Prereq: ACCT 5135


MBT 5233. Mergers and Acquisitions I. (2 cr.; A-F or Audit; Every Spring) Different types of acquisitions, disposessions, reorganizations, and spin-offs involving C corporations. Tax consequences of acquisition to corporations/shareholders involved. Use of 338 elections, limitations on acquired net operating losses/credits, use of covenants not to compete, consulting agreements, deferred payment terms, treatment of transaction costs. Prereq: MBT 5230


MBT 5335. Taxation of the Small Business Corporation. (2 cr.; A-F or Audit; Every Summer) Federal income taxation of S corporations. Election eligibility; termination of status; treatment of income and deduction items; distributions, basis of stock and debt. Compensation arrangements in closely held corporations; fiscal year issues; personal service corporations; advantages of C corporations vs. S corporations; corporation liquidation and redemption rules; S corporation's built-in gains tax. Prereq: 5230

MBT 5340. Taxation of Partners and Partnerships. (2 cr.; A-F or Audit; Every Spring) Reviews tax consequences associated with formation, operation, and dissolution of a partnership. Prereq: Acct 5135


MBT 5347. Tax Technology and Analytics Fundamentals. (2 cr.; A-F or Audit; Every Spring) Tax technology is transforming the way tax departments are doing business in many amazing ways. Both public accounting firms and businesses are investing in people, process, data, and technology at a rapid pace. This course provides the student with relevant background on current technologies and associated challenges, managerial approaches, systems design, process, data challenges and risk assessment methods that are specific to the tax technology arena. Additionally, it will focus on the fundamental concepts of project management, business requirements, data analytics, implementation choices, and the necessary business cases that are being conducted in both the public and private sector. Prereq: ACCT 5135

MBT 5348. Advanced ASC 740 Concepts. (2 cr.; A-F or Audit; Spring Even Year) Examination of topics under ASC 740 Accounting for Income Taxes. Share-based awards, uncertain tax positions, valuation allowances, business combinations, foreign operations, interim period tax calculations. Process design/perspective of stakeholders of income tax accounting. Prereq: 5346


MBT 5360. State and Local Taxation. (2 cr.; A-F or Audit; Every Spring) Examines state levying of individual income, corporate income, property, sales, and excise taxes. Tax problems of businesses with multistate operations. Prereq: Acct 5135, MBT student

MBT 5363. Compensation and Benefits. (2 cr.; A-F or Audit; Every Fall) Federal income taxation of executive compensation, relevant fringe benefit programs. Benefit programs other than qualified retirement plans. Salary continuation, stock options, non-profit organization plans, health/welfare plans. Prereq: ACCT 5135

MBT 5370. Taxation of Property Transactions. (2 cr.; A-F or Audit; Every Fall) Determining realized gain or loss and recognized gain or loss, and tax treatment of that gain or loss on property dispositions. Consequences of property transactions including depreciation, depletion, basis, and capital gains problems. Prereq: Acct 5135

MBT 5380. Tax Aspects of International Business I. (2 cr.; A-F or Audit; Every Fall) Multinational business operations/transactions involving foreign income. Tax consequences of transactions with/for foreign organizations/companies. Prereq: 5230

MBT 5381. Tax Aspects of International Business II. (2 cr.; A-F or Audit; Spring Even Year) Foreign tax credit, Subpart F planning opportunities, international structuring (joint ventures, use of entity classification regulations). Transfer pricing, foreign currency. Legislative, regulatory, and judicial developments. Prereq: MBT 5380

MBT 5382. Transfer Pricing. (2 cr.; A-F or Audit; Spring Odd Year) Transfer pricing requirements facing multinational companies. Tax requirements of the United States and other countries that have adopted the “arm’s-length standard” or the transfer pricing guidelines adopted by the Organization for Economic Cooperation and Development. Regulations, methods, economic models, pricing policies, transaction accounting, and management of audits of managing transfer prices within a multinational company. Prereq: ACCT 5135

MBT 5420. Current Topics in Taxation. (1-4 cr.; A-F or Audit; Every Fall, Spring & Summer) Tax research/compliance, other tasks. Students submit summary paper. Prereq: ACCT 5135, MBT student

finance, government expenditures in theory/practice. Specific taxes. prereq: MBT 5230

**MDT 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent**

### Master of Development Practice (MDP)

**MDP 5001. Ways of Knowing for Sustainable Development. (2 cr.; A-F or Audit; Every Fall)**
Complexities of interdisciplinary study of development and a range of ways of knowing the field of development studies and sustainability. Approaches practiced by physical, biological, social science, and humanities scholars. “Ways of knowing” in different cultures/groups and from a variety of situated perspectives. Key issues and concepts and key methodological challenges facing us as we engage in interdisciplinary and international development study and practice. Sustainable livelihoods. Team taught when possible by faculty from biological, social sciences, and humanities, or at minimum will include guest lecturers who can offer a range of disciplinary perspectives on questions of development. prereq: Grad MDP major or instr consent

**MDP 5002. Program Development Workshop. (3 cr. [max 4 cr.]; A-F only; Every Spring)**
Research/writing skills to support work in international development. Discussion of basic qualitative research methods/data analysis. Qualitative/quantitative data, collaborative research/analysis. Relationship between research/policy. prereq: MDP grad student or instr consent

**MDP 5004. International Field Experience. (3 cr.; S-N or Audit; Every Summer)**
International field experience. prereq: MDP grad student or instr consent

**MDP 5005. Qualitative Methods for Development Practice. (3 cr.; A-F only; Every Spring)**
Course introduces students to qualitative inquiry and analysis in the field of international and/or sustainable development practice. It provides students with first hand experience in research design for development practice applications, including data collection and analysis. The course includes lectures, discussions, presentations, and project based learning. It is considered introductory as a single semester is insufficient to introduce, design, and conduct a comprehensive qualitative inquiry and analysis.

**MDP 5100. Post-Field / Pre-Capstone Seminar. (1 cr.; A-F only; Every Fall)**
This project-focused seminar meets once at the beginning of the fall semester to collect observations, reflections and insights from the summer field placements. Then, throughout the fall semester, the seminar will meet periodically to stage the spring capstone course. Staging includes a capstone overview session, presentation of projects, team selection process and initial client engagements, the latter being particularly important for teams aspiring to travel during the winter or spring breaks.

**MDP 5200. Capstone Workshop in Development Practice. (3 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring)**
Learning from field experiences. Analytical/practical skills developed in academic training. Apply skill/experiences to “real world” problem provided by local or international development-focused organization. Reflective practice. prereq: MDP grad student or instr consent

### Master of Healthcare Admin (MHA)

**MHA 8763. External Forces Affecting Health Services Delivery. (2 cr.; A-F or Audit; Periodic Fall)**
Guidance in development of concepts, models, and principles of financing, social policy making, and organizing and human resource development for health services delivery. Written paper and teaching presentation required. prereq: PhD student

**MHA 8782. Research Practicum. (2 cr.; A-F or Audit; Every Fall & Spring)**
Field experience in healthcare research. Supervised independent and team research on selected topics and problems. prereq: PhD student

### Master of Science in Finance (MSF)

**MSF 6021. Communications for Finance. (2 cr.; A-F only; Every Fall)**
This course covers guidelines and practical skill development for writing well-organized, professional documents and delivering confident, credible, and dynamic presentations. Students will practice designing and delivering effective messages including reader-friendly documents and PowerPoint using a professional writing style and document design. Through discussion and practice, students will also learn to deliver poised, formal and informal presentations to small and large groups both individually and in teams. prereq: Summer Cohort Completion

**MSF 6022. Financial Statement Analysis. (2 cr.; A-F only; Every Fall)**
This course teaches how to analyze financial statements, and it covers the following topics: overview of business activities and financial statements; profitability analysis and interpretation; credit risk analysis and interpretation; revenue recognition and operating income; asset recognition and operating assets; and inter-corporate entities. prereq: Summer Cohort Completion

**MSF 6031. Financial Accounting. (3 cr.; A-F only; Every Summer)**
This course provides students with a deep understanding of financial accounting fundamentals so that they can make decisions based on reported financials. Students will learn how a firm’s operating activities, its investments, and financing transactions are recorded in the income statement, balance sheet, and statement of cash flows. Students will develop some skills needed to analyze financial statements that would later be used.

**MSF 6121. Fixed Income and Securities. (2 cr.; A-F only; Every Fall)**
This class provides an introduction to fixed income markets. Topics include the price/yield relation, no-arbitrage pricing of stripped coupon bonds, the duration/convexity approximation, the term structure of interest rates, defaultable bonds, mortgage-backed securities, inflation protected securities, bonds with embedded options, swap rates, the Fed Funds rate, repurchase agreements, and attribution analysis. prereq: Fall A Cohort Completion

**MSF 6221. Fundamentals of Finance I. (2 cr.; A-F only; Every Summer)**
This course is the first course in a three-course sequence to introduce the ideas of corporate finance. This course will focus on an overview of corporate finance in the firm, the valuation principle, the time value of money, interest rates, valuing bonds, risk and return, and estimating the cost of capital.

**MSF 6222. Fundamentals of Finance II. (2 cr.; A-F only; Every Fall)**
This course is the second course in a three-course sequence to introduce the ideas of corporate finance. Section I will introduce capital budgeting. Students will use the cost of capital learned at the end of the first course in conjunction with an introduction to the calculation of cash flows and the use of decision rules for project selection. Section II will move into stock valuation and company valuation based upon the dividend discount model and enterprise model of valuation; students will also be exposed to other valuation methods. Section III will introduce the effect of capital structure on company valuation, starting with perfect markets and introducing the opposing effects of taxation and financial distress on valuation. Students will complete a case to demonstrate understanding of the core concepts from the first three sections; the case is a continuing case with each week building on the prior week?'s work. Section IV will provide an introduction to financial options and option valuation.

**MSF 6223. Fundamentals of Finance III. (2 cr.; A-F only; Every Fall)**
This course is the last of a three-course sequence that introduces the ideas of corporate finance. It focuses on the three major decisions of a firm: the financing decision, the capital structure decision, and the payout decision. There is also an introduction to corporate valuation. This course uses a balanced mix of lectures and case studies, and emphasizes the use of real world data. prereq: Summer Cohort Completion

**MSF 6224. Corporate Finance Analysis and Decisions. (2 cr.; A-F only; Every Spring)**
Theoretical/applied understanding of corporate financial decisions. Adjusted present value, economic value added options. Impact of
MSF 6321. Quantitative Portfolio Analysis. (2 cr.; A-F only; Every Spring)
This course develops and examines models for portfolio decisions by investors and the pricing of securities in capital markets. We will develop portfolio theory along the way and also study the extensive empirical work that characterizes movements in security prices and evaluates alternative asset pricing models. Topics include the mean variance portfolio analysis, the capital asset pricing model, arbitrage pricing theory, the empirical performance of asset pricing model (market anomalies), multi-factor asset pricing models, time varying risk and returns, and portfolio performance evaluation, including style and attribution analysis. Extensive use of the computer will be required. prereq: Fall A Cohort Completion

MSF 6322. Corporate Valuation and Modeling. (2 cr.; A-F only; Every Fall)
This course develops the financial modeling principles and tools needed to build, operate, and understand the standard business performance, M&A, equity, and credit models that have become central to modern financial decision making. The course develops a deep understanding of financial models so they can be used to analyze a wide range of financial issues. Finance concepts introduced in other courses are reinforced by having students build them into models and by having students interpret the results produced by those models. Students build a financial model on their own, learn to use a fully developed financial model and use models repeatedly to evaluate and plan performance, to estimate value added from projects, operating strategies and financing proposals and to estimate the value of securities. This course extensively uses VBA macros, sensitivity tables and scenario analyses. prereq: Fall A Cohort Completion

MSF 6421. Computing for Finance: Excel/ VBA I & II. (2 cr. [max 4 cr.]; A-F only; Every Summer)
This course first introduces students to specific software (e.g., Excel VBA, ModelRisk Monte Carlo simulator) and databases (e.g., Bloomberg, Factset, CRSP, Compustat) that will be used throughout the MS program. It then focuses on the use of Excel for many topics in finance, including modern portfolio theory, optimal portfolio analysis and binomial option pricing. This course often takes the material being learned in the "Fundamentals of Finance" course to motivate specific examples.

MSF 6422. Financial Econometrics and Computational Methods I. (2 cr.; A-F only; Every Fall)
This course provides an introduction to the methods used in empirical finance. A review of statistics is followed by intensive instruction on matrix algebra that culminates in a fundamental understanding of linear regression, the basic empirical tool. Asset pricing theories are discussed and developed and then methods are derived to test them. The course will emphasize estimation and inference using computer-based applications. prereq: Summer Cohort Completion

MSF 6423. Financial Econometrics and Computational Methods II. (2 cr.; A-F only; Every Fall)
This course builds on Financial Econometrics I and provides instruction on the econometrics used in empirical finance. Topics will include time series analysis, parametric models of volatility, evaluation of asset pricing theories, and models for risk management. The course will emphasize estimation and inference using computer-based applications. prereq: Fall A Cohort Completion

MSF 6522. Derivatives and Risk Management. (2 cr.; A-F only; Every Spring)
This class provides an introduction to derivatives markets. This course is designed to achieve two main objectives. First, provide students with a rigorous framework used in valuing derivative contracts. This will include an in-depth treatment of the two work horses of the binomial model and the Black-Sholes-Merton model. Second, apply the framework to understand a wide variety of issues related to risk management and investment decisions. prereq: Fall A Cohort Completion

MSF 6621. Finance within the Macroeconomy. (2 cr.; A-F only; Every Fall)
This course is intended to provide you with an understanding of modern macroeconomics. We are particularly interested in how financial markets and institutions fit into the overall macro system. By the time that the term is over you will have a much stronger sense of the ongoing macroeconomic news and policy discussion. Having a sense of this material is often helpful in job interviews as well. prereq: Fall A Cohort Completion

MSF 6801. Finance Independent Study Masters Program. (1-6 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring) Independent Study. prereq: instr consent

MSF 6821. Experiential Learning. (4 cr.; A-F only; Every Spring)
This course is the first half of the experiential learning segment of this program. Students will be partitioned into groups to investigate a particular project. The students will identify the most crucial issues associated with the project, collect the necessary data that will be used to analyze the issue at hand, and determine the quantitative tools that will be required to analyze the relevant issues. prereq: completion of Fall Cohort.

MSF 6920. Introduction to Python. (2 cr.; A-F only; Every Summer)
This course is focused on analyzing economic and financial data using Python. You will learn how to access powerful and popular libraries for data access, analysis, and visualization. We will spend most of our class time completing practical, hands-on exercises.

MSBA 6210. Introduction to Statistics for Data Scientists. (3 cr.; A-F only; Every Summer)
This course is designed to develop statistical thinking, i.e., understanding variation and using data to identify possible sources of variation. Specific techniques include basic descriptive and inferential procedures and regression modeling. The emphasis is on understanding such analysis for their relevance to decision making.

MSBA 6250. Analytics for Competitive Advantage II. (3 cr.; A-F only; Every Summer)
Case/discussion-based introduction to variety of analytics-related issues/examples in business. Business value, impact, benefits/limitations, as well as ethical, legal, privacy issues. Use of case studies, examples, guest speakers.

MSBA 6255. Analytics for Competitive Advantage I. (3 cr.; A-F only; Every Fall & Summer)
Quantitative problem solving formulation and solving skills.

MSBA 6310. Programming for Data Science. (3 cr.; A-F only; Every Fall)
According to recent industry surveys, Python is one of the most popular tools used by organizations data analysis. We will explore the emerging popularity of Python for tasks such as general purpose computing, data analysis, website scraping, and data visualization. You will first learn the basics of the Python language. Participants will then learn how to apply functionality from powerful and popular data science-focused libraries. In addition, we will learn advanced programming techniques such as lambda functions and closures. We will spend most of our class time completing practical hands-on exercises.

MSBA 6320. Data Management, Databases, and Data Warehousing. (3 cr.; A-F only; Every Fall)

MSBA 6330. Big Data Analytics. (3 cr.; A-F only; Every Fall)
Big data infrastructure and ecosystem, ingesting and managing big data, analytics with big data; Hadoop, MapReduce, Sqoop, Pig, Hive, Spark, SOL for Big Data, Machine Learning for Big Data, Real-time Streaming for Big Data; cloud computing and other recent developments in big data.

MSBA 6345. Project Management of Analytics Projects. (1.5 cr.; A-F only; Every Fall)
Project Management of full-stack analytics projects: identifying deliverables and a methodology; gathering requirements (use cases, user stories); estimating and staffing the project; monitoring project status (earned value and visual methods); team roles in an agile project. prereq: MSBA student

MSBA 6355. Building and Managing Teams. (0-1.5 cr.; A-F only; Every Fall)
Examine individual, group and organizational aspects of team effectiveness; learn and practice basic skills central to team management; develop appreciation for team leadership function; learn the tools for effective team decision making and conflict management; develop general diagnostic skills for assessment of team issues within and across organizations and national boundaries.


MSBA 6420. Predictive Analytics. (3 cr.; A-F only; Every Fall) Fundamentals of predictive modeling and data mining, assessing performance of predictive models, machine learning and statistical classification and prediction, logistic regression, decision trees, naïve Bayesian classifiers, support vector machine, ensemble learning, deep neural network, and their applications in structured and unstructured data.


MSBA 6440. Data-Driven Experimentation and Measurement. (3 cr.; A-F only; Every Fall) Controlled experiments in business settings, experiment design, A/B testing. Specialized statistical methodologies. Fundamentals of econometrics, instrument variable regression, propensity score matching.


MSBA 6510. Business Analytics Experiential Learning. (6 cr.; A-F only; Every Spring) This course involves hands-on application of the analytics methodologies, techniques, and tools learned throughout the program to a real-world business client in the area of marketing, strategy, operation/supply chain, information technology, finance, accounting, or human resources as well as the development and presentation of results, interpretations, insights, and recommendations.

MSBA 6515. Capstone Project in Analytics. (0-3 cr.; A-F only; Every Spring) Hands-on, integrative application of analytics methodologies, techniques, and tools learned throughout the program in the context of a specific analytics problem. Experience with the entire data analytics cycle, starting from business and data understanding as well as data cleaning and integration and ending with the development and presentation of results, interpretations, insights, and recommendations.

Materials Science (MATS)

MATS 5353. Electron Microprobe Theory and Practice. (3 cr.; Student Option; Periodic Spring) Characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions. prereq: [One yr chem, one yr physics] or instr consent

MATS 5517. Electron Microscopy. (3 cr.; A-F or Audit; Periodic Spring) Transmission electron microscope, scattering and diffraction, electron sources, lenses, apertures and resolution, specimen preparation, diffraction patterns, kikuchi diffraction, planar defects, strain fields, high resolution imaging, X-ray spectrometry.

MATS 5531. Electrochemical Engineering. (3 cr.; Student Option; Periodic Fall) Fundamentals of electrochemical engineering. Topics include electrochemical mass transfer, electrokinetics, thermodynamics of cells, modern sensors, formation of thin films and microstructured materials. Computer-based problems will be assigned. prereq: MatS 3011 or instr consent, upper div CSE or grad

MATS 5771. Colloids and Dispersions. (3 cr.; A-F or Audit; Every Fall) Preparation, stability, coagulation kinetics, or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures. prereq: Physical chemistry

MATS 8001. Structure and Symmetry of Materials. (3 cr.; Student Option; Every Fall) Comprehensive description of structure of materials, including metals, semiconductors, organic crystals, polymers, and liquid crystals. Atomic and molecular ordering, influence of intermolecular forces on symmetry and structure. Principles of scattering and use of X-ray, neutron, and electron diffraction. prereq: MatS and ChEn majors must take this course for a grade

MATS 8002. Thermodynamics and Kinetics. (3 cr.; A-F or Audit; Every Fall) First three laws of thermodynamics, free energy, equilibrium constants, fugacity and activity relationships, solution models, order-disorder transitions, phase transitions. Elementary statistical mechanics. Applications to materials systems, including surface energies, multicomponent equilibria, reaction kinetics, mass transport, diffusion.


MATS 8004. Mechanical Properties. (3 cr.; A-F or Audit; Every Spring) Defects in crystalline materials, including point defects, dislocations, and grain boundaries. Structure and movement of defects related to mechanical behavior of materials. Tools used to understand crystals and crystallography.

MATS 8201. Applied Math. (3 cr.; A-F or Audit; Every Fall) Integrated approach to solving linear mathematical problems. Linear algebraic equations. Linear ordinary and partial differential equations using theoretical/numerical analysis based on linear operator theory. prereq: Materials science grad student or instructor consent.

MATS 8204. Computational Methods and Applications to Problems in Materials Science and Engineering. (2 cr.; A-F or Audit; Every Spring) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications. prereq: Grad student, knowledge of programming languages such as Fortran

MATS 8211. Physical Chemistry of Polymers. (4 cr.; Student Option; Every Spring) Introduction to polymer physical chemistry. Chain conformations; thermodynamics of polymer solutions, blends, and copolymers; light, neutron, and X-ray scattering; dynamics in dilute solutions and polymer characterization; dynamics of melts and viscoelasticity; rubber elasticity, networks, and gels; glass transitions; crystallization. prereq: Undergrad physical chem or instr consent

MATS 8221. Synthetic Polymer Chemistry. (4 cr.; A-F or Audit; Every Fall) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties. prereq: Undergrad organic chemistry course, undergrad physical chemistry course) or instr consent


MATS 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

MATS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
MATH 5067. Actuarial Mathematics I. (4 cr.; Student Option; Every Fall) Future lifetime random variable, survival function. Insurance, life annuities, future loss random variables. Net single premium, actuarial present value, net premium, net reserves. prereq: 4065, [one sem [4xxx or 5xxx] [probability or statistics] course]

MATH 5068. Actuarial Mathematics II. (4 cr.; Student Option; Every Spring) Multiple decrement insurance, pension valuation. Expense analysis, gross premium, reserves. Problem of withdrawals. Regulatory reserves systems. Minimum cash values. Additional topics at instructor's discretion. prereq: 5067

MATH 5075. Mathematics of Options, Futures, and Derivative Securities I. (4 cr.; Student Option; Every Fall) Mathematical background such as partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods--including Monte Carlo simulation. Interest-rate derivative securities, exotic options, risk theory. First course of two-course sequence. prereq: Two yrs calculus, basic computer skills

MATH 5076. Mathematics of Options, Futures, and Derivative Securities II. (4 cr.; A-F or Audit; Every Spring) Mathematical background such as partial differential equations, Fourier series, computational methods, Black-Scholes theory, numerical methods (including Monte Carlo simulation), interest-rate derivative securities, exotic options, risk theory. prereq: 5075

MATH 5165. Mathematical Logic I. (4 cr.; Student Option; Every Fall) Theory of computability: notion of algorithm, Turing machines, primitive recursive functions, recursive functions, Kleene normal form, recursion theorem. Propositional logic. prereq: 2283 or 3283 or Phil 5201 or CSci course in theory of algorithms or instr consent

MATH 5166. Mathematical Logic II. (4 cr.; Student Option; Every Spring) First-order logic: provability/truth in formal systems, models of axiom systems, Gödel's completeness theorem. Gödel's incompleteness theorem: decidable theories, representability of recursive functions in formal theories, undecidable theories, models of arithmetic. prereq: 5165


MATH 5285H. Honors: Fundamental Structures of Algebra I. (4 cr.; Student Option; Every Fall) Review of matrix theory, linear algebra. Vector spaces, linear transformations over abstract fields. Group theory, including normal subgroups, quotient groups, homomorphisms, class equation, Sylow's theorems. Specific examples: permutation groups, symmetry groups of geometric figures, matrix groups. prereq: [2243 or 2373 or 2573], [2283 or 2574 or 3283]

MATH 5286H. Honors: Fundamental Structures of Algebra II. (4 cr.; Student Option; Every Fall & Spring) Ring/module theory, including ideals, quotients, homomorphisms, domains (unique factorization, euclidean, principal ideal), fundamental theorem for finitely generated modules over euclidean domains. Jordan canonical form. Introduction to field theory, including finite fields, algebraic/transcendental extensions. Galois theory. prereq: 5285

MATH 5335. Geometry I. (4 cr.; Student Option; Every Fall) Advanced two-dimensional Euclidean geometry from a vector viewpoint. Theorems/problems about triangles/circles, isometries, connections with Euclid's axioms. Hyperbolic geometry, how it compares with Euclidean geometry. prereq: [2243 or 2373 or 2573], [concurrence registration is required (or allowed) in 2263 or concurrent registration is required (or allowed) in 2374 or concurrent registration is required (or allowed) in 2574]

MATH 5336. Geometry II. (4 cr.; Student Option; Every Spring) Projective geometry, including: relation to Euclidean geometry, finite geometries, fundamental theorem of projective geometry. N-dimensional Euclidean geometry from a vector viewpoint. Emphasizes N=3, including: polyhedra, spheres, isometries. prereq: 5335

MATH 5345H. Honors: Introduction to Topology. (4 cr.; A-F only; Every Fall) Rigorous introduction to general topology. Set theory, Euclidean/metric spaces, compactness/connectedness. May include Urysohn metrization, Tychonoff theorem or fundamental group/covers spaces. prereq: [2263 or 2374 or 2573], [concurrence registration is required (or allowed) in 2283 or concurrent registration is required (or allowed) in 2374 or concurrent registration is required (or allowed) in 3283]

MATH 5378. Differential Geometry. (4 cr.; Student Option; Every Spring) Basic geometry of curves in plane and in space, including Frenet formula, theory of surfaces, differential forms, Riemannian geometry. prereq: [2283 or 2374 or 2573], [2243 or 2373 or 2574]; [2283 or 3283] recommended

MATH 5385. Introduction to Computational Algebraic Geometry. (4 cr.; Student Option; Every Fall) Geometry of curves/surfaces defined by polynomial equations. Emphasizes concrete computations with polynomials using computer packages, interplay between algebra and geometry. Abstract algebra presented as needed. prereq: [2263 or 2374 or 2573], [2243 or 2373 or 2574]


MATH 5447. Theoretical Neuroscience. (4 cr.; Student Option; Every Fall)
MATH 5467. Introduction to the Mathematics of Image and Data Analysis. (4 cr.; Student Option; Every Fall) Background theory/experience in wavelets. Inner product spaces, operator theory, Fourier transforms applied to Gabor transforms, multi-scale analysis, discrete wavelets, self-similarity. Computing techniques. prereq: [2243 or 2373 or 2573], [2283 or 2574 or 3283] or instr consent; [2263 or 2374], 4567 recommended

MATH 5485. Introduction to Numerical Methods I. (4 cr.; Student Option; Every Fall) Solution of nonlinear equations in one variable. Interpolation, polynomial approximation. Methods for solving linear systems, eigenvalue problems, systems of nonlinear equations. prereq: [2243 or 2373 or 2573], familiarity with some programming language


MATH 5490. Topics in Applied Mathematics. (1-3 cr.; max 12 cr.; Student Option; Periodic Fall & Spring) Topics vary by instructor. See class schedule.

MATH 5525. Introduction to Ordinary Differential Equations. (4 cr.; Student Option; Periodic Fall & Spring) Ordinary differential equations, solution of linear homogeneous/nonhomogeneous methods for nonlinear systems. Linear algebra background, fundamental matrix solutions, variation of parameters, existence/uniqueness theorems, phase space. Rest points, their stability. Periodic orbits, Poincare-Bendixon theory, strange attractors. prereq: [2243 or 2373 or 2573], [2283 or 2574 or 3283]

MATH 5535. Dynamical Systems and Chaos. (3-4 cr.; Student Option; Every Fall & Spring) Dynamical systems theory. Emphasizes iteration of one-dimensional mappings. Fixed points, periodic points, stability, bifurcations, symbolic dynamics, chaos, fractals, Julia/ Mandelbrot sets. prereq: [2243 or 2373 or 2573], [2263 or 2374 or 2574]


MATH 5587. Elementary Partial Differential Equations I. (4 cr.; Student Option; Every Fall) Emphasizes partial differential equations w/physical applications, including heat, wave, Laplace’s equations. Interpretations of boundary conditions. Characteristics, Fourier series, transforms, Green’s functions, images, computational methods. Applications include wave propagation, diffusions, electrostatics, shocks. prereq: [2243 or 2373 or 2573], [2263 or 2374 or 2574]

MATH 5588. Elementary Partial Differential Equations II. (4 cr.; A-F or Audit; Every Spring) Heat, wave, Laplace’s equations in higher dimensions. Green’s functions, Fourier series, transforms. Asymptotic methods, boundary layer theory, bifurcation theory for linear/nonlinear PDEs. Variational methods. Free boundary problems. Additional topics as time permits. prereq: [2243 or 2373 or 2573], [2263 or 2374 or 2574], 5587 or instr consent

MATH 5615H. Honors: Introduction to Analysis I. (4 cr.; Student Option; Every Fall) Axiomatic treatment of real/complex number systems. Introduction to metric spaces: convergence, connectedness, compactness. Convergence of sequences/series of real/complex numbers, Cauchy criterion, root/ratio tests. Continuity in metric spaces. Rigorous treatment of differentiation of single-variable functions, Taylor’s Theorem. prereq: [2243 or 2373], [2263 or 2374], [2283 or 3283]] or 2574


MATH 5651. Basic Theory of Probability and Statistics. (4 cr.; Student Option; Every Fall & Spring) Logical development of probability, basic issues in statistics. Probability spaces, random variables, their distributions/expected values. Law of large numbers, central limit theorem, generating functions, sampling, sufficiency, estimation, prereq: [2263 or 2374 or 2573], [2243 or 2373]; [2283 or 2574 or 3283] recommended.

MATH 5652. Introduction to Stochastic Processes. (4 cr.; Student Option; Every Fall & Spring) Random walks, Markov chains, branching processes, martingales, queuing theory, Brownian motion. prereq: 5651 or Stat 5101

MATH 5654. Prediction and Filtering. (4 cr.; Student Option; Every Spring) Prediction of future values of partially observable processes. prereq: 5651 or Stat 5101

MATH 5705. Enumerative Combinatorics. (4 cr.; Student Option; Every Fall & Spring) Basic enumeration, bijections, inclusion-exclusion, recurrence relations, ordinary/exponential generating functions, partitions, Polya theory. Optional topics include trees, asymptotics, listing algorithms, rook theory, involutions, tableaux, permutation statistics. prereq: [2243 or 2373 or 2573], [2263 or 2374 or 2574 or 3283]

MATH 5707. Graph Theory and Non-enumerative Combinatorics. (4 cr.; Student Option; Every Fall & Spring) Basic topics in graph theory: connectedness, Eulerian/Hamiltonian properties, trees, colorings, planar graphs, matchings, flows in networks. Optional topics include graph algorithms, Latin squares, block designs, Ramsey theory. prereq: [2243 or 2373 or 2573], [2263 or 2374 or 2574] or [2283 or 3283 or experience in writing proofs] highly recommended; Credit will not be granted if credit has been received for: 4707

MATH 5711. Linear Programming and Combinatorial Optimization. (4 cr.; Student Option; Every Fall & Spring) Simplex method, connections to geometry, duality theory, sensitivity analysis. Applications to cutting stock, allocation of resources, scheduling problems. Flows, matching/transportation problems, spanning trees, distance in graphs, integer programs, branch/bound, cutting planes, heuristics. Applications to traveling salesman, knapsack problems. prereq: 2 sems soph math [including [2243 or 2373 or 2573]

MATH 5900. Tutorial in Advanced Mathematics. (1-6 cr.; max 120 cr.; A-F or Audit; Every Fall, Spring & Summer) Individually directed study.

MATH 5990. Topics in Mathematics. (3-4 cr.; max 12 cr.; Student Option; Periodic Fall & Spring) Topics vary by instructor. See class schedule.

MATH 8001. Preparation for College Teaching. (1 cr.; S-N or Audit; Every Fall & Spring) New approaches to teaching/learning, issues in mathematics education, components/expectations of a college mathematics professor. prereq: Math grad student in good standing or instr consent

MATH 8141. Applied Logic. (3 cr.; A-F or Audit; Periodic Fall & Spring) Applying techniques of mathematical logic to other areas of mathematics and computer science. Sample topics: complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8142. Applied Logic. (3 cr.; A-F or Audit; Periodic Spring) Applying techniques of mathematical logic to other areas of mathematics, computer science.
Complexity of computation, computable analysis, unsolvability of diophantine problems, program verification, database theory.

MATH 8151. Axiomatic Set Theory. (3 cr.; A-F or Audit; Periodic Fall)
Axiomatic development of basic properties of ordinal/cardinal numbers, infinitary combinatorics, well founded sets, consistency of axiom of foundation, constructible sets, consistency of axiom of choice and of generalized continuum hypothesis. prereq: 5166 or inst consent

MATH 8152. Axiomatic Set Theory. (3 cr.; A-F or Audit; Periodic Fall)
Notion of forcing, generic extensions, forcing with finite partial functions, independence of continuum hypothesis, forcing with partial functions of infinite cardinalities, relationship between partial orderings and Boolean algebras, Boolean-valued models, independence of axiom of choice. prereq: 8151 or inst consent

MATH 8166. Recursion Theory. (3 cr.; A-F or Audit; Periodic Fall)
Analysis of concept of computability, including various equivalent definitions. Primitive recursive, recursive, partial recursive functions. Oracle Turing machines. Kleene Normal Form Theorem. Recursive, recursively enumerable sets. Degrees of unsolvability. Arithmetic hierarchy. prereq: Math grad student or inst consent

MATH 8167. Recursion Theory. (3 cr.; A-F or Audit; Periodic Spring)
Sample topics: computability theory, recursion analysis, generalized recursion theory, analytical hierarchy, constructive ordinals. prereq: 8166

MATH 8172. Model Theory. (3 cr.; A-F or Audit; Periodic Fall)
Interplay of formal theories, their models. Elementary equivalence, elementary extensions, partial isomorphisms. Lowenheim-Skolem theorems, compactness theorems, preservation theorems. Ultraproducts. prereq: Math grad student or inst consent

MATH 8173. Model Theory. (3 cr.; A-F or Audit; Periodic Fall)
Types of elements. Prime models, homogeneity, saturation, categoricity in power. Forking. prereq: 8172 or inst consent

MATH 8190. Topics in Logic. (1-3 cr.; max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Offered for one year or one semester as circumstances warrant.

MATH 8201. Commutative and Homological Algebra. (3 cr.; A-F or Audit; Periodic Fall)
Selected topics. prereq: 8202 or inst consent

MATH 8202. Axiomatic Set Theory. (3 cr.; A-F or Audit; Periodic Fall)
Notion of forcing, generic extensions, forcing with finite partial functions, independence of continuum hypothesis, forcing with partial functions of infinite cardinalities, relationship between partial orderings and Boolean algebras, Boolean-valued models, independence of axiom of choice. prereq: 8151 or inst consent

MATH 8207. Theory of Modular Forms and L-Functions. (3 cr.; A-F or Audit; Periodic Fall)
Zeta and L-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, class number formulas; Riemann hypothesis; modular forms and associated L-function; Eisenstein series; Hecke operators, Poincaré series, Euler products; Ramanujan conjectures; Theta series and quadratic forms; waveforms and L-functions.

MATH 8208. Theory of Modular Forms and L-Functions. (3 cr.; A-F or Audit; Periodic Fall)
Applications of Eisenstein series: special values and analytic continuation and functional equations of L-functions. Trace formulas. Applications of representation theory. Computations. prereq: 8207 or inst consent

MATH 8211. Commutative and Homological Algebra. (3 cr.; A-F or Audit; Periodic Fall)
Selected topics. prereq: 8202 or inst consent

MATH 8212. Commutative and Homological Algebra. (3 cr.; A-F or Audit; Periodic Fall)
Selected topics. prereq: 8211 or inst consent

MATH 8245. Group Theory. (3 cr.; A-F or Audit; Every Fall)
Permutations, Sylow's theorems, representations of groups on groups, semi-direct products, solvable and nilpotent groups, generalized Fitting subgroups, p-groups, co-prime action on p-groups, prereq: 8202 or inst consent

MATH 8246. Group Theory. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Representation and character theory, simple groups, free groups and products, presentations, extensions, Schur multipliers. prereq: 8245 or inst consent

MATH 8251. Algebraic Number Theory. (3 cr.; A-F or Audit; Periodic Fall)
Algebraic number fields and algebraic curves. Basic commutative algebra. Completions: p-adic fields, formal power series, Puiseux series. Ramification, discriminant, different. Finiteness of class number and units theorem. prereq: 8202 or inst consent

MATH 8252. Algebraic Number Theory. (3 cr.; A-F or Audit; Periodic Fall)

MATH 8253. Algebraic Geometry. (3 cr.; A-F or Audit; Periodic Fall)

MATH 8254. Algebraic Geometry. (3 cr.; A-F or Audit; Periodic Spring)

MATH 8270. Topics in Algebraic Geometry. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Selected topics. prereq: Math 8201, Math 8202; offered for one year or one semester as circumstances warrant

MATH 8271. Lie Groups and Lie Algebras. (3 cr.; A-F or Audit; Periodic Fall)
Definitions and basic properties of Lie groups and Lie algebras; classical matrix Lie groups; Lie subgroups and their corresponding Lie subalgebras; covering groups; Maurer-Cartan forms; exponential map; correspondence between Lie algebras and simply connected Lie groups; Baker-Campbell-Hausdorff formula; homogeneous spaces. prereq: 8302 or inst consent

MATH 8272. Lie Groups and Lie Algebras. (3 cr.; A-F or Audit; Periodic Spring)
Solvable and nilpotent Lie algebras and Lie groups; Lie's and Engel's theorems; semisimple Lie algebras; cohomology of Lie algebras; Whitehead's lemmas and Levi's theorem; classification of complex semisimple Lie algebras and compact Lie groups; representation theory. prereq: 8271 or inst consent

MATH 8280. Topics in Number Theory. (1-3 cr.; max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Various topics in Number Theory.

MATH 8300. Topics in Algebra. (1-3 cr.; max 12 cr.; A-F or Audit; Every Fall & Spring)
Selected topics. prereq: Grad math major or inst consent; offered as one yr or one sem crse as circumstances warrant

MATH 8301. Manifolds and Topology. (3 cr.; A-F or Audit; Every Fall)
Classification of compact surfaces, fundamental group/covering spaces. Homology group, basic cohomology. Application to degree of a map, invariance of domain/dimension. prereq: [Some point-set topology, algebra] or inst consent

MATH 8302. Manifolds and Topology. (3 cr.; A-F or Audit; Every Spring)

MATH 8306. Algebraic Topology. (3 cr.; A-F or Audit; Periodic Fall)
Singular homology, cohomology theory with coefficients. Eilenberg-Steenrod axioms, Mayer-Vietoris theorem. prereq: 8301 or inst consent

MATH 8307. Algebraic Topology. (3 cr.; A-F or Audit;)
Basic homotopy theory, cohomology rings with applications. Time permitting: fibre
spaces, cohomology operations, extra-ordinary cohomology theories. prereq: 8306 or instr consent
MATH 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

MATH 8360. Topics in Topology. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring)
Selected topics. prereq: 8301 or instr consent; offered as one yr or one sem cr as circumstances warrant
MATH 8365. Riemannian Geometry. (; 3 cr.; A-F or Audit; Every Fall)
Riemannian metrics, curvature. Bianchi identities, Gauss-Bonnet theorem, Meyers's theorem, Cartan-Hadamard theorem. prereq: 8301 or basic point-set topology or instr consent

MATH 8366. Riemannian Geometry. (; 3 cr.; A-F or Audit; Every Spring)
Gauss, Codazzi equations. Tensor calculus, Hodge theory, spinors, global differential geometry, applications. prereq: 8365 or instr consent

MATH 8370. Topics in Differential Geometry. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring)
Current research in Differential Geometry. prereq: 8301 or 8365; offered for one yr or one sem as circumstances warrant

MATH 8380. Topics in Advanced Geometry. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring)
Current research. prereq: 8301, 8365

MATH 8385. Riemannian Geometry. (; 3 cr.; A-F or Audit; Every Fall)
Minimal Surfaces.
MATH 8386. Calculus of Variations and Applications. Modeling of deterministic/
probabilistic, discrete/continuous processes; methods for analysis/computation. prereq: [5xxx numerical analysis, some computer experience] or instr consent
MATH 8388. Mathematical Modeling of Industrial Problems. (; 3 cr.; A-F or Audit; Periodic Fall)
Techniques for analysis of mathematical models. Asymptotic methods; design of simulation and visualization techniques. Specific computation for models arising in industrial problems. prereq: 8597 or instr consent

MATH 8390. Topics in Mathematical Physics. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall)
Current research. prereq: 8601; offered for one yr or one sem as circumstances warrant
MATH 8401. Mathematical Modeling and Methods of Applied Mathematics. (; 3 cr.; A-F or Audit; Every Fall)
Dimension analysis, similarity solutions, linearization, stability theory, well-posedness, and characterization of type. Fourier series and integrals, wavelets, Green's functions, weak solutions and distributions. prereq: 4xxx numerical analysis and applied linear algebra or instr consent

MATH 8402. Mathematical Modeling and Methods of Applied Mathematics. (; 3 cr.; A-F or Audit; Every Spring)
Calculus of variations, integral equations, eigenvalue problems, spectral theory. Perturbation, asymptotic methods. Artificial boundary conditions, conformal mapping, coordinate transformations. Applications to specific modeling problems. prereq: 8401 or instr consent

MATH 8431. Mathematical Fluid Mechanics. (; 3 cr.; A-F or Audit; Periodic Fall)
Equations of continuity/motion. Kinematics. Bernoulli's theorem, stream function, velocity potential. Applications of conformal mapping. prereq: 4xxx numerical analysis of partial differential equations or instr consent

MATH 8432. Mathematical Fluid Mechanics. (; 3 cr.; Student Option; Periodic Fall)

MATH 8441. Numerical Analysis and Scientific Computing. (; 3 cr.; Student Option; Every Fall)
MATH 8442. Numerical Analysis and Scientific Computing. (; 3 cr.; Student Option; Every Spring)

5477-5478 recommended for engineering and science grad students
MATH 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

MATH 8445. Numerical Analysis of Differential Equations. (; 3 cr.; A-F or Audit; Every Fall)
Finite element and finite difference methods for elliptic boundary value problems (e.g., Laplace's equation) and solution of resulting linear systems by direct and iterative methods. prereq: 4xxx numerical analysis, 4xx partial differential equations or instr consent

MATH 8446. Numerical Analysis of Differential Equations. (; 3 cr.; A-F or Audit; Every Spring)
Numerical methods for parabolic equations (e.g., heat equations). Methods for elasticity, fluid mechanics, electromagnetics. Applications to specific computations. prereq: 8445 or instr consent

MATH 8450. Topics in Numerical Analysis. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring)
Selected topics. prereq: Grad math major or instr consent; offered as one year or one semester course as circumstances warrant

MATH 8470. Topics in Mathematical Theory of Continuum Mechanics. (; 1-3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring)
Offered for one year or one semester as circumstances warrant.

MATH 8501. Differential Equations and Dynamical Systems I. (; 3 cr.; A-F or Audit; Every Fall)
Existence, uniqueness, continuity, and differentiability of solutions. Linear theory and hyperbolicity. Basics of dynamical systems. Local behavior near a fixed point, a periodic orbit, and a homoclinic or heteroclinic orbit. Perturbation theory. prereq: 4xxx ODE or instr consent

MATH 8502. Differential Equations and Dynamical Systems II. (; 3 cr.; A-F or Audit; Every Spring)

MATH 8503. Bifurcation Theory in Ordinary Differential Equations. (; 3 cr.; A-F or Audit; Periodic Fall)

MATH 8505. Applied Dynamical Systems and Bifurcation Theory I. (; 3 cr.; A-F or Audit; Periodic Fall)
MATH 8506. Applied Dynamical Systems and Bifurcation Theory II.  (3 cr.; A-F or Audit; Periodic Fall) Background on analysis in Banach spaces, linear operator theory. Lyapunov-Schmidt reduction, static bifurcation, stability at a simple eigenvalue, Hopf bifurcation in infinite dimensions invariant manifold theory. Applications to hydrodynamic stability problems, reaction-diffusion equations, pattern formation, and elasticity. prereq: 5587 or instr consent

MATH 8580. Applications of Linear Operator Theory.  (3 cr.; A-F or Audit; Periodic Fall) Fourier theory. Self-adjoint, compact, unbounded linear operators. Spectral analysis, eigenvalue-eigenvector problem, spectral theorem, operational calculus. prereq: 8581 or instr consent

MATH 8583. Theory of Partial Differential Equations.  (3 cr.; A-F or Audit; Every Fall) Classification of partial differential equations/characteristics. Laplace, wave, heat equations. Some mixed problems. prereq: [Some 5xxx PDE, 8601] or instr consent

MATH 8584. Theory of Partial Differential Equations.  (3 cr.; A-F or Audit; Every Fall) Fundamental solutions/distributions, Sobolev spaces, regularity, Advanced elliptic theory (Schauder estimates, Garding's inequality). Hyperbolic systems. prereq: 8583 or instr consent

MATH 8589. Topics in Dynamic Systems.  (1-3 cr.; max 12 cr.; A-F or Audit; Periodic Fall & Spring) Current research. prereq: 8502

MATH 8530. Topics in Ordinary Differential Equations.  (1-3 cr.; A-F or Audit; Periodic Fall & Spring) Offered for one year or one semester as circumstances warrant. prereq: 8502

MATH 8540. Topics in Mathematical Biology.  (1-3 cr.; max 12 cr.; A-F or Audit; Every Fall & Spring) Offered for one year or one semester as circumstances warrant.

MATH 8571. Theory of Evolutionary Equations.  (3 cr.; A-F or Audit; Every Fall) Infinite dimensional dynamical systems, global attractors, existence and robustness. Linear semigroups, analytic semigroups. Linear and nonlinear reaction diffusion equations, strong and weak solutions, well-posedness of solutions. prereq: 8502 or instr consent

MATH 8572. Theory of Evolutionary Equations.  (3 cr.; A-F or Audit; Periodic Spring) Dynamics of Navier-Stokes equations, strong/weak solutions, global attractors. Chemically reacting fluid flows. Dynamics in infinite dimensions, unstable manifolds, center manifolds perturbation theory. Inertial manifolds, finite dimensional structures. Dynamical theories of turbulence. prereq: 8571 or instr consent

MATH 8580. Topics in Evolutionary Equations.  (1-3 cr.; max 12 cr.; A-F or Audit; Periodic Fall) N/A prereq: 8572 or instr consent; offered for one yr or one semester as circumstances warrant

MATH 8581. Applications of Linear Operator Theory.  (3 cr.; A-F or Audit; Periodic Fall) Metric spaces, continuity, completeness, contraction mappings, compactness. Normed linear spaces, continuous linear transformations. Hilbert spaces, orthogonality, projections. prereq: 4xxx applied mathematics or instr consent

MATH 8582. Applications of Linear Operator Theory.  (3 cr.; A-F or Audit; Periodic Fall) Fourier theory. Self-adjoint, compact, unbounded linear operators. Spectral analysis, eigenvalue-eigenvector problem, spectral theorem, operational calculus. prereq: 8581 or instr consent

MATH 8583. Theory of Partial Differential Equations.  (3 cr.; A-F or Audit; Every Fall) Classification of partial differential equations/characteristics. Laplace, wave, heat equations. Some mixed problems. prereq: [Some 5xxx PDE, 8601] or instr consent

MATH 8584. Theory of Partial Differential Equations.  (3 cr.; A-F or Audit; Every Spring) Fundamental solutions/distributions, Sobolev spaces, regularity. Advanced elliptic theory (Schauder estimates, Garding's inequality). Hyperbolic systems. prereq: 8583 or instr consent

MATH 8590. Topics in Partial Differential Equations.  (1-3 cr.; A-F or Audit; Every Fall & Spring) Research topics. prereq: 8602; offered for one yr or one sem as circumstances warrant

MATH 8600. Topics in Advanced Applied Mathematics.  (1-3 cr.; max 12 cr.; Student Option; Every Fall & Spring) Offered for one yr or one semester as circumstances warrant. Topics vary. For details, contact instructor.

MATH 8601. Real Analysis.  (3 cr.; A-F or Audit; Every Fall) Set theory/fundamentals. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


MATH 8640. Topics in Real Analysis.  (3 cr.; max 12 cr.; A-F or Audit; Periodic Fall) Current research. prereq: 8602 or instr consent; offered for one year or one semester as circumstances warrant

MATH 8641. Spatial Ecology.  (3 cr.; S-N or Audit; Periodic Fall) Introduction: role of space in population dynamics and interspecific interaction; includes single species and multispecies models, deterministic and stochastic theory, different modeling approaches, effects of implicit/explicit space on competition, pattern formation, stability diversity and invasion. Recent literature. Computer lab. prereq: Two semesters calculus, theoretical population ecology or four semesters more robust calculus, course in statistics or probability or instr consent


MATH 8652. Theory of Probability Including Measure Theory.  (3 cr.; Student Option; Periodic Spring) Conditional distributions and expectations, convergence of sequences of distributions on real line and on Polish spaces, central limit theorem and related limit theorems, Brownian motion, martingales and introduction to other stochastic sequences. prereq: 8651 or instr consent

MATH 8654. Fundamentals of Probability Theory and Stochastic Processes.  (3 cr.; Student Option; Periodic Spring) Review of basic theorems of probability for independent random variables; introductions to Brownian motion process, Poisson process, conditioning, Markov processes, stationary processes, martingales, super- and sub-martingales, Doob-Meyer decomposition. prereq: 8651 or 8602 or instr consent

MATH 8655. Stochastic Calculus with Applications.  (3 cr.; Student Option; Every Fall) Stochastic integration with respect to martingales, Ito's formula, applications to business models, filtering, and stochastic control theory. prereq: 8654 or 8659 or instr consent

MATH 8659. Stochastic Processes.  (3 cr.; Student Option; Every Fall) In-depth coverage of various stochastic processes and related concepts, such as Markov sequences and processes, renewal sequences, exchangeable sequences, stationary sequences, Poisson point processes, Levy processes, interacting particle systems, diffusions, and stochastic integrals. prereq: 8652 or instr consent

MATH 8660. Topics in Probability.  (1-3 cr.; max 12 cr.; Student Option; Every Fall & Spring) Offered for one year or one semester as circumstances warrant.

MATH 8666. Doctoral Pre-Thesis Credits.  (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

MATH 8668. Combinatorial Theory.  (3 cr.; A-F or Audit; Periodic Fall) Basic enumeration, including sets and multisets, permutation statistics, inclusion-exclusion, integer/set partitions, involutions and Polya theory. Partially ordered sets, including lattices, incidence algebras, and Mobius inversion. Generating functions.
MATH 8669. Combinatorial Theory. (3 cr.; A-F or Audit; Spring Even Year)
Further topics in enumeration, including symmetric functions, Schensted correspondence, and standard tableaux; non-enumarative combinators, including graph theory and coloring, matching theory, connectivity, flows in networks, codes, and extremal set theory. prereq: 8668 or instr consent

MATH 8680. Topics in Combinatorics. (1-3 cr.; max 12 cr.; A-F or Audit; Every Fall & Spring)
Selected topics. prereq: Grad math major or instr consent; offered as one yr or one sem crse as circumstances warrant

MATH 8701. Complex Analysis. (3 cr.; A-F or Audit; Every Fall)

MATH 8702. Complex Analysis. (3 cr.; A-F or Audit; Every Spring)

MATH 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

MATH 8790. Topics in Complex Analysis. (1-3 cr.; max 12 cr.; A-F or Audit; Periodic Fall)
Current research. prereq: 8702 or instr consent; offered for one yr or one sem as circumstances warrant

MATH 8801. Functional Analysis. (3 cr.; A-F or Audit; Every Fall)
Motivation in terms of specific problems (e.g., Fourier series, eigentfunctions). Theory of compact operators. Basic theory of Banach spaces (Hahn-Banach, open mapping, closed graph theorems). Frechet spaces. prereq: 8602 or instr consent

MATH 8802. Functional Analysis. (3 cr.; A-F or Audit; Periodic Spring)
Spectral theory of operators, theory of distributions (generalized functions), Fourier transformations and applications. Sobolev spaces and pseudo-differential operators. C-star algebras (Gelland-Naimark theory) and introduction to von Neumann algebras. prereq: 8801 or instr consent

MATH 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

MATH 8990. Topics in Mathematics. (1-6 cr. [max 24 cr.]; S-N or Audit; Every Fall & Spring)
Readings, research. prereq: instr consent

MATH 8991. Independent Study. (1-6 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer)
Individually directed study. prereq: instr consent

MATH 8992. Directed Reading. (1-6 cr. [max 24 cr.]; S-N or Audit; Every Fall & Spring)
Individually directed reading. prereq: instr consent

MATH 8993. Directed Study. (1-6 cr. [max 24 cr.]; S-N or Audit; Every Spring)
Individually directed study. prereq: instr consent

MATH 8994. Topics at the IMA. (1-3 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring)
Current research at IMA.

Mathematics Education (MTHE)

MTHE 5011. Arithmetic Structures in School Mathematics. (3 cr.; Student Option; Every Summer)
Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the K-8 mathematics curriculum. Instructional materials and technology appropriate for elementary or middle school arithmetic. Credit hours and targeted level vary with particular classes. prereq: Enrollment in math initial licensure program or tchg exper

MTHE 5021. Algebraic Structures in School Mathematics. (3 cr.; Student Option; Every Fall)
Pedagogy, content, and instructional strategies for teaching arithmetic. Content and issues relevant to the algebra curriculum. Instructional materials and technology appropriate for arithmetic. Each offering of the course will focus on either elementary/middle or middle/secondary grade levels. prereq: Tchg exper or instr consent

MTHE 5031. Geometric Structures in School Mathematics. (3 cr.; Student Option; Every Spring)
Pedagogy, content, and instructional strategies for teaching school geometry. Content and issues relevant to the geometry curriculum. Instructional materials and technology appropriate for geometry. Each offering will focus on either elementary/middle or middle/secondary grade levels. prereq: Tchg exper or instr consent

MTHE 5041. Statistics. (3 cr.; Student Option; Every Fall)
Pedagogy, content, and instructional strategies for teaching statistics. Content and issues relevant to the statistics curriculum. Instructional materials and technology appropriate for statistics. Each offering will focus on either elementary/middle or middle/secondary grade levels. prereq: Tchg exper or instr consent

MTHE 5314. Teaching Mathematics. (3 cr.; Student Option; Every Fall)
Methods, materials, and curriculum development. Principles of learning. Review of research. Preparation/evaluation of tests, units, and materials of instruction. Recent developments in mathematics curriculum and in instructional alternatives. Issues in teaching/learning. Program planning/evaluation. prereq: Math Ed or MEd or CI MEd or grad student or instr consent

MTHE 5366. Technology-Assisted Mathematics Instruction. (3 cr.; Student Option; Every Spring)
Technology—including computers, programmable and graphing calculators, and video—as instructional tools in mathematics; design and evaluation of technology-based mathematics lessons; the effect of technology on the mathematics curriculum; managing the technology-enriched classroom.

MTHE 5696. Student Teaching in Mathematics. (1-8 cr.; S-N only; Every Spring) Student teaching in secondary school mathematics classes. prereq: MED/initial licensure student or instr consent

MTHE 5993. Directed Studies in Mathematics Education. (2 cr.; S-N or Audit; Every Fall, Spring & Summer) Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student’s adviser. prereq: Math ed MEd student, instr consent

MTHE 8561. School Mathematics Curricula - 1850 to Present. (1-3 cr.; A-F only; Every Fall) Historical antecedents of present day school mathematics curricula. Examine primary source materials by reviewing early mathematics texts from curriculum library.

MTHE 8571. Research in Mathematics Education. (3 cr.; Student Option; Periodic Fall) Designed for advanced graduate students in mathematics education. Presentation and discussion of Ph.D. thesis proposals and other contemporary research. prereq: 5313, 8501

MTHE 8591. Seminar: Mathematics Education. (1-3 cr.; Student Option; Fall Even Year) Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research. prereq: Math educ PhD student

MTHE 8995. Problems: Mathematics Education. (1-6 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer) Students survey most recent literature and design and prepare research reports on special topics.

Mechanical Engineering (ME)

ME 5101. Vapor Power Cycles. (4 cr.; A-F or Audit; Periodic Spring) Vapor power cycle analysis, regeneration, reheat, compound cycle modifications, combined gas turbine--vapor cycle systems, components, fuels and combustion, heat sources -- solar, nuclear, geothermal, low T cycles, bottoming cycles, environmental concerns. EES software used extensively for cycle analysis. prereq: CSE upper div or grad student

ME 5103. Thermal Environmental Engineering. (4 cr.; A-F or Audit; Every Fall) Thermodynamic properties of moist air; psychrometric charts; HVAC systems; solar energy; human thermal comfort; indoor air quality; heating and cooling loads in buildings. prereq: 3331 or 3332, 3333, CSE upper div or grad

ME 5113. Aerosol/Particle Engineering. (4 cr.; A-F or Audit; Every Fall) Kinetic theory, definition, theory and measurement of particle properties, elementary particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling and transport. prereq: CSE upper div or grad student


ME 5222. Materials in Design. (4 cr.; Student Option; Every Fall) Fundamental properties of engineering materials. Fabrication, treatment. Physical/corrosive properties. Failure mechanism, cost/value analysis as related to material selection/specification. prereq: 3221, ME upper division or grad student

ME 5228. Introduction to Finite Element Modeling, Analysis, and Design. (4 cr.; A-F or Audit; Every Fall) Finite elements as principal analysis tool in computer-aided design (CAD); theoretical issues and implementation aspects for modeling and analyzing engineering problems encompassing stress analysis, heat transfer, and flow problems for linear situations. One-, two-, and three-dimensional practical engineering applications. prereq: CSE upper div or grad, 3221, AEM 3031, CSci 1113, MatS 2001

ME 5241. Computer-Aided Engineering. (4 cr.; A-F or Audit; Every Fall & Spring) Apply computer-aided engineering to mechanical design. Engineering design projects and case studies using computer-aided design and finite element analysis software; design optimization and computer graphical presentation of results. prereq: 3222, CSci 1113 or equiv, CSE upper div or grad

ME 5243. Advanced Mechanism Design. (4 cr.; A-F or Audit; Periodic Summer) Analytical methods of kinematic, dynamic, and kinetostatically analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmester theory. prereq: CSE upper div or grad, 3222 or equiv, basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E recommended


ME 5281. Analog and Digital Control. (4 cr.; Student Option; Periodic Summer) Apply vibration theory to design: optimize isolators, detuning mechanisms, viscoelastic suspensions and structures. Use modal analysis methods to describe free vibration of complex systems, relating to both theoretical and test procedures. prereq: CSE upper div or grad, 3281

ME 5286. Robotics. (4 cr.; A-F or Audit; Every Spring) The course deals with two major components: robot manipulators (more commonly known as the robot arm) and image processing. Lecture topics covered under robot manipulators include their forward and inverse kinematics, the mathematics of homogeneous transformations and coordinate frames, the Jacobian and velocity control, task programming, computational issues related to robot control, determining path trajectories, reaction forces, manipulator dynamics and control. Topics under computer vision include: image sensors, digitization, preprocessing, thresholding, edge detection, segmentation, feature extraction, and classification techniques. A weekly laboratory lasting for 8-9 weeks, will provide students with practical experience using and programming robots: students will work in pairs and perform a series of experiments using a collaborative robot. prereq: [3281 or equiv]. [upper div ME or AEM or CSci or grad student]

applications. Concentrating solar energy, including solar thermo-chemical processes, to produce hydrogen/solar power systems and photovoltaics. Solar design project. prereq: [3333, CSE upper Div] or grad student

ME 5332. Intermediate Fluid Mechanics. (3 cr.; Student Option; Every Fall) Bridge between introductory fluid mechanics and advanced graduate level course. Principles of incompressible and compressible flows, boundary layer theory, and analysis using differential formulations of the governing conservation equations. Analysis of phenomena relevant to the practice of engineering is emphasized through problem solving. Prereq: 3332 or equiv, CSE upper division or graduate student.


ME 5351. Computational Heat Transfer. (4 cr.; A-F or Audit; Every Fall & Spring) Numerical solution of heat conduction/analogous physical processes. Develop/use computer program to solve complex problems involving steady/unsteady heat conduction, flow/heat transfer in ducts, flow in porous media. prereq: 3333, CSE upper div or grad student

ME 5446. Introduction to Combustion. (4 cr.; A-F or Audit; Every Fall) Thermodynamics, kinetics, energy and mass transport, pollutants in reacting systems. Reactors, laminar and turbulent flames. Ignition, quenching, and flame stability. Diffusion flames. Combustion in reciprocating engines, furnaces, and turbines, with emphasis on internal combustion engine performance and emissions. prereq: 3331, 3332, 3333, CSE upper div or grad student

ME 5461. Internal Combustion Engines. (4 cr.; A-F or Audit; Every Spring) Basic spark ignition and diesel engine principles, air, fuel-air and actual engine cycles, cycle modeling, combustion and emissions, knock phenomena, air flow and volumetric efficiency, mixture requirements, ignition requirements and performance. Lectures/complementary labs. prereq: CSE upper div or grad student, C or better in [3332, 3333] or 3324

ME 5462. Gas Turbines. (4 cr.; A-F or Audit; Periodic Fall & Spring) Gas turbine cycles, regeneration, recuperation, reheat, intercooling, combined cycle plants, and thermochemical regeneration. Axial and radial flow compressors and turbines; combustor designs, energy analysis, emissions, and noise. Turbojet, fanjet, turboprop engine performance. Stationary power plants, vehicular propulsion, hybrid vehicles. prereq: 3331, 3332, 3333, CSE upper div or grad student

ME 5566. Modern Thermodynamics. (4 cr.; A-F only; Every Fall & Spring) Applications of thermodynamics to natural phenomena. Multiscale approach. Student group projects, with undergrads and grad students in same group. Three hours/week classroom instruction, one hour/week project discussion. Project presentations at weeks 8 and 14 are webcast, prereq: 3331 or equiv

ME 8001. Research Ethics and Professional Practice. (0 cr.; No Grade Associated; Every Fall, Spring & Summer) Intellectual property, data management, social responsibility, authorship, and plagiarism, conflict of interest, and reporting misconduct. Case studies. Recent newspaper articles.

ME 8113. Advanced Aerosol/Particle Engineering. (3 cr.; A-F or Audit; Periodic Spring) Introduction to kinetic theory, definition, theory, and measurement of particle properties; elementary particle mechanics, particle statistics; Brownian motion and diffusion, coagulation, evaporation and condensation, sampling, and transport. prereq: CSE grad student or instr consent

ME 8221. New Product Design and Business Development I. (4 cr.; A-F or Audit; Every Fall) Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, detail design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. ME 8222 must be taken in sequence the same year. prereq: CSE grad student, some design experience

ME 8222. New Product Design and Business Development II. (4 cr.; A-F or Audit; Every Spring) Students and faculty work with company representatives to develop a product concept, a working physical prototype, and an extensive business plan. Concept design, detail design, manufacturing, marketing, introduction strategy, and profit forecasting. Sponsoring company intends to bring product to market. Must be taken in sequence with 8221 the same year. prereq: 8221


ME 8229. Finite Element Methods for Computational Mechanics: Transient/Dynamic Problems. (4 cr.; A-F or Audit; Every Spring) Computational mechanics involving transient or dynamic situations; development and analysis of computational algorithms. Stability and accuracy of algorithms, convergence issues; linear/nonlinear situations. Implicit, explicit, mixed, and variable time discretization approaches; modal-based methods for engineering problems prereq: 5228 or equiv, 5341, AEM 3031, CSci 1113

ME 8243. Topics in Design. (4 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring) Topics vary with each offering.

ME 8253. Computational Nanomechanics. (3 cr.; Student Option; Every Spring) Fundamentals of mechanical properties in nanometer scale. Role of discrete structure and underlying atomic, molecular, and interfacial forces are illustrated with modern examples. Overview of computational atomistic methods. Lectures, hands-on computing using publicly available or personally developed scientific software packages. prereq: CSE grad student
part characteristics. Part production/testing. Processes, technologies, and topics vary with each offering. prereq: 3221, AEM 3016

ME 8281. Advanced Control System Design. (4 cr.; A-F or Audit; Periodic Fall)

ME 8282. Control of Nonlinear Systems. (4 cr.; A-F or Audit; Periodic Fall)

ME 8283. Design of Mechatronic Products. (4 cr.; A-F or Audit; Fall Odd Year)
The purpose of this course is for advanced mechanical engineering students to gain additional mechatronic skills by learning how to use microcontrollers to implement control systems in the context of a practical product or device. Embedded microcontrollers are ubiquitous in modern products from washing machines to cell phones to automobiles to space rockets. Knowing how to design and program microcontrollers, how to interface microcontrollers to sensors and actuators, and how to implement control algorithms on a microcontroller is an important skill for the modern control system design engineer. The course is hands-on and follows a learn by doing approach. Students spend 1/3 the course in a microcontroller boot camp and 2/3 on a substantial microcontroller project. The lectures cover didactic material related to microcontrollers, sensors, actuators, electronics circuit design and fabrication and control algorithm implementation, prereq: An introductory system dynamics and controls course or permission of instructor.

ME 8285. Advanced Control System Design, with Applications to Smart Vehicles. (3 cr.; A-F or Audit; Every Fall)
This course focuses on a study of several advanced control design techniques and their applications to smart vehicles. The control systems studied include lead and lag compensator design, loop shaping, analysis of system norms, H2-optimal control, feedback linearization, sliding surface control, and observer design. The vehicle application topics studied include cruise control, adaptive cruise control, automated lane keeping, automated highway systems, yaw stability control, active rollover prevention, engine control, and active and semi-active suspensions. In each application, a dynamic model is developed that is simple enough for control system design, but at the same time, rich enough for capturing the essential features of the dynamics. The control design for each application is studied in-depth during lecture and further analyzed during hands-on homework. prereq: 5281 or EE 5231 or equiv

ME 8287. Topics in Dynamics and Control. (2-4 cr.; max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Topics Course in Dynamics and Control

ME 8322. Advanced Fluid Dynamics in Mechanical Engineering. (3 cr.; A-F or Audit; Every Spring)
Advanced fluid dynamics course addressing the theory and applications of fluid flows pertinent to mechanical engineering. The course focuses on the physical phenomena, mathematical formulations, and advanced problem-solving techniques for flows ranging from microscale flows to turbulence, with examples from mechanical engineering practice. Prerequisite an intermediate fluid mechanics course or permission of instructor.

ME 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

ME 8337. Experimental Methods in the Thermal Sciences. (3 cr.; A-F or Audit; Periodic Fall)
The course will provide fundamentals on optics theory and optical instruments for students to understand and implement cutting-edge optical diagnostic tools, and to design optical methods for measurements in fluid and thermal sciences. The course will cover commonly used optical measurement techniques including particle image/tracking velocimetry, laser induced fluorescence, Schlieren photography, and digital holography.

ME 8341. Conduction. (3 cr.; A-F or Audit; Every Fall)
Advanced understanding/application of conduction/diffusion to heat/mass transfer problems. Solving ordinary/partial differential equations related to fluid diffusion. Special topics in numerical microscale heat transfer. prereq: Undergrad class in heat transfer or inst consent

ME 8342. Convection. (3 cr.; A-F or Audit; Every Spring)
Heat transfer in fluids flowing around bodies and in tubes/ducts. Forced/natural convection. Laminar/turbulent flow regimes. Turbulent transport and modeling. High-speed flows, viscous dissipation, variable property effects. Application to heat exchange devices. Convective mass transfer. prereq: Grad level course on fundamentals of fluid mechanics that has a substantial component on viscous flows or inst consent

ME 8343. Radiation. (3 cr.; A-F or Audit; Every Spring)

ME 8345. Computational Heat Transfer and Fluid Flow. (3 cr.; Student Option; Every Fall & Spring)

ME 8350. Heat Transfer Physics. (3 cr.; A-F only; Spring Odd Year)

ME 8361. Molecular Gas Dynamics. (3 cr.; A-F or Audit; Periodic Fall)

ME 8362. Introduction to Plasma Technology. (3 cr.; A-F or Audit; Periodic Spring)

ME 8381. Bioheat and Mass Transfer. (3 cr.; Student Option; Periodic Summer)
Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications. prereq: CSE grad student, upper-division transport/fluids course; [physics, biology] recommended

ME 8390. Advanced Topics in the Thermal Sciences. (1-3 cr.; max 18 cr.; A-F or Audit; Every Spring)
Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

ME 8446. Advanced Combustion. (3 cr.; A-F or Audit; Periodic Fall)
Fundamental understanding of linkage between thermodynamics, chemical kinetics, and transport phenomena in combustion systems. Heat release rate, flame stability, and emissions. How those issues arise in furnaces, internal combustion engines, and rockets. prereq: Undergrad courses in thermodynamics, fluid mechanics, heat transfer, IT grad student; 5446 or 8641 highly recommended

ME 8462. Turbomachinery. (3 cr.; A-F or Audit; Periodic Summer)
Thermodynamic analysis of energy transfer between fluid and rotor; dimensional analysis; principles of axial, mixed, and radial flow
pumps, fans, compressors, and turbines; cascade performance; computer flow simulations; applications to propulsion systems and power plants. prerequisite CSE grad student, 3321, 3322 or equiv or instr consent

ME 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prerequisite: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

ME 8772. Advanced Transportation Technologies Seminar. (1 cr.; S-N or Audit; Every Fall)
Advanced technologies specifically related to transportation. Topics draw from core science/technology areas of human factors, intelligent vehicles, traffic modeling/management, sensing, communications, and controls.

ME 8773. Graduate Seminar. (1 cr.; S-N or Audit; Every Fall & Spring)
Recent developments. prerequisite: CSE grad student

ME 8774. Graduate Seminar. (1 cr.; S-N or Audit; Every Fall & Spring)
Recent developments. prerequisite: 8773

ME 8775. Technical Communication. (1 cr.; S-N or Audit; Periodic Fall)
One-day workshop on presenting a seminar. Students deliver one-hour seminar on technical topic and attend nine other technical seminars.

ME 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

ME 8794. Mechanical Engineering Research. (1-4 cr.; S-N only; Every Fall, Spring & Summer)
Directed research. prerequisite: instr consent

ME 8800. Modern Developments in Mechanical Engineering. (1 cr. [max 2 cr.]; S-N or Audit; Periodic Fall & Spring)
Seminars on topics in engineering science of importance to mechanical engineers. Invited scholars deliver five-lecture series on each topic; two to five topics each semester. prerequisite: CSE grad student

ME 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Max 18 cr per semester or summer; 24 cr required

ME 8990. Curricular Practical Training. (1-2 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer)
Industrial work assignment involving advanced mechanical engineering. Review/approval by faculty member and director of graduate studies. Final report covering work assignment.

Medical Device Innovation (MDI)

MDI 5001. Technical Writing Essentials. (0-1 cr.; A-F only; Every Fall)
This new core course focuses on the important skill to train MedTech professionals to communicate technical information to a broad audience in an effective manner. prerequisite: grad MDI major

MDI 5002. Technology Foresight and Forecasting. (3 cr.; A-F only; Every Fall, Spring & Summer)
Tools and techniques for technology forecasting, assessment, foresight for decision making in medical device industry. Topics include technology dynamics, research and development, portfolio management, and resource allocation. prerequisite: grad MDI major

MDI 5003. Technology Foresight & Forecasting: Analytical Lab. (1 cr.; A-F only; Every Fall)
This course is a continuation of MDI 5002: Technology Foresight & Forecasting and will afford students an opportunity to complete the therapeutic area analysis they began in the summer semester, prepare a Powerpoint presentation in consultation with the instructor, and then present the results of their analysis to a group of MDI faculty. prerequisite: grad MDI major

MDI 5004. Clinical Foundations of Medical Device Innovation. (3 cr.; A-F only; Every Fall, Spring & Summer)
Master essential topics to deepen knowledge of Clinical Environment in which products will be conceived, tested, used. Topics include surgical protocols, physician, surgeon, nursing, technical support functions. Medical terminology, anatomy/physiology, ethnology research, Healthcare Law, Medicare/Medicaid, HIPAA requirements. prerequisite: MDI grad student. Non-MDI graduate students and non-degree graduate students may register for this course with permission of the MDI program.

MDI 5006. Finance, Valuation, and Entrepreneurship. (3 cr.; A-F only; Every Summer)
Course provides students the opportunity to develop the entrepreneurial skills important in managing development, design, and commercialization of medical devices. Focuses on creating value within the organization, financial methods important to managers in technology-based organizations, and business plan development. Topics include budgeting capital, projecting financial needs, and managing working capital. Registration is limited to MDI students only.

MDI 5008. Quality, Regulatory and Manufacturing Management. (2 cr.; A-F only; Every Spring)
Course provides students with understanding of the global regulatory environment in which the medical device industry operates. Students gain a fundamental understanding of critical quality systems regulations including ISO13485/ISO14971 and their relationship to the FDA’s cGMP regulations. Students gain practical experience using tools that are essential to both product development and continuation/sustaining engineering including; design control procedures, FMEA, verification and validation, internal and external (supplier) management and audit methods. prerequisite: MDI graduate student only

MDI 5010. Product Innovation & Development Management. (3 cr.; A-F only; Every Fall, Spring & Summer)
Framework for conceptualization, design, development, commercialization process for medical products. Survey of key steps in innovation, from engineering/business perspective. Cross-functional development of concepts/processes. prerequisite: Grad MDI student. Non-MDI graduate students and non-degree graduate students may register for this course with permission of the MDI program.

MDI 5012. Medical Industry Macro Environment. (3 cr.; A-F only; Every Fall, Spring & Summer)
Application of macro environmental analysis to medical device industry. Methods reviewed. Industry-relevant case studies/macro environmental analysis of firms of interest. Political, economic, social, technological, legal, ecological factors that impact medical innovation. prerequisite: MDI grad student. Non-MDI graduate students and non-degree graduate students may register for this course with permission of the MDI program.

MDI 5013. Medical Device Center Practicum I. (2 cr.; A-F only; Every Fall, Spring & Summer)
First of three part series of practicum courses for MDI program. Focus on teaching innovation steps/process using known/pre-assigned clinical needs as examples in collaboration with Medical Device Center. Essential steps in BioDesign process. Apply knowledge to specific real-world examples. prerequisite: Grad MDI student

MDI 5014. Medical Device Center Practicum II. (2 cr.; A-F only; Every Fall, Spring & Summer)
Second of three part series of practicum courses for MDI program. Clinical environment, including research tools/methods, filtering/translating needs, ideation/prototype development, communication with functional managers, corporate executives/investors. prerequisite: Grad MDI student

MDI 5015. Medical Device Center Practicum III. (2 cr.; A-F only; Every Spring)
Medical Device Innovation Practicum III is the third of a three part series. Students will gain a high-level understanding of essential steps in the BioDesign process related to ideation. The steps of the ideation process will include brainstorming and prototyping of potential solutions, risk assessment, and business strategy development. Students will prepare and present a technical evaluation that articulates the value of their new technology or device to functional managers, corporate executives, and/or investors. prerequisite: Grad MDI student

MDI 5020. Medical Device Innovation Capstone. (1-2 cr.; A-F only; Every Spring & Summer)
The MDI capstone is an independent, original, and applied investigation on a relevant subject, problem, or issue in areas of medical device technologies, policy, business, and innovation. All students in the MDI program are required to complete a capstone project as part of the program. Registration is open to MDI students only.

MDI 5050. Interpersonal & Team Effectiveness. (1 cr.; A-F only; Every Summer)

MDI 5050 builds the context and capability innovation leaders need to manage effective interpersonal relationships and develop high performance teams. Emphasis is placed on foundational principles and practices that help leaders self-manage, engage and influence key stakeholders, and generate shared commitment for team and project success. Students will increase their self-awareness through self and peer feedback and develop an action plan to enhance their leadership effectiveness in both their current work role and their MDI practicum teams. prereq: Grad MDI student

MDI 5051. Leading Innovation & Change. (1 cr.; A-F only; Every Fall)

MDI 5051 explores the role and differentiating capabilities of outstanding innovation leaders in complex and dynamic environments. Emphasis is placed on principles and practices that help leaders focus on the right strategies, build the organizational capability required to execute a strategy, lead change initiatives and sustain commitment versus compliance among diverse stakeholders. Students will practice improving their team effectiveness and develop a change leadership plan to support implementation of either a current work initiative or their upcoming Capstone Project. prereq: Grad MDI Student and completion of MDI 5050.

MDI 5060. MDI Independent Study. (1-3 cr.; A-F only; Periodic Fall, Spring & Summer)

Independent study in MDI-related topic. prereq: Grad MDI student

MDI 5585. The Healthcare Marketplace. (2 cr. [max 3 cr.]; A-F only; Every Fall & Spring)
The healthcare marketplace constitutes nearly three trillion dollars in the United States and several trillion spent throughout the world. With growing demand for medical technology and the aging of the population, the scale and complexity of the healthcare supply chain is expected to dramatically increase over the next two decades. The healthcare sector is comprised of several markets for goods and services, including physician services, hospital services, insurance, pharmaceuticals and medical devices, and information technology. This course aims to provide a survey of the health sector to understand the scale, market opportunities, as well as barriers to this expanding and global industry.

MDI 5589. Medical Technology Evaluation and Market Research. (2 cr.; A-F only; Every Spring)

This course, with the insight of industry leaders, addresses public-private sector interactions and the business, public policy, regulatory, and technology management issues that concern medical device and biotechnology companies.

MILI 5995. Medical Industry Valuation Laboratory. (2 cr.; A-F only; Every Fall, Spring & Summer)

Interdisciplinary student teams create rapid production market analysis of promising medical technologies/services to determine potential for success in market. Exposure to University innovations, venture firms, inventors. prereq: consent

MILI 5999. Independent Study. (1-8 cr. [max 16 cr.]; A-F only; Every Fall, Spring & Summer)

Independent study.

MILI 6235. Pharmaceutical Industry: Business and Policy. (2 cr.; A-F only; Every Spring)

Business/policy issues specific to pharmaceutical industry. Interdisciplinary perspectives, active involvement by industry leaders.

MILI 6421. Healthcare Law: Strategic and Business Implications. (2 cr.; A-F only; Every Fall)

This course will survey fundamental healthcare laws that apply to a wide variety of healthcare businesses, and will examine their impact on business strategy and operations. The goal is to enable current and prospective managers and leaders in the healthcare space to understand compliance requirements and how healthcare law impacts business strategy and decisions. In the end, healthcare law can be a competitive advantage. In addition, the course will address key current healthcare policy challenges and how these impact business environment and strategy.

MILI 6562. Information Technology in Healthcare Care. (2 cr.; A-F only; Every Fall)

Theoretical/conceptual base for health care information technology. Applications of current/developing health IT. Approaches to evaluate effectiveness of health IT systems. Information technology, computer technology, and data structures commonly found in health care information systems. Information system design/evaluation. prereq: MBA student

MILI 6589. Medical Technology Evaluation and Market Research. (2 cr.; A-F only; Every Spring)

Hands-on experience in creating a value proposition for new medical technologies. Leadership pathways in medical technology, insurance, and delivery industries. Personal input from industry leaders: United Health Group, Medtronic, and Mayo Clinic.

MILI 6726. Medical Device Industry: Business and Public Policy. (2 cr.; A-F only; Every Fall)

This course, with the insight of industry leaders, addresses public-private sector interactions and the business, public policy, regulatory, and innovation leaders.

MILI 6991. Anatomy and Physiology for Managers. (2 cr.; A-F only; Every Spring)

Survey of medical vocabulary/physiology of major body systems. Understanding current clinical practice. Market opportunities of major body systems, Medical technology innovation.

MILI 6992. Healthcare Delivery Innovations: Optimizing Cost and Quality. (2 cr.; A-F only; Every Fall)

Healthcare delivery. Analyze value for population.

MILI 6995. Medical Industry Valuation Laboratory II. (2-4 cr. [max 10 cr.]; A-F only; Every Fall & Spring)

Interdisciplinary student teams create rapid production market analysis of promising medical technologies/services to determine potential for success in market. Exposure to University innovations, venture firms, inventors. prereq: Approved application

MILI 6997. MILI Global Valuation Lab. (4 cr. [max 12 cr.]; A-F only; Periodic Summer)

Global version of medical industry leadership institute valuation lab. Assess value of proprietary inventions.

MILI 6998. MILI Fellows. (0-2 cr. [max 6 cr.]; A-F only; Every Fall & Spring)

Fellows will apply the knowledge they have acquired in the MILI Valuation Lab course to assess the commercial viability of innovations developed by the Medical Device Center’s Innovation Fellows.

MILI 6999. Independent Study. (0-8 cr. [max 16 cr.]; A-F only; Every Fall, Spring & Summer)

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
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**Medical Laboratory Sciences Pr (MLSP)**

**MLSP 5011W. Professional Issues in the Health Care Community.** (WI; 2 cr.; A-F only; Every Spring & Summer) Current literature and written discussion to explore the laboratory profession: healthcare systems, professional scope of practice, regulatory and licensure issues, medical ethics, Interprofessional practice models and current topics impacting health care delivery. Focus is on the medical laboratory's crucial role in patient care.

**MLSP 5012. Foundations in Interprofessional Communication and Collaboration.** (1 cr.; A-F only; Every Fall) Interprofessional approach to health care. Online discussion topics. Directed group activities. Personal/professional image, teamwork, self/peer assessment, health professions, professional identity and integrity, relationships between professions and those they serve. Introduction to basic education theory, instructional design for laboratory practitioners. prereq: Admission into MLS Program

**MLSP 5013. Scholarly Inquiry and Analysis in Medical Laboratory Sciences.** (1 cr.; A-F only; Every Fall & Summer) Review concepts of scientific inquiry. Major steps of research project. How to select topics, evaluate literature, and construct and test working hypothesis. Analyze and interpret data, report results. Quantitative, qualitative, and mixed methods research designs.

**MLSP 5014W. Laboratory Operations and Management in Health Care Systems.** (WI; 2 cr.; A-F only; Every Fall & Summer) Theory/practice of fiscal/personnel management for laboratory professionals. Includes introduction to laboratory information systems, legal aspects of test reporting. Government regulatory, certification, licensure, medical ethics of health care, accreditation policies. prereq: Admission into MLS program or instr consent

**MLSP 5111. Concepts of Diagnostic Microbiology.** (3 cr.; A-F only; Every Fall) Presentation of medically significant human bacterial and yeast diseases. Epidemiology, physiology, and pathogenic interactions between man and microorganism. Laboratory regulations, morphological characteristics, laboratory testing, and mechanisms of antimicrobial therapy and resistance. prereq: [MICB 3301 or equivalent], [BIOL 3021, Biochemistry or equivalent] or instr consent

**MLSP 5112. Application of Diagnostic Microbiology Principles.** (2 cr.; A-F only; Every Fall) Application in identification and treatment of microorganisms causing human diseases. Emphasis on aerobic and anaerobic bacteria, mycobacteria, and yeast from various body sites. Specimen processing, culture workup, conventional microscopy, and molecular and immunological techniques.

**MLSP 5113. Advanced Concepts in Diagnostic Microbiology.** (3 cr.; A-F only; Every Spring) Physiology and pathogenic interactions between man and microorganism. Epidemiology, prevention, recovery, conventional, immunological, molecular identification, and methods and treatment of microorganisms involved in human diseases. prereq: 5111 or instr consent

**MLSP 5211. Fundamentals in Hematology and Hemositosis.** (3 cr.; A-F only; Every Fall) Anatomy and physiology of hematopoietic and coagulation systems. Basic blood cell morphology and common hematology and hemoitis tests. Clinical implications for health and disease. prereq: PHSL 3051 or instr consent

**MLSP 5212. Application of Hematology & Hemositosis Principles.** (1 cr.; A-F only; Every Fall) Theory, performance, and application of common hematologic and hemoitis diagnostic procedures. Interpretation and correlation of laboratory findings. Venipuncture, cell counting, white blood cell differential, red and white blood cell morphology interpretation, and coagulation studies. prereq: concurrent registration is required (or allowed) in 5211

**MLSP 5213. Diagnostic Hematology.** (3 cr.; A-F only; Every Spring) Blood and bone marrow in assessment of hematologic function and disease. Major focus on normal development and differentiation, abnormal changes found in disease. Cytochemical stains, flow cytometry, cytogentic, molecular diagnostics. prereq: [5211, 5212] or instr consent

**MLSP 5214. Advanced Hematology Morphology.** (1 cr.; A-F only; Every Spring) Blood and bone marrow in assessment of hematologic function and presence of disease. Major focus on normal development and differentiation, abnormal changes in pathologic conditions. Cytochemical stains, flow cytometry, cytogentic, molecular diagnostics. prereq: [5211, 5212], concurrent registration is required (or allowed) in 5213 or instr consent

**MLSP 5311. Fundamental Biomedical Laboratory Techniques.** (4 cr.; A-F only; Every Spring & Summer) Principles of good laboratory practice, experimental design/standard operating procedures, laboratory technical skills, safety, process control. Analytical techniques include colorimetry, chromatography, electrochemical, immunologic, nucleic acid techniques. prereq: 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry

**MLSP 5312. Body Fluid Analysis.** (2 cr.; A-F only; Every Spring) Formation of urine and body fluids, changes that occur in disease, testing used for diagnosis and treatment. Correlation of test results with clinical information discussed. Laboratory skills in body fluid analysis introduced. prereq: 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry. Successful completion of MLSP 5311 with grade of C or higher

**MLSP 5313. Chemical Analysis in Health and Disease.** (3 cr.; A-F only; Every Fall) Pathophysiology of organ systems and metabolic disorders. Liver, heart, kidney, lungs, diabetes. Health and disease states evaluated in context of clinical chemistry. prereq: 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry

**MLSP 5511. Principles of Immunobiology.** (3 cr.; A-F only; Every Fall & Summer) Immune system function, immunologic and serologic testing. Immunologic techniques utilized in various clinical laboratory settings. prereq: PHSL 3051 or instr consent

**MLSP 5513. Transfusion Medicine Principles and Methods.** (3 cr.; A-F only; Every Spring) Didactic material covering genetics, detection, significance of human blood group antigens and antibodies. Donor and compatibility testing. Component therapy, transfusion reactions. Hemolytic disease of fetus and newborn. Immune hemolytic anemias. Quality systems. Alternate technologies. prereq: [5511, upper level genetics course] or instr consent


**MLSP 5701. Clinical Experience in Microbiology.** (2 cr.; S-N only; Every Fall, Spring & Summer) Gain practical experience, apply technical competencies learned on campus to microbiology laboratory. Develop entry-level competencies and assist in making transition to clinical practitioner. Guided by clinical preceptors and university faculty. prereq: Advanced standing in MLS program

**MLSP 5702. Clinical Experience in Hematology and Hemositosis.** (2 cr.; S-N only; Every Fall, Spring & Summer) Gain practical experience and apply technical competencies learned on campus to hematology laboratory. Designed to develop entry-level competencies and assist students in making transition to clinical practitioner. Course guided by clinical preceptors and university faculty. prereq: Advanced standing in MLS program

**MLSP 5703. Clinical Experience in Clinical Chemistry and Urinalysis.** (2 cr.; S-N only; Every Fall, Spring & Summer) Gain practical experience and apply technical competencies learned on campus to Chemistry laboratory. Designed to develop entry-level competencies and assist student in making
transition to clinical practitioner. Course guided by clinical preceptors and university faculty. 

**MLSP 5704. Clinical Experience in Transfusion Medicine.** (2 cr. ; S-N only; Every Fall, Spring & Summer) 

Gain practical experience and apply technical competencies learned on campus to transfusion medicine lab. Designed to develop entry-level competencies and assist in making transition to clinical practitioner. Course guided by clinical preceptors and university faculty. 

**MLSP 5801. Advanced Practicum Experience in Specialty Disciplines.** (1 cr. ; S-N only; Every Fall, Spring & Summer) 

Advanced practicum experience. Restricted enrollment. Students can select variety of specialty sub-disciplines of MLS including cytogenetics, flow cytometry, molecular diagnostics, toxicology, virology, education, management, research, public health, bone marrow, tissue transplantation. 

**MLSP 6024. Advanced Laboratory Operations and Management.** (3 cr. ; A-F only; Every Fall, Spring & Summer) Principles of quality management, process improvement in laboratory and health care systems. Project based application of human resources and financial management, informatics, leadership, marketing and quality improvement. Includes professional development, ethics, and strategic planning.

**MLSP 6111. Concepts in Diagnostic Microbiology.** (3 cr. ; A-F only; Every Fall) 

Presentation of medically significant bacteria and yeast - normal and pathogenic flora in the human body. Includes clinical presentation, pathophysiology, medical diagnosis, laboratory regulations, morphological characteristics, laboratory testing, and mechanisms of antimicrobial therapy and resistance. Case study and journal discussions.

**MLSP 6113. Advanced Diagnostic Microbiology.** (3 cr. ; A-F only; Every Spring) 

Epidemiology, prevention, recovery, conventional, immunological, molecular identification, and methods and treatment of microorganisms involved in human disease. Emphasis on fungal, parasitic, and viral diseases including specimen processing, detection, identification, and therapy. Case studies and journal reviews included.

**MLSP 6211. Advanced Principles in Hematology and Hemostasis.** (3 cr. ; A-F only; Every Fall) 

This course introduces anatomy and physiology of the hematopoietic and coagulation systems including basic blood cell morphology, common hematology and hemostasis tests, non-malignant alterations and their etiologies, current therapeutic regimens, and their clinical implications for health and disease.

**MLSP 6213. Advanced Diagnostic Hematology.** (3 cr. ; A-F only; Every Spring) 

This course explores blood and bone marrow in the assessment of hematologic function and disease. Major focus is on normal development and differentiation and abnormal changes found in disease. Cytochemical stains, flow cytometry, cytogenetics, and molecular diagnostics, along with their clinical implications for health and disease are discussed.

**MLSP 6313. Advanced Chemical Analysis in Health and Disease.** (3 cr. ; A-F only; Every Fall) 

Pathophysiology of organ systems and metabolic disorders. Liver, heart, kidney, lungs, and diabetes. Advanced concepts in special chemistry, laboratory methods, quality assurance and clinical chemistry research will be discussed.

**MLSP 6401. Fundamentals of Molecular Diagnostics.** (3 cr. ; A-F only; Every Fall) 

Fundamental concepts of molecular science as it relates to molecular diagnostics. Principles of molecular technologies used for diagnostic purposes. Students will be introduced to the unique operation considerations applicable to molecular diagnostic methods and laboratories including design, quality assurance and regulatory issues.

**MLSP 6402. Application of Molecular Diagnostics Techniques.** (2 cr. ; A-F only; Every Fall, Spring & Summer) 

Fundamental techniques in molecular science related to molecular diagnostics. Principles of molecular technologies used for diagnostic purposes and obtain the technical skills to perform those techniques. Unique operational considerations applicable to a molecular diagnostics laboratory including design, quality assurance and regulatory issues.

**MLSP 6410. Diagnostic Molecular Science.** (3 cr. ; A-F only; Every Fall, Spring & Summer) 

This course presents the role of genetics in medicine and related molecular testing methodologies, and highlights the importance of genetics by linking disease diagnosis, prognosis, prevention and treatment with molecular testing applications. Specimen procurement, patient education, quality assurance, ethics and consent are discussed.

**MLSP 6411. Diagnostic Molecular Science Laboratory.** (2 cr. ; A-F only; Every Fall, Spring & Summer) 

Presentation of the role of genetics in medicine with emphasis on related molecular testing methodologies. Addresses performance of laboratory techniques in genetics, cancer medicine and microbiology. Focus on topics unique to molecular diagnostics in specimen procurement, patient education, quality assurance, ethics and consent.

**MLSP 6513. Advanced Principles in Transfusion Medicine.** (3 cr. ; A-F only; Every Spring) 

Topics covered in this course include detection of human blood group antigens, donor selection, hemolytic diseases, platelet and granulocyte immunology and stem cell transplantation. Application of quality assurance, process controls, alternate technologies and molecular techniques to the practice of transfusion medicine will be discussed.

**MLSP 6610. Integrated Concepts in Medical Laboratory Science.** (3 cr. ; A-F only; Every Fall, Spring & Summer) 

Interpretation of routine laboratory testing ordered for patient care. Case study discussions, reference ranges and common laboratory tests performed for health assessment, diabetes, cholesterol, anemia, urinalysis, cardiac function, blood typing, common infections and more. Course supports preparation for the Board of Certification exam.

**MLSP 6620. Advanced Concepts in Medical Laboratory Science.** (3 cr. ; A-F only; Every Fall, Spring & Summer) 

Case studies and journal exploration of advanced diagnostic testing, method development and validation, pathophysiology, and future directions of the field of laboratory medicine. Relationships among research, theory/theoretical formulations, and practice.

**MLSP 6801. Advanced Practicum in Medical Laboratory Science.** (2 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer) 

Advanced practicum experience. Students can select variety of specialty sub-disciplines of MLS including cytogenetics, flow cytometry, molecular diagnostics, toxicology, virology, education, management, research, public health, bone marrow, tissue transplantation.

**MLSP 6905. Research Methods and Capstone Project.** (3 cr. ; A-F only; Every Fall, Spring & Summer) 

Overall review of important concepts of research design, data collection, statistical and interpretative analysis, and final report presentation. The course will develop ability to use the following tasks: Development of a hypothesis, outlining the research problem, related questions, quantitative, qualitative, and mixed methods designs.

**Medical Physics (MPHY)**

**MPHY 5040. Introduction to Medical Physics.** (3 cr. ; A-F only; Every Spring) 

Interactions and energy deposition by ionizing radiation in matter; medical imaging; radiation therapy physics and related radiation safety topics.

**MPHY 5138. Research Seminar.** (1-5 cr. ; S-N or Audit; Every Fall) 

**MPHY 5139. Seminar and Journal Club.** (1 cr. [max 2 cr.]; S-N or Audit; Every Spring) 

Current research topics related to goals/methods of biophysical sciences and medical physics. Lectures/discussions.

**MPHY 5160. Advanced Radiation Physics and Dosimetry.** (3 cr. ; A-F only; Every Fall) 

Interactions and energy deposition by ionizing radiation in matter; concepts, quantities and units in radiological physics; principles and methods of radiation dosimetry.

**MPHY 5170. Basic Radiological Physics.** (3 cr. ; Student Option; Every Fall)
Theoretical/experimental aspects of radiological physics. Physical properties of various ionizing radiations, interactions of ionizing radiations with matter, methods of radiation dose measurement. prereq: instr consent

**MPHY 5171. Medical and Health Physics of Imaging I.** (3 cr.; Student Option; Every Fall) Physics of diagnostic imaging: specification/quantification of image quality, X-ray production, image receptors, magnetic resonance imaging, radiation exposure and protection. Special imaging techniques, including mammography, computed tomography, and direct digital image capture. prereq: 5170 or instr consent

**MPHY 5172. Radiation Biology.** (3 cr.; Student Option; Every Fall & Spring) Effects of ionizing radiation on cells, tissues, and organisms. Biochemical/physiological bases of radiation effects. Biological rationale for radiation therapy practices. prereq: 5170 or instr consent

**MPHY 5173. Medical and Health Physics of Radiation Therapy.** (3 cr.; Student Option; Every Spring) Measurements of radiation quality, output, and depth dose distributions for clinical use. Treatment parameter calculation. Beam modification and shaping. Treatment planning for fixed field and rotational therapy in external beam, intracavitary, and interstitial therapy. Computer applications in treatment planning. Principles/criteria for radiation protection. prereq: 5170 or instr consent

**MPHY 5174. Medical and Health Physics of Imaging II.** (3 cr.; Student Option; Every Spring) Physics of diagnostic imaging. Ultrasound, theoretical/experimental applications of radionuclides in medicine and biology. Counting statistics and imaging systems associated with radiopharmaceuticals, radiation dosimetry, and safety in nuclear medicine. prereq: 5170 or instr consent

**MPHY 5177. Radiation Therapy Physics Lab: Radiation Physics Basics.** (3 cr.; A-F only; Every Spring) This course provides students hands-on experience with equipment and software used in radiation therapy clinic for physics measurements. prereq: 5170 or concurrent registration is required (or allowed) in 5173 or instr consent

**MPHY 5178. Physical Principles of Magnetic Resonance Imaging.** (3 cr.; A-F only; Spring Even Year) Magnetic resonance imaging physics, spatial selection and encoding, imaging hardware and system engineering. Imaging sequences, signal-to-noise, and contrast.

**MPHY 8147. Advanced Physics of Magnetic Resonance Imaging (MRI).** (3 cr.; Student Option; Every Spring) NMR (nuclear magnetic resonance) and MRI physics, spatial selection and encoding, imaging hardware and system engineering. Imaging sequences, associated contrast/resolution. Recent developments in MRI. prereq: 5174 or instr consent

**MPHY 8148. Advanced Digital Imaging Science.** (3 cr.; Student Option; Every Fall & Spring) Role of digital image science in medical imaging. Measurement of image quality, digital radiography. Image reconstruction for CT, SPECT, PET, and MRI. 3D image processing, image registration/visualization. Picture archiving, communications systems. prereq: 5171 or instr consent

**MPHY 8149. Advanced Topics in Radiation Therapy Physics.** (2 cr.; A-F only; Every Fall) Special procedures. Total body irradiation, intensity-modulated radiation therapy, stereotactic radiosurgery/radiotherapy, image-guided radiation therapy. Treatment planning algorithms/techniques. Brachytherapy. prereq: [5170, 5173] or instr consent

**MPHY 8293. Directed Study in Biophysical Sciences and Medical Physics.** (1-12 cr.; Student Option; Every Fall, Spring & Summer) Individualized study under faculty direction. prereq: instr consent

**MPHY 8294. Directed Research in Biophysical Sciences and Medical Physics.** (1-12 cr.; Student Option; Every Fall, Spring & Summer) Individualized research under faculty direction. prereq: instr consent

**MPHY 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

**MPHY 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**MPHY 8666. Doctoral Pre-Thesis Credits.** (1-6 cr.; max 12 cr.) No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**MPHY 8777. Thesis Credits: Master's.** (1-18 cr.; max 50 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**MPHY 8888. Thesis Credit: Doctoral.** (1-24 cr.; max 100 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

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**MEDC 5185. Principles of Biomolecular Simulation.** (3 cr.; Student Option; Periodic Fall) Molecular simulation for students in medicinal chemistry, pharmacology, biochemistry, and chemical physics prereq: Chem 3502 or instr consent

**MEDC 5245. Introduction to Drug Design.** (3 cr.; A-F or Audit; Every Fall) Concepts that govern design/discovery of drugs. Physical, bioorganic, medicinal chemical principles applied to explain rational design, mechanism of action drugs. prereq: Chem

**MEDC 5494. Advanced Methods in Quantitative Drug Analysis.** (2 cr.; A-F or Audit; Periodic Fall & Spring) Quantitative methods (HPLC, GC, TLC, immunoassays) for analysis of drugs/metabolites in biological fluids. Advanced techniques such as capillary electrophoresis, supercritical fluid chromatography, GC-MS, LC-MS, tandem mass spectrometry. Chromatographic theory/statistical approaches to method validation.

**MEDC 5495. Vistas in Medicinal Chemistry Research.** (1 cr.; S-N or Audit; Every Fall) Selected topics of contemporary interest in medicinal chemistry

**MEDC 5710. General Principles of Medicinal Chemistry.** (2 cr.; A-F or Audit; Periodic Fall) Fundamental principles of enzyme inhibitors, combinatorial chemistry and library design, drug receptor interactions and signal transduction mechanisms, and molecular modeling. prereq: Med C grad student or instr consent

**MEDC 6001. General Principles of Medicinal Chemistry.** (3 cr.; A-F or Audit; Every Fall) Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA. prereq: Med chem grad student or instr consent

**MEDC 6002. General Principles of Medicinal Chemistry.** (3 cr.; A-F or Audit; Every Spring) Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA. prereq: Med chem grad student or instr consent

**MEDC 8050. Physical and Mechanistic Organic Chemistry.** (2 cr.; A-F only; Every Fall) Didactic instruction in foundational principles of physical and mechanistic organic chemistry. Recitation component in which students actively solve organic chemistry reaction mechanisms and related problems in organic and medicinal chemistry during course meeting times with faculty guidance. prereq: First-year Medicinal Chemistry grad students or by permission.

**MEDC 8070. The Chemistry and Biology of Infectious Diseases.** (3 cr.; A-F only; Periodic Fall & Spring)
The objectives of this course are to provide a comprehensive overview of antimicrobial agents used in infectious diseases with an emphasis on the underlying foundational principles in chemotherapy and pharmacology. Antibiotic, antifungal, and antiprotozoal agents will be covered. For each antimicrobial agent, the history, discovery, synthesis, structure-activity relationships, spectrum of activity, clinical uses, mechanism(s) of action, resistance, drug disposition properties, and adverse reactions will be discussed in great detail.

MEDC 8100. Medicinal Chemistry Seminar. (1 cr. [max 6 cr.]; A-F only; Every Fall & Spring) Current topics. prereq: Grad major or instr consent

MEDC 8333. FTE: Master’s. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

MEDC 8413. Chemistry of Nucleic Acids. (; 4 cr.; A-F only; Spring Even Year) Chemical aspects of nucleic acid structure and function, synthesis, and functional variants. prereq: [Medical chem or chem or biochem] grad student

MEDC 8420. Natural Products Chemistry. (; 3 cr.; A-F only; Spring Odd Year) Biosynthesis of natural products with an emphasis on how these biochemical principles can be used in drug discovery and design through metabolic engineering and combinatorial biosynthesis. Natural product isolation, structure determination, target identification, and the role of synthetic organic chemistry. prereq: [CHEM 8321, biochemistry] or equiv or course director approval

MEDC 8435. BioAssay & Data Analysis. (1 cr.; A-F or Audit; Spring Even Year) Emphasis is on an intro to bioassay & rodent experimental design approaches, data analysis & basic statistical analysis of corresponding data. Concepts of what instrumentation resources are available within the Department of Medicinal Chemistry & the Institute for Therapeutics Discovery & Development (ITDD), what the corresponding bioassays that can be measured on those resources, consideration & criteria for the development of a new bioassay, how to design basic rodent (mouse & rat) animal experiments including power-analysis (how to predict the number of animals needed for the experiment), as well as data analysis [mean, standard error of the mean (SEM), standard deviation of the mean (SD)] & statistical analysis [student t-test, one-way ANOVA, two-way ANOVA, & appropriate post-hoc tests]. prereq: MEDC 8001 or instructor permission

MEDC 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

MEDC 8461. Design of Cancer Therapeutics. (3 cr.; A-F only; Spring Even Year) Cancer Drug Therapy is a relatively new field of medicine that has undergone many medical and societal changes over the course of the last 100 years and in particular the last 60 years. The emphasis in this course will be to familiarize the student with the basic concepts of cancer biology and to survey current advanced approaches for the development and design of small molecule, protein and cell based therapeutics for the treatment of cancer.

MEDC 8471. High Throughput Drug Discovery. (3 cr.; A-F only; Spring Even Year) Combinatorial chemistry, multi-compound based technologies, their use in screening bioassays to discover lead compounds. Solidphase synthesis, designing compound libraries, pharmaceutical assay design, data interpretation, biological target selection, compound lead optimization. prereq: Undergraduate [chemistry or biochemistry] or instr consent

MEDC 8500. Design of Chemotherapeutic Agents. (; 2 cr.; A-F or Audit; Periodic Fall) Modern aspects of designing chemotherapeutic agents. Strategies for enzyme inhibition and metabolic blocks in development of anticancer, antimicrobial, and antiviral agents. prereq: 5600 or instr consent

MEDC 8600. Chemical Aspects of Drug Metabolism and Bioactivation. (; 2 cr.; A-F or Audit; Periodic Fall) Chemical and enzymatic mechanisms of biotransformation and bioactivation of drugs and other xenobiotics. Reactivity and fate of bioactivated metabolites. prereq: 5600 or instr consent

MEDC 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral: no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 must register up to four times, up to 60 combined cr

MEDC 8700. Advanced Concepts in Drug Design. (; 2 cr.; A-F or Audit; Periodic Spring) Current approaches to rational design of drugs. prereq: 5600 or instr consent

MEDC 8753. MOLECULAR TARGETS OF DRUG DISCOVERY. (; 3 cr.; A-F only; Fall Even Year) Structure of biological macromolecules that are targets of drugs. Techniques to accelerate directed drug discovery. Protein structure/interactions. Popular target classes. Computational tools for visualizing/analyzing protein-ligand and protein-protein interactions. Structural characterization at a level sufficient to underpin critical data evaluation. Biophysical techniques to assess weak ligand binding and suitable for fragment-based lead discovery. prereq: 5710 or 8002 or CHEM 5412 or structural biochemistry or instr consent

MEDC 8760. Design of Peptidomimetics. (; 2 cr.; A-F or Audit; Periodic Fall) Current approaches to design and synthesis of mimetics of biologically active peptides. Structural and conformational rationale used in peptidomimetic design. prereq: 5600 or instr consent

MEDC 8777. Thesis Credits: Master’s. (; 1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

MEDC 8800. Medicinal Chemistry Laboratory Techniques. (; 1-2 cr.; max 4 cr.; S-N or Audit; Every Fall & Spring) Experiential rotations in medicinal chemistry research laboratories. prereq: Grad med chem major or instr consent

MEDC 8888. Thesis Credit: Doctoral. (; 1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

MEDC 8900. Research in Medicinal Chemistry. (; 1-4 cr.; max 8 cr.; A-F or Audit; Every Fall & Spring) Study and experimental investigation. prereq: Grad med chem major or instr consent

Medicine (MED)

MED 7300. Global Health. (; 0.5-8 cr.; max 16 cr.; A-F only; Every Summer) Global nature of health and health care. Global health by systems (cardiology, GI, oncology, etc.). Tropical infectious diseases, public health. Refugee/migrant health, cross cultural health care, travel medicine. All core required topics for ASTMH certification. Case-based lectures. Lab component during modules 4-7. prereq: instr consent

MED 7500. Medicine Externship I. (; 6-8 cr.; H-N only; Every Fall, Spring & Summer) Med 7500 emphasizes diagnostic approach to patient problems and acquisition of core knowledge and skills. The student is part of a patient care team and evaluates and follows at least two new patients per week. Required conferences and tutorial sessions related to the student’s patients and to basic problems in internal medicine are organized for the student at each site.

MED 7507. Research in Oncology. (; 6 cr.; H-N or Audit; Periodic Fall) The student is involved in ongoing laboratory studies in an area under active investigation by a faculty member in oncology. Topics may include, but are not limited to, studies of cell differentiation, cell signaling and G-proteins, neutrophil membrane biochemistry and function, molecular biology of gene expression in hematopoietic and tumor cells, regulation of cellular genes by CMV, mechanisms of action by interferones, biology of breast carcinoma, chromatin structure, and regulation of histo-compatibility antigen gene expression in tumor cells. In addition to hands-on laboratory research, the student participates in research of relevant scientific literature and
is encouraged to participate in regular research conferences.

MED 7511. Gastroenterology Research. (4-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)
The student works with a staff member in the gastroenterology section and carries on an active research program under the direction of the staff. Time will be available to attend various clinical functions of the GI section.

MED 7512. Hematology/Oncology/Transplantation Research (H.O.T. Research). (4-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)
The student will plan and execute a project under the supervision of a faculty member in H.O.T. Division of Medicine. Cancer biology, stem cell, endothelial cell cancer, and sickle cell biology, coagulation abnormalities, and gene regulation are areas of opportunity. This course may also include shadowing a faculty member in clinic and production of a case report.

MED 7518. Diabetes & Endocrinology Research. (6 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)
The student plans and executes a research project under the supervision of a faculty member in the section of diabetes, endocrinology, and metabolism.

MED 7521. Infectious Disease. (4 cr.; H-N only; Every Fall, Spring & Summer)
The student functions as an integral member of the clinical infectious diseases team during this elective. They will evaluate patients, participate in all discussions, and explore the literature on problems relating to patients they have seen.

MED 7522. Gastroenterology. (4 cr.; H-N only; Every Fall, Spring & Summer)
The student, as a member of the G.I. consult team, does work ups and attends teaching rounds on patients with gastrointestinal disease, attends gastrointestinal conferences (clinic, x-ray, pathology), gain outpatient clinical experience, and becomes familiar with special diagnostic techniques, such as endoscopy, liver biopsy, and small intestinal biopsy. Night call is not required.

MED 7523. Diabetes, Endocrinology, & Metabolism. (4 cr.; H-N only; Every Fall, Spring & Summer)
This elective rotation is a four (4) week introductory, structured clinical experience under direct supervision designed to provide the student experience diagnosing, treating, and caring for patients with endocrine disorders.

MED 7525. Cardiovascular Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer)
The student participates in the evaluation and management of the acute and chronic cardiovascular disease problems as they occur in both the inpatient consultation service and the outpatient setting. Supervised electrocardiographic interpretation sessions are available to allow development of skills in electrocardiography. The student attends cardiovascular clinical conferences as well as informal didactic teaching conferences. prereq: Med Student Yr 3 or 4/at least one other medicine elective

MED 7526. Oncology. (4 cr.; H-N or Audit; Every Fall, Spring & Summer)
As members of the oncology clinic team, students will do patient evaluations and followups in the oncology clinics, and participate in oncology conferences. Emphasis is on the clinical evaluation and management of new cancer patients.

MED 7528. Hematology. (4 cr.; H-N only; Every Fall, Spring & Summer)
This rotation will involve the opportunity to directly learn about diagnosis and management of classical and malignant hematology disorders in both inpatient and outpatient setting. The student will act as a subintern with initial responsibility to conduct history and physical exams on hospitalized patients for whom hematology consultations have been requested.

MED 7531. Rheumatology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Musculoskeletal complaints are among the most common problems that present to primary care physicians and arthritis and related diseases are a major cause of disability and loss of work in our society. It is thus essential that physicians involved in primary care develop skill in recognition and treatment of common rheumatologic diseases and ability to recognize and refer rare or more complicated problems.

MED 7532. Pulmonary Disease. (4 cr.; H-N only; Every Fall, Spring & Summer)
This elective is designed to expand students' understanding of respiratory pathophysiology as they acquire new skills in the diagnosis and management of pulmonary diseases.

MED 7533. Clinical Allergy. (3-6 cr.; H-N or Audit; Every Fall, Spring & Summer)
Practical aspects of allergic/immunologic work ups, treatments. Content modified depending upon individual student needs; special programs (e.g., laboratory methods) arranged depending upon student needs. Clinical material provided through Fairview-University, Regions, VA Hospitals, inpatient consultations, offices of practicing allergists in Twin Cities area. Lectures, seminars, discussions.

MED 7534. Research in Allergy. (6 cr.; H-N or Audit; Every Fall, Spring & Summer)
The student works with a staff member. He/she may choose to participate in an ongoing research within our program or in an original investigative project of the student's design. He/she is expected to review the subject area of the investigation as well as plan, perform, interpret his/her studies, and make a presentation as well as a written report on the project.

MED 7535. Clinical Allergy, Asthma and Immunology Elective Rotation. (3 cr.; H-N or Audit; Every Fall & Summer)
Manage adults/children with atopic dermatitis, contact dermatitis, urticaria, angioedema, food allergies, asthma, chronic cough, dysfunctional breathing, hypersensitivity pneumonias, allergic bronchopulmonary aspergillosis allergic rhinoconjunctivitis, nonallergic rhinitis, nasal polyps, sinusitis, eosinophilic esophagitis, gastritis, food protein intolerances, anaphylaxis, recurrent infections, venom allergy. prereq: It is recommended but not required that third and fourth year medical students have at least one primary care rotation finished. Knowledge of how to perform full medical history and exam is required.

MED 7548. Clinical Genetics. (6 cr.; H-N or Audit; Every Fall, Spring & Summer)
Designed for students interested in clinical pediatrics and medicine as well as academic genetics. The student builds basic genetic skills by participating as a member of the combined medicine/pediatrics clinical genetics group at the Fairview-University Medical Center. The activities include weekly hospital rounds, genetics clinic and genetics conference, and hospital consultations when requested. The student evaluates patients with different types of genetic problems and discusses these cases fully. During the second three weeks of the rotation, the student is expected to prepare one topic for genetics conference.

MED 7555. Medicine Rural Ambulatory Elective. (3-4 cr. [max 8 cr.]; H-N only; Every Fall, Spring & Summer)
Out-patient practice of primary care internal medicine.

MED 7556. Renal Consultation. (4 cr.; H-N only; Every Fall, Spring & Summer)
The course offers a unique opportunity to see a large number of acutely ill patients with disturbed renal function. There will be ample opportunities for study of the physiological impact of severe renal failure in both medical and surgical patients. Students will be part of the consultation service, where the nephrology consult team and the primary service physician manage patients with severe electrolyte problems and renal failure.

MED 7561. Outpatient & Clinical Nephrology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Focus is on renal problems common to a community clinic and hospital practice. Renal clinics are held four days a week. Inpatient consultation is done daily. Didactic lectures are given. This experience is appropriate for the student interested in primary care.

MED 7562. Nephrology. (4 cr.; H-N only; Every Fall, Spring & Summer)
The student spends four weeks on the renal consult service. They attend the departmental teaching conferences, including the renal pathology and clinical nephrology conferences held every week. They work closely with the medicine residents and fellows. They are expected to present the cases for their patients, including clinical and lab data, and assessment of problems to the attending physician on rounds.

MED 7573. Acute Care Internal Medicine. (2-4 cr.; H-N or Audit; Every Fall & Spring)
This course provides an opportunity to acquire skills in the diagnosis and treatment of acute conditions encountered in internal medicine. The student works with attending physicians and medical residents to evaluate patients (including many with undiagnosed illnesses) in both the ER and urgent care on Monday through Friday (8:30 A.M. to 5:00 PM). Learning is enhanced by a daily didactic curriculum. prereq: 7500, Med 7501

MED 759. Critical Care/MICU. (4 cr.; H-N or Audit; Every Fall, Spring & Summer) Evaluation of performance is based on abilities in eliciting a history, conducting an appropriate physical exam, use of lab and imaging studies, breadth and depth of knowledge base, differential diagnosis, formulation of a treatment program, verbal and written presentation, patient relationship, interaction with colleagues and other hospital staff, and on overall professionalism. prereq: 7501 or instr consent

MED 7582. Medical Intensive Care Unit--Regions Medical Center. (3-4 cr.; H-N or Audit; Every Fall, Spring & Summer) Key principles of diagnosis/management of critical illness. Emphasizes cardiopulmonary assessment/management. Using mechanical ventilation, hemodynamic monitoring as focal points. One-month clinical rotation.

MED 7583. Fundamentals of Clinical Oncology. (4 cr.; H-N or Audit; Every Fall, Spring & Summer) This multidisciplinary course provides an introduction to the fundamentals of clinical oncology (adult and pediatric) and is designed for the medical student interested in entering any specialty. Emphasis is placed on understanding important concepts of oncology, acquiring practical skills relevant to the diagnosis and treatment of the common malignancies, and gaining confidence in providing psychosocial support to patients and families. The student follows newly diagnosed patients as they go through their initial evaluation/staging tests for malignancy and participate in planning treatments. Approximately two hours a day is devoted to conferences and tutorial sessions developed specifically for the student enrolled in this course. prereq: 7500 or Ped 7501

MED 7595. Musculoskeletal Problems in Primary Care Practice. (3 cr.; H-N or Audit; Every Fall, Spring & Summer) The focus of this course is on the evaluation of various common musculoskeletal problems likely to be encountered in a primary care practice. Emphasis is placed on the proper musculoskeletal examination, basic joint aspiration and injection techniques, as well as developing better interpretive skills in reviewing laboratory values and bone/joint radiographs. In addition to attending patient clinics daily, the student is part of interactive conferences and didactic sessions covering various rheumatologic/medical orthopedic topics. Teaching methods include the use of patient instructors, videotapes, polarized microscopy, labeled skeleton, and computer teaching programs. The student works with full-time staff including Drs. Thomas Bloss, David Rhude, Peter Schlesinger, and the course director, Tom Stillman. prereq: 7500

MED 7596. Occupational Health. (3-6 cr.; H-N or Audit; Every Fall, Spring & Summer) This course consists of conferences, clinical experience in occupational health, and optional visits to local workplaces. The conferences include a review of common occupational diseases and an introduction to occupational health law and policy through case presentations by students, and discussion with faculty and residents in occupational medicine.

MED 7598. Bioethics Theory. (3-6 cr.; H-N or Audit; Every Fall & Spring) In this independent study course, the student is expected to attend interdisciplinary seminars on basic issues in bioethics, and to write one substantive paper on a bioethical topic. Students must meet with instructor prior to enrolling in course

MED 7602. Advanced Physical Diagnosis and Medical Decision Making. (4 cr.; H-N only; Every Spring) This course focuses on building upon the clinical skills learned in the first three years of medical school and incorporating an evidence-based approach to making high-value, patient-centered medical decisions. Students work with a variety of expert faculty to hone physical examination skills and learn critical article appraisal and presentation skills through small group work. Students will also gain an introduction to the use of point-of-care ultrasound as part of the physical examination.

MED 7603. Palliative Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) This hospital-based elective offers the opportunity to learn the scope of practice of Internal Medicine's newest subspecialty: palliative medicine. The student will function as a sub-intern under the direct supervision of board-certified hospice and palliative medicine physicians, caring for the broad range of problems managed by palliative medicine consultants.

MED 7604. Hospitalist and Palliative Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) Students function as sub-interns under supervision of experienced hospitalists in caring for problems as primary caregivers. Care of hospitalized patients with broad mix of medical problems, in ICU/non- ICU settings. Students work with palliative medicine consult team in managing patients with advanced illness, care focused on pain management and complex medical decision making. Faculty present core topics in hospitalist/palliative medicine. Periodic topic presentations by students.

MED 7605. Regions Hospital Hospital Medicine Elective. (4-8 cr.; H-N only; Every Fall, Spring & Summer) Students work alongside staff. Students choose from medicine inpatient service, surgical co-management service, hospital medicine palliative care team, progressive care unit, and evening admission team. prereq: 7500


MED 7666. Medicine Pediatrics Ambulatory Elective. (3-4 cr. [max 8 cr.]; H-N or Audit; Every Fall, Spring & Summer) Out-patient practice of primary care internal medicine and pediatrics.

MED 7700. Primary Care Selective - Medicine. (4 cr.; P-N only; Every Fall, Spring & Summer) Four-week ambulatory experience. Focuses on both specialty-specific areas and process-of-care in ambulatory setting.

MED 7701. Primary Care Selective - Medicine/Pediatrics. (4 cr.; P-N only; Every Fall, Spring & Summer) Four-week ambulatory experience. Focuses on both specialty-specific areas and process-of-care in ambulatory setting.

MED 7703. Patient Safety. (2 cr.; H-N only; Every Fall, Spring & Summer) Two-week long elective incorporating reading, case analysis, consultation, simulation, presentations, projects in patient safety. Educate medical students at University of Minnesota in multidisciplinary patient safety principles/practices.

MED 7800. Internal Medicine: Primary Care and Beyond. (4 cr.; P-N only; Every Fall, Spring & Summer) The Internal Medicine-Primary Care and Beyond ?PCB? elective centers around 4 main areas: Patient Care, Quality Improvement, Advocacy and Self-Reflection. PCB offers students the opportunity to hone their clinical skills via direct patient encounters in the outpatient setting.

MED 7900. Sub-internship in Critical Care. (4 cr.; H-N only; Every Fall, Spring & Summer) Second part of the required 12 weeks of experience in internal medicine started in Medicine 7500. Medicine 7900 is a "sub-internship" in which the student takes direct responsibility for patient care. Therapeutic decision making and care planning are emphasized. The student is part of a patient care team and assumes responsibility for the evaluation and care of three new patients per week. Acute care tutorials with learning objectives and suggested readings are an important part of the course. Self-directed learning tools are available.

MED 7910. Internal Medicine Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Internal medicine residency.

MED 7920. Medicine-Pediatric Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Medieval Studies (MEST)

MEST 5610. Advanced Topics in Medieval Studies. (3 cr.; max 15 cr.; Student Option; Every Fall & Spring) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Topics specified in Class Schedule. prereq: One yr work in some area of Middle Ages, reading knowledge of appropriate language, instr consent

MEST 5993. Directed Studies in Medieval Studies. (1-3 cr.; max 6 cr.; Student Option; Every Fall & Spring) Directed study with one of the core faculty of medieval studies program. prereq: One yr work in some area of Middle Ages, reading knowledge of appropriate language, instr consent

MEST 8010. Medieval Studies Colloquium. (3 cr.; max 9 cr.; Student Option; Every Fall & Spring) Lectures by and discussions with faculty and visiting speakers.

MEST 8110. Seminar in Medieval Studies. (3-4 cr.; max 48 cr.; A-F or Audit; Every Fall & Spring) Offered when feasible. prereq: Appropriate language, instr consent

Microbial Engineering (MICE)

MICE 5035. Personal Microbiome Analysis. (3 cr.; Student Option; Every Spring) Personal Microbiome Analysis, an introduction to the computational exploration and analysis of your inner microbial community, also known as your microbiome. In this course, you will have the opportunity to explore your own microbiome using visualization and analysis tools. Sequencing your own microbiome is encouraged but not required for the course. Introductory biology or genetics is recommended: BIOL 1009, GCD 3022 or BIOL 4003.

MICE 5355. Advanced Fermentation and Biocatalysis Laboratory. (1 cr.; S-N only; Every Spring) Methods in industrial microbiology, lab, and pilot scale fermentation/biocatalysis engineering. Lab experiments carried out in fermentation pilot plant. Operation of bench/pilot scale bioreactors. Designing bioreactors. Process optimization, monitoring, and control. Scale-up experiments, data analysis. prereq: [3301 or BIOL 3301], [grad student in microbial engineering or upper-div major in [microbiology or chem engineering or biochemistry]], instr consent

MICE 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

MICE 8777. Thesis Credits: Master’s. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A-F or Audit]

MICE 8920. Teaching Practicum. (1 cr.; max 4 cr.; Student Option; Every Fall, Spring & Summer) Supervised experience in classroom, laboratory, and/or recitation instruction; develops skills in effective use of instructional techniques, materials, tests, and measurements. prereq: Grad MIE major

MICE 8990. Biotechnology Seminar. (1-3 cr.; max 6 cr.; Student Option; Every Fall & Spring) Student presentations of thesis research and presentations by invited speakers. prereq: Prereq-First-yr MICE students enroll S-N, as they do not make a presentation. Second-yr MICE students enroll A-F, as they present a seminar; fall, spring, every year). Student presentations of thesis research and presentations by invited speakers or designated lecturers.

MICA 5000. Practicum: Teaching. (0 cr.; No Grade Associated; Every Fall & Spring) Supervised experience in lab instruction. Use of instructional materials, tests/measurement.

MICA 8002. Structure, Function, and Genetics of Bacteria and Viruses. (4 cr.; A-F or Audit; Every Fall) Structure, function, and metabolism of microorganisms. Microbial genetics. Molecular virology. prereq: [One undergrad or grad course each in [microbiology, genetics, biochemistry]] or instr consent

MICA 8003. Immunity and Immunopathology. (4 cr.; Student Option; Every Fall) Lymphocyte activation, signal transduction in lymphocytes, antigen receptor genetics, antigen presentation, lymphoid anatomy, adaptive immune responses to microbes, immunodeficiency, immunopathology, cytokines, transplantation, autoimmunity. prereq: Upper level undergraduate immunology course or inst consent


MICA 8005. Topics in Microbiology, Immunology, and Cancer Biology. (1-4 cr.; A-F or Audit; Every Fall & Spring) Colloquium format. Readings/discussion on specialized topic. prereq: 8012, [8002 or 8003 or 8004] or instr consent

MICA 8006. Protein Sequence Analysis. (3 cr.; Student Option; Fall Even Year) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genetics Computer Group (GCG) sequence analysis programs; and current literature and research problems. prereq: Biochem course, knowledge of UNIX operating system recommended

MICA 8007. Cell Biology and Biochemistry of the Extracellular Matrix. (3 cr.; A-F or Audit; Every Fall & Spring) Concepts in cell adhesion and tissue composition and importance of cell adhesion in tissue function and disease. Topics range from structure/function/assembly of tissue components to cellular adhesion mechanisms. prereq: 8002 or 8004 or instr consent

MICA 8009. Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death. (2 cr.; Student Option; Every Spring) Aspects of mechanisms involved in growth control at level of nuclear function. Neoplasia in hormonal cancers (such as prostate cancer) and role of protein phosphorylation in normal and abnormal growth. Mechanisms of cell death via apoptosis and its implications in normal and abnormal proliferation. prereq: 8004 or [BioC 3021, Biol 4004] or instr consent

MICA 8010. Microbial Pathogenesis. (3 cr.; A-F or Audit; Fall Even Year) Molecular mechanisms of bacterial/viral pathogenesis. Strategies of disease causation/interaction with host, regulation of virulence factors, mechanism of virulence factor transmission to other microbes. prereq: MICA grad student or inst

MICA 8011. Current Topics in Immunology. (3 cr.; A-F or Audit; Every Spring) Colloquium format. In-depth reading, discussion prereq: MICA 8003 or instr consent

MICA 8012. Writing and Reviewing a Research Proposal. (2 cr.; A-F only; Every Fall) Assist first/second year graduate students to prepare research proposals for funding. prereq: First or second year MICA grad student

MICA 8013. Translational Cancer Research. (2 cr.; A-F or Audit; Every Spring) Clinical issues in cancer research. Discuss translational research projects as they pertain to a variety of cancers. prereq: 8004 or instr consent

MICA 8014. Small RNA Biology. (2 cr.; A-F or Audit; Every Spring) Small RNAs as major regulators of gene/protein expression. MicroRNAs and their potential use in diagnosis/prognosis of various disease conditions, including cancers. Biology of small RNAs and their role in health and disease. prereq: BIOL 8002 or MICA 8004 or equiv or instr consent

MICA 8094. Research in Microbiology, Immunology, and Cancer Biology. (1 cr.; max 5 cr.; S-N or Audit; Every Fall, Spring & Summer)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

<table>
<thead>
<tr>
<th>MCDG 8333. FTE: Master's.</th>
<th>(1 cr.; No Grade Associated; Every Fall, Spring &amp; Summer) (No description) prereq: Master's student, adviser and DGS consent</th>
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</thead>
<tbody>
<tr>
<td>MCDG 8444. FTE: Doctoral.</td>
<td>(1 cr.; No Grade Associated; Every Fall, Spring &amp; Summer) (No description) prereq: Doctoral student, adviser and DGS consent</td>
</tr>
<tr>
<td>MCDG 8666. Doctoral Pre-Thesis Credits.</td>
<td>(1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring &amp; Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr</td>
</tr>
<tr>
<td>MICA 7777. Thesis Credits: Master's.</td>
<td>(1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring &amp; Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]</td>
</tr>
<tr>
<td>MICA 8888. Thesis Credit: Doctoral.</td>
<td>(1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring &amp; Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required</td>
</tr>
<tr>
<td>MICA 8900. Student Research Seminar.</td>
<td>(1 cr. [max 10 cr.]; S-N or Audit; Every Fall &amp; Spring) Presentation/discussion of student thesis research. prereq: Grad MCDG or BMBB major dept consent</td>
</tr>
<tr>
<td>MICA 8910. Journal Presentations.</td>
<td>(1 cr. [max 2 cr.]; S-N or Audit; Every Fall &amp; Spring) Discussion of original scientific literature. prereq: Grad MCDG or BMBB major or dept consent</td>
</tr>
<tr>
<td>MICA 8920. Special Topics.</td>
<td>(1-4 cr. [max 8 cr.]; Student Option; Every Fall) Special Topics Course in the Molecular, Cellular, Developmental Biology and Genetics Program, including Itasca Research. prereq: Grad MCDG or BMBB major or dept consent</td>
</tr>
<tr>
<td>MICA 8950. Teaching Practicum.</td>
<td>(1 cr. [max 2 cr.]; S-N or Audit; Every Fall &amp; Spring) Supervised experience in classroom, laboratory, and/or recitation instruction; development of skills in effective use of instructional techniques, materials, tests, and measurements. prereq: Grad MCDG major or dept consent</td>
</tr>
<tr>
<td>MICA 8993. Directed Studies.</td>
<td>(1-5 cr. [max 15 cr.]; Student Option; Every Fall &amp; Spring) Directed Studies. prereq: MCDG grad student or inst consent</td>
</tr>
<tr>
<td>MICA 8994. Research.</td>
<td>(1-15 cr. [max 10 cr.]; S-N or Audit; Every Fall &amp; Spring) Independent research determined by student's interests, in consultation with faculty mentor. prereq: MCDG grad student or dept consent</td>
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Special topics in moving image studies.

MIMS 8001. Theories of the Moving Image. (3 cr.; A-F only; Every Fall) Study of the moving image as the intersection between critical media studies and film studies. Not a historical overview, but rather current discussions in these areas contextualized with relevant readings in classical film and media theory.

MIMS 8003. Historiography of the Moving Image. (3 cr.; A-F only; Every Spring) Genealogies of the moving image. “Crisis” of film in debates about “old” and “new” media; Hollywood’s role in defining commercial and oppositional forms of moving images; approaches to the writing of history in relation to media historiography.

**Museum Studies (MST)**

| MST 5011. Museum History and Philosophy. | (3 cr.; A-F or Audit; Every Fall) Historical and philosophical roots of museums and emerging philosophical issues faced by museums today - from art, history, science, and youth to living collections, living history sites, and historic houses. Field trips to area museums. |
| MST 5012. Museum Practices. | (3 cr.; A-F or Audit; Every Spring) Practical aspects of museum work. Standards, practices, responsibilities, issues, all set in greater museum context. Curatorial/educational duties, collections management, security, funding, boards, public relations, installation, budgeting, prereq: Grad student or instructor consent |
| MST 5020. Internship. | (1-6 cr. [max 32 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students arrange to perform a professional-level task in a museum of good standing under close supervision of a member of the museum’s professional staff. Instructor must approve a work plan and report. prereq: 5011, 5012, dept consent |
| MST 5170. Topics in Museum Studies. | (1-4 cr.; A-F only; Periodic Fall & Spring) In-depth investigation of specific topic, announced in advance. prereq: grad student consent |
| MST 8993. Directed Study in Museum Studies. | (1-4 cr. [max 16 cr.]; A-F or Audit; Every Spring & Summer) Study by a student, largely self directed with consultation of a faculty member, on a topic not covered (or not covered in depth) by another course. Program of study is determined jointly by student and advising faculty member. prereq: [5012 or concurrent registration is required (or allowed) in 5012], inst consent, dept consent |

**Music (MUS)**

| MUS 5101. Piano Pedagogy I. | (2 cr.; Student Option; Periodic Fall) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, |

One-on-one research training from faculty adviser during laboratory rotation. prereq: 1st yr MICA grad student
MUS 5102. Piano Pedagogy II. (2 cr.; Student Option; Periodic Fall & Spring) Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, early intermediate, and late intermediate levels.

MUS 5150. Body Awareness in Activity: The Alexander Technique for Musicians. (2 cr. [max 8 cr.]; Student Option; Every Fall & Spring) Alexander technique with specific applications to music performance. Emphasis on body/mind awareness to promote technical ease and freedom.

MUS 5151. Organ Literature I. (3 cr.; A-F or Audit; Periodic Fall) Organ literature from the 14th century to the mid-18th century. Influence of organ design of various periods and national schools on the literature and its performance. prereq: 3502, 3603, sr or grad or instr consent

MUS 5152. Organ Literature II. (3 cr.; A-F or Audit; Periodic Fall) Organ literature of J. S. Bach and of other 19th- and 20th-century composers. Influence of organ design of various periods and national schools on the literature and its performance. prereq: 3502, 3603, sr or grad or instr consent

MUS 5153. Organ Pedagogy. (2 cr.; A-F or Audit; Spring Odd Year) Familiarization with materials and techniques for teaching playing the pipe organ. Through their study, students are to gain knowledge of organ methods and various aspects of teaching and learning to play the King of Instruments.

MUS 5181. Advanced Piano Literature I. (2 cr.; A-F or Audit; Fall Even, Spring Odd Year) Literature for piano from late Baroque period to mid-20th century. prereq: grad piano major or instr consent

MUS 5182. Advanced Piano Literature II. (2 cr.; A-F or Audit; Periodic Spring) Literature for piano from late Baroque period to mid-20th century. prereq: grad piano major or instr consent

MUS 5230. Chorus. (1-2 cr. [max 16 cr.]; Student Option; Every Fall & Spring) University Women’s Chorus, Men’s Chorus, Concert Choir and Choral Union. Choirs participate in a variety of programs exploring both Western and non-Western repertoire from the Middle Ages through the 20th century. Concerts include touring, and collaborative campus and community performances. prereq: Choral and/or instrumental music background; audition, instr consent

MUS 5240. University Singers. (1 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Mixed choir with members of former chamber singers and concert choir. Programs exploring Western/non-Western repertoire from Middle Ages through 20th century. Concerts include touring and collaborative campus/community performances. prereq: Audition, instr consent

MUS 5241. Vocal Literature I. (3 cr.; A-F or Audit) Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice. prereq: [12 cr in MUS 1304, grad music student] or instr consent

MUS 5242. Vocal Literature II. (3 cr.; A-F or Audit; Periodic Spring) Vocal literature of major and minor composers from 17th century to present; structure, style, and performance practice. prereq: 12 cr in MUS 1104 or MUS 1304, grad music major or instr consent

MUS 5250. Opera Workshop and Ensemble. (2 cr. [max 16 cr.]; A-F or Audit; Every Fall & Spring) Preparation and performance of operatic arias, choruses, and scenes. Participation in fully staged or workshop productions of music theatre repertoire. prereq: audition, instr consent

MUS 5271. Diction for Singers I. (2 cr.; A-F or Audit; Every Fall) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used. prereq: 12 cr MusA 1304 or grad music major or instr consent

MUS 5272. Diction for Singers II. (2 cr.; A-F or Audit; Periodic Spring) Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used. prereq: 12 cr MusA 1304 or grad music major or instr consent

MUS 5275. Vocal Pedagogy I. (3 cr.; Student Option; Every Spring) Advanced study of mind/body preparations for singing, anatomy, and physiology of the vocal mechanism. Voice use and care, historical and comparative pedagogy, learning theories, models and guidelines for teaching, instructional techniques, and diagnosing and solving vocal problems. prereq: Sr vocal major or instr consent

MUS 5276. Vocal Pedagogy II. (3 cr.; A-F or Audit; Periodic Spring) History of solo vocal performance; selection and preparation of beginning level solo vocal repertoire; development of vocal performance skills (interpretation, expression, artistry), vocal career counseling. prereq: Sr vocal major or instr consent

MUS 5280. Opera Theatre. (2 cr. [max 16 cr.]; A-F or Audit; Every Fall & Spring) Preparation and performance of fully-staged operatic production. Major involvement in singing, acting, and technical aspects of opera. prereq: audition, instr consent

MUS 5331. Jazz Improvisation I. (2 cr.; A-F or Audit; Periodic Summer) Rudiments, analysis. Improvisation on blues in three major keys and on standard American popular jazz compositions from swing era to early bebop. Applications of major/minor scales. Ear training. prereq: Music major or instr consent

MUS 5333. Post-tonal Theory and Analysis II. (3 cr.; A-F only; Spring Even Year) Art music composed since 1945. Develop skills in analyzing and interpreting this literature.

MUS 5336. Jazz Arranging. (3 cr.; A-F or Audit; Every Fall & Spring) Beginning techniques of arranging for jazz combo and jazz ensemble; vocal and instrumental. prereq: 3502 or instr consent

MUS 5340. Jazz Ensemble. (1 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium. prereq: audition, instr consent

MUS 5400. University and Campus Bands. (1 cr. [max 10 cr.]; Student Option; Every Fall & Spring) Lab course.

MUS 5410. University Wind Bands. (1 cr. [max 14 cr.]; A-F or Audit; Every Fall & Spring) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate. prereq: audition, instr consent

MUS 5420. Orchestra. (1 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Symphony orchestra performs standard repertory and major works with chorus; concerts and tour appearances. Players from all colleges may participate. prereq: audition, instr consent

MUS 5423. Suzuki Pedagogy Practicum. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons. Prereq [(& 5424 or & 5425), grad music student] or instr consent, grad consent.

MUS 5426. Final project Suzuki Pedagogy. (1 cr.; A-F or Audit; Periodic Spring) Research project.

MUS 5427. Violin Pedagogy I. (2 cr.; A-F or Audit; Periodic Fall) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques. prereq: Violin or viola major or instr consent

MUS 5430. Contemporary Music Workshop. (1 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Generation/performance of new chamber works set within context to situate musical works within dynamic field of historical, philosophical, and expressive import. prereq: instr consent

MUS 5440. Chamber Ensemble. (1 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Performance of chamber music; duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices. prereq: audition, instr consent

MUS 5450. Orchestral Repertoire. (1-3 cr. [max 9 cr.]; A-F or Audit; Every Fall & Spring)
MUS 5460. World Music Ensemble. (1-2 cr. [max 16 cr.]; Student Option; Every Fall & Spring) Afro-Brazilian/Afro-Caribbean popular repertoires. Samba, bossa nova, salsa, merengue, mambo. Planned master classes/clinics with local artists to complement regularly scheduled rehearsals/performances. No audition required.

MUS 5461. Guitar Literature. (2 cr.; Student Option; Fall Odd Year) This course is principally intended for guitar majors (graduate and undergraduate students). The main focus of this course is to introduce students to guitar literature, through the historical overview of the repertoire, classical guitar composers, and performers. It will also introduce students to method books, in chronological order (through an examination of specific styles and "performance practices") and teaching methods through the history of guitar and guitar literature intended for technique development (studies, exercises, etc.).

MUS 5464. Cello Pedagogy. (2 cr.; A-F or Audit) Concentrated study of cello teaching methods. Provides students with the strategies for teaching cello privately, develops analytical skills, and increases knowledge of cello repertoire. Designed for practical application in conjunction with the string technique class.

MUS 5466. Guitar Pedagogy. (2 cr.; A-F or Audit; Fall Even Year) Intended for guitar performance majors. This course will introduce basic teaching concepts/methods/philosophies and examine method books, studies, and methodology through the history of classical guitar. Other topics (e.g., starting a studio, developing promotional material/website, contemporary teaching methods) will be addressed. Prereq: Guitar performance major or instr consent

MUS 5480. University Brass Choir. (1 cr. [max 8 cr.]; Student Option; Every Fall & Spring) The University Brass Choir is an ensemble of 16 brass and percussion players exploring unique literature that spans 400 years. From the rich antiphonal music of Giovanni Gabrieli (1557-1612) to the works of the 20th century. The Brass Choir performs in Twin Cities churches and concert halls. Prereq: audition, instr consent

MUS 5481. Trumpet Pedagogy. (2 cr.; Student Option; Fall Odd, Spring Even Year) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids. Prereq: Sr or grad in music or instr consent

MUS 5485. Transcription for Winds. (2 cr.; Student Option; Periodic Fall) Principles of music manuscript and examination of transcription examples. Transcription projects with score and parts. Smaller projects that involve arrangements and original compositions. Prereq: 3502 or instr consent

MUS 5490. Percussion Ensemble. (1 cr. [max 10 cr.]; A-F or Audit; Every Fall & Spring) Practice and performance of standard and contemporary compositions for percussion instruments in various combinations. Prereq: instr consent

MUS 5491. Percussion Literature I. (2 cr.; A-F or Audit; Periodic Fall) Repertoire derived from orchestral and band literature for snare drum, timpani, mallet instruments, and various percussion accessories. Major works of the 20th century written for solo percussion, percussion ensemble, and chamber groups of percussion and non-percussion instruments. Prereq: Jr or Sr or grad or instr consent

MUS 5493. Javanese Gamelan Music Ensemble. (1 cr. [max 8 cr.]; Student Option; Periodic Fall & Spring) Hands-on experience in learning to play Javanese gamelan music, one of the great non-western musical traditions that is readily accessible to beginners. Related insights into the role of this tradition in Javanese culture. Open to all students - no musical background needed!

MUS 5494. West African Music Ensemble. (1 cr. [max 8 cr.]; Student Option; Periodic Fall & Spring) Hands-on experience in learning to play West African music, one of the great non-western musical traditions that is readily accessible to beginners. Also, insights into function, context, structure, gender roles, politics, instruments, life-cycle rites, genres, musical organizations, traditional musicians, and contemporary popular music. Open to all students - no musical background needed!

MUS 5534. Musical Minimalisms. (3 cr.; A-F or Audit; Periodic Fall & Spring) This course provides an introduction to the various music associated with the label "minimalism," including musical trajectories emerging from them. Numerous artists and compositions will be covered, spanning from 1958 to the present, though the focus is on music composed during the 1960s and 1970s, including that by Young, Riley, Reich, Glass, Monk, the Velvet Underground, Andriessen, P?rt, Eno, Feldman, and others. The class blends analysis, historical and analytical secondary readings, and in-class performance. Students must contribute informed comments to discussion, which in turn requires the completion of reading and listening assignments. Prereq: Undergraduates-Mus 4504/4514 or equivalent; Graduates-Mus 3508/3518 or passing of the Theory Entrance Exam

MUS 5511. 16th-Century Counterpoint. (3 cr.; A-F or Audit; Periodic Fall & Spring) Polyphonic counterpoint in modal style of Renaissance. Writing exercises in species counterpoint and in two, three, and four parts. Cantus firmus techniques, mixed values, invertible counterpoint, canon. Representative works by Josquin, Lassus, Palestina, Victoria, and others. Renaissance treatises by Artusi, Banchieri, Diruta, Morley, Zarlino, and others. Prereq: [3501, 3508] or pass basic skills exam

MUS 5550. Class Composition. (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Original works in various forms. Development of individual compositional style in a post-tonal idiom. Various forms, performing forces, techniques. Prereq: [4504, 4514 [with C- or better]] or instr consent

MUS 5561. Orchestration I. (3 cr.; A-F or Audit; Every Fall) Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries. Prereq: 3502

MUS 5571. Schenkerian Analysis for Performers. (3 cr.; A-F or Audit; Periodic Fall & Summer) Theory/analysis of tonal music using principles developed by Heinrich Schenker. Basic concepts/notation, their application to excerpts/short pieces from 18th/19th centuries. Prereq: 3502

MUS 5573. Analysis of Late-Romantic Orchestral Literature. (3 cr.; A-F or Audit; Periodic Spring) Advanced tonal analysis. Dramatic orchestral music by Wagner, Strauss, Tchaikovsky, Rimsky-Korsakov, Moussorgsky, and Rachmaninoff as focus for projects/discussions related to chromatic harmony, form, and orchestration. Prereq: 3502 or Theory IV Exam or instr consent; [4504 or equiv] recommended

MUS 5574. Wagner's Ring: Conception, Coherence, Consequence. (3 cr.; A-F or Audit; Spring Even Year) Enrich process of listening to Wagner's Ring by providing analytic insight into Wagner's compositional technique and the dramatic, tonal, and motivic structure of the work. Analytic approach broadened with a number of interdisciplinary forays. Prereq: 3502 or equiv

MUS 5591. Introduction to Music Information Technology. (3 cr.; A-F or Audit; Every Fall) Principles of acoustics, electronic sound generation/manipulation, digital signal processing techniques. Programming languages for digital sound synthesis. Editing software, MIDI applications. Prereq: Music grad student or instr consent

MUS 5592. Music Informatics Seminar. (3 cr.; A-F or Audit; Every Spring) Filtering, formant synthesis, reverberation techniques, additive synthesis. Interactive MIDI applications. Prereq: 5591 or instr consent

MUS 5597. Music and Text. (3 cr.; A-F or Audit; Every Fall) Designed for music majors only. Introduction to analysis of music with texts. Song/opera

MUS 5611. Resources for Music Research. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
Aesthetic and professional issues in composition. Survey of professional activities, including research, and grant writing and concert production. Prereq: Composition emphasis or instr consent

MUS 8571. Composers’ Laboratory. (3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring)
Preparing original music composition to specification for possible radio/TV/theatre/film use. Analytic projects based on research into current practice of music criticism/music journalism. Philosophical and sociological research into creative process. Prereq: 8570

MUS 8580. Topics in Tonal Analysis. (3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring)
Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, significant works by tonal composers. Prereq: instr consent

MUS 8581. Schenkerian Theory and Analysis I. (3 cr.; A-F or Audit; Periodic Fall)
Analysis and critical readings pertaining to theory of tonal music developed by Heinrich Schenker. Application of his method to representative repertoire from 18th and 19th centuries. Contrapuntal writing modeled after presentation in Schenker’s [Counterpoint]. Prereq: instr consent

MUS 8582. Schenkerian Theory and Analysis II. (3 cr.; A-F or Audit; Spring Even Year)
Application of Schenkerian theory to 18th-/19th-century music, coordinated with critical study of major music traditions from that era. Prereq: 8581 or instr consent

MUS 8584. Current Issues in the Analysis of 19th-Century Music. (3 cr.; A-F or Audit; Spring Even Year)
Recent analytic approaches to 19th-century music. Students demonstrate fluency with methods and current issues. In-class discussions, short written analytical projects, two longer papers. Prereq: [3502, 3512] or equiv placement exam, instr consent; grad-level Schenkerian analysis recommended

MUS 8590. Topics in 20th-Century Analysis. (3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring)
Seminar explores literatures of 20th-century art music.

MUS 8631. Seminar: Music in Medieval Europe. (3 cr.; A-F or Audit; Periodic Fall)
Selected genres of polyphonic and monophonic music, 9th-14th centuries, for analysis and cultural criticism. Social roles of music and performance traditions; current musicological issues. Prereq: Undergrad music degree

MUS 8632. Seminar: Music in Early Modern Europe. (3 cr.; A-F or Audit; Periodic Fall)
Transformation of chanson, madrigal, mass, and motet from 1400 to 1580. Analysis and cultural criticism; social roles of music and performance traditions; current musicological issues. Prereq: Undergrad music degree

MUS 8640. Seminar in Musicology. (3 cr. [max 12 cr.]; A-F or Audit; Every Fall & Spring)
Topics vary; readings, research, strategies, and methods. Prereq: Musicology or theory emphasis or instr consent

MUS 8644. Seminar: Advanced Research in Historical Musicology. (3 cr.; A-F or Audit; Periodic Fall)
Major reference and research materials in musicology and related disciplines, including databases. Historical methods and historiography. Locating and interpreting primary sources of music and archival documents. Developing research strategies for degree papers and theses. Forms of documentation and historical writing. Prereq: Undergrad music degree

MUS 8647. Seminar: The Critical Editing of Early Music—Method and Practice. (3 cr.; A-F or Audit; Periodic Fall)
Preparation of critical editions from primary sources of vocal and instrumental music (partbooks and tablatures). Nature of musical sources, both manuscripts and prints. Stemmatics, critical judgment and method, presentation of text. Prereq: Undergrad music degree

MUS 8651. Sonata Theory. (3 cr.; A-F or Audit; Periodic Fall)
Principles of the classic sonata: norms, types, and deformations. Structural analysis, analytical methodologies, and fundamentals of sonata hermeneutics. Prereq: instr consent

MUS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Tbd Prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

MUS 8711. Performance Theory. (3 cr.; A-F only; Spring Odd Year)
Investigate transformation process from score to its sounding instrumental realization. Discuss most important scholarly publications by B. Repp, Th. W. Adorno, et al. Theory first describes structure of such transformations, then investigates analytical, emotional, gestural rationales for expressive performance. Prereq: Grad student in music or instr consent

MUS 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

MUS 8864. Current Issues in Ethnomusicology. (3 cr.; A-F or Audit; Every Fall)
Ethnomusicological methods, theorizing, and research practice. Current issues in monographs, journals, and anthologies. Fieldwork practicum. Prereq: instr consent

MUS 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Music Applied (MUSA)

MUSA 5101. Piano: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5103. Organ: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5104. Voice: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5105. Violin: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5106. Viola: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) Private instruction. prereq: consent

MUSA 5112. Clarinet: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) Private instruction. prereq: consent

MUSA 5113. Saxophone: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Periodic Fall & Spring) Private instruction. prereq: consent

MUSA 5116. Trumpet: Elective Individual Lessons (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Periodic Fall, Spring & Summer) Individualized trumpet instruction. prereq: consent

MUSA 5121. Percussion: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5123. Guitar: Elective (graduate non-major in music). (2 cr. [max 8 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5401. Piano: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5402. Harpsichord: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5403. Organ: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5404. Voice: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5405. Violin: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5406. Cello: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5407. French Horn: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5408. Double Bass: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5409. Flute: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5410. Bassoon: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5411. Oboe: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5412. Clarinet: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5413. Saxophone: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5414. Bassoon: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5415. French Horn: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5416. Trumpet: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5417. Trombone: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5418. Baritone: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 5421. Percussion: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 5423. Guitar: Music Major Secondary (graduate). (2-4 cr. [max 24 cr.]; A-F or Audit; Every Fall & Spring) Private instruction. prereq: consent

MUSA 8301. Piano: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8302. Harpsichord: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8303. Organ: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8304. Voice: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8305. Violin: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8306. Viola: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8307. Cello: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8308. Double Bass: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8309. Flute: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8311. Oboe: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8312. Clarinet: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8313. Saxophone: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8314. Bassoon: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent

MUSA 8315. French Horn: Music Major (graduate). (2-4 cr. [max 48 cr.]; A-F or Audit; Every Fall, Spring & Summer) Private instruction. prereq: consent
MUED 5301. General Music I. (3 cr.; A-F or Audit; Every Spring) Materials, strategies and the field experience for planning and implementing instruction for global arts understanding among early childhood and lower elementary school children. Experiential learning, for integrating international music and culture perspectives while planning and implementing sequential elementary music instruction. prereq: MUED 1201, MUS 4504, MUS 4514, [music education major or inst consent], successful completion of soph proficiency exam

MUED 5302. General Music II. (3 cr.; A-F only; Every Fall) Materials, strategies and an extensive field experience with expert general music teachers for planning and implementing sequential upper elementary, middle and high school music instruction for global arts understanding. Includes integration of music and technology. First of two required semesters. 25 hours of practicum at the middle school level. Applications of technology. First of two required semesters. prereq: MUED 1201, MUS 4504, and MUS 4514 with a grade of at least C-

MUED 5350. Student Teaching in Classroom Music. (4-8 cr.; A-F or Audit; Every Fall & Spring) Supervised teaching and observing of classroom and general music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5517. Instrumental Methods and Materials II. (3 cr.; A-F only; Every Fall) Instrumental methods and materials as part of licensure to work in K-12 settings per legislated standards. Sight-singing, classroom management, adolescent development, instrumental conducting skills, repertoire, and rehearsal techniques. 25 hours of practicum at the middle school level. Applications of technology. Second of two required semesters. prereq: MUED 5516, MUED 1201, MUS 4504, and MUS 4514 with a grade of C- or better, music education major, successful completion of Music Education sophomore proficiency exam

MUED 5519. Advanced Conducting and Repertoire (Choral). (2 cr.; A-F only; Every Fall) Conducting/baton technique, non-verbal communication skills, rehearsal techniques, score study habits. Aural/diagnostic skills necessary to effectively rehearse an instrumental ensemble. Selection of quality, age-appropriate repertoire. prereq: 3517, MUS 3502, MUS 3512, music education major, dept consent

MUED 5550. Student Teaching in Instrumental Music. (4-8 cr.; A-F or Audit; Every Fall & Spring) Supervised teaching and observing of instrumental music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5650. Student Teaching Seminar. (2 cr.; A-F or Audit; Every Fall & Spring) Reflective practice during student teaching. Developing materials for professional employment (e.g., resume, portfolio). prereq: At least C- in all required [music, music education, professional education] courses
MUED 5669. Psychology of Music. (3 cr.; A-F or Audit; Every Fall)
Basic study of the psychology and psychoacoustics of music including hearing, music perception and cognition, values and preferences, musical abilities, musical systems, media music effects, the influence of music on human behavior, and psycho-socio-physiological processes involved in musical behavior. prereq: Psy 1001 or Psy 3604 or instr consent

MUED 5750. Topics in Music Education. (1-4 cr.; max 16 cr.; A-F or Audit; Every Fall, Spring & Summer)
Focuses on single topic, specified in Class Schedule.

MUED 5800. Group Music Leadership Skills. (3 cr.; A-F or Audit; Every Spring)
Role of group music experiences in human development. Relations specific to music therapy. Students develop repertoire of music applications/techniques for various age groups/populations. Standards for group leadership. Precision teaching skills. prereq: [Completion of [MUS 1151, MUS 1152] or MUS 1155], music therapy major or instr consent

MUED 5803. Therapeutic Music in Music Settings. (4 cr.; A-F only; Every Fall)
Cognitive behavioral methodology related to music therapy and music education settings. Prepares students to complete case studies mandated for internship completion set forth by American Music Therapy Association. prereq: [5804, 5805] or instr consent

MUED 5804. Music Therapy Methods and Procedures I. (4 cr.; A-F or Audit; Every Fall)
Methods/procedures for developing basic music therapy competencies/professionalism. Music therapy populations, their clinical needs. How to use music therapy in an evidence-based approach to meet client objectives. prereq: 5800 or instr consent

MUED 5805. Music Therapy Methods and Procedures II. (4 cr.; A-F only; Every Spring)
Second course in professional sequence for music therapy. Topics include psychotherapy techniques and other music therapy approaches. Practicum in the community, in-class lab. prereq: 5804 or instr consent

MUED 5806. Career Preparation. (4 cr.; A-F or Audit; Every Spring)
Ethics, grant writing, resume/CV preparation, supervision, board certification, professional responsibilities. Students design evidence-based music therapy program, present their proposals to class/community. prereq: 5805 or instr consent

MUED 5807. Psychiatric Music Therapy. (3-4 cr.; A-F only; Every Fall)
Psychiatric populations. How music therapy can be implemented as evidence-based practice. Students design original research and role-play music therapy interventions for psychiatric populations. Practicum component on designing music therapy interventions. Graduate students registering for this course should enroll for 4 credits. Undergraduate students registering for this course should enroll for 3 credits. prereq: Grad music therapy student or instr consent

MUED 5808. Medical Music Therapy. (3-4 cr.; A-F only; Every Spring)
Role/scope of music therapy in medical treatment. Medical diagnoses. How to program appropriate music therapy interventions to address patient needs. prereq: Grad music therapy major or instr consent

MUED 5855. Music Therapy Internship. (1-13 cr.; S-N or Audit; Every Fall & Spring)
Six-month resident internship in music therapy at an affiliated, approved hospital or clinic. prereq: Music therapy major, instr consent

MUED 5991. Independent Study. (1-4 cr.; max 8 cr.; A-F or Audit; Every Fall, Spring & Summer)
Independent study project organized by the student in consultation with the appropriate instructor. prereq: Music ed or music therapy major or grad, instr consent, dept consent

MUED 8112. Introduction to Research Methods and Design in Arts Education. (3 cr.; A-F or Audit; Fall Odd, Spring Even Year)
Methods and research designs employed in investigating education issues in the arts. Reporting results. Proposal development. Bibliographic skills for conducting a review of related research literature. Common analytical techniques. prereq: Grad student in [music or music education], dept consent

MUED 8115. Assessment in Arts Education. (3 cr.; A-F or Audit; Fall Odd, Spring Even Year)
Methods for assessing unique challenges in artistic achievement: performances, products, and other artistic achievements. Assessment design. Interpretation for large-/small-scale assessments in performance, classroom, and clinical settings. prereq: Grad student in [music or music education], dept consent

MUED 8118. Qualitative Research in Arts Education. (3 cr.; A-F or Audit; Fall Even, Spring Odd Year)
A theoretical, practical and systematic approach to qualitative research in arts education. Students participate in a joint field exploration or work in a setting relevant to their long-term research interests, prereq: Grad student in [arts or education], dept consent

MUED 8119. Advanced Applications of Research Methods. (3 cr.; A-F or Audit; Spring Even Year)
Application of research methods/design. Emphasizes both quantitative and qualitative methods. Contemporary procedures/theories of data collection, management, analysis, and interpretation. prereq: Grad music education student or instr consent

MUED 8210. Advanced Music Teaching Seminar. (1 cr.; max 3 cr.; A-F only; Every Fall & Spring)
Advanced music teaching techniques. Assessment, comprehensive musicianship, action research, international education. Readings/assignments vary depending on topic. Focus on promising practices with immediate application in music classroom. prereq: Grad student in music education or with music teaching license

MUED 8211. Foundations of Music Education. (3 cr.; A-F or Audit; Every Fall & Summer)
Major historical, philosophical, sociological, and psychological foundations of music education. Primary literature in the field. Role and current state of music education. prereq: Grad student in [music or music education] or instr consent

MUED 8212. Curriculum Design in Music Education. (3 cr.; A-F only; Every Fall & Spring)
Examine/critically analyze curricular models from multiple perspectives, consider influence on music teaching/learning. Design/construct curricula with view towards promoting musical growth. prereq: Grad student in music education or instr consent

MUED 8280. Seminar: Current Trends in Music Education. (3 cr.; max 30 cr.; A-F only; Periodic Fall, Spring & Summer)
Current issues/trends in music education: philosophical, historical, psychological, and pedagogical. Course's focus varies, reflecting the dynamic nature of the field. prereq: dept consent

MUED 8284. Seminar: Research and Scholarly Issues. (3 cr.; A-F or Audit; Spring Even Year)
Scholarly/professional expectations of music educators and music therapists in academia and other positions of leadership. Writing for a variety of professional purposes/publications. prereq: Doctoral student in music or music education or instr consent

MUED 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

MUED 8809. Advanced Music Therapy Competencies. (3-4 cr.; max 8 cr.; A-F only; Fall Even Year)
Enter to the music therapy profession requires basic competencies that are acquired through graduate music therapy coursework. This course is designed to provide graduate music therapy students with advanced music therapy competencies related to ethics, supervision, diversity, social justice, counseling, and higher education in a seminar style format. prereq: Music Therapy 4th-year undergraduates with instructor consent; Music Therapy MA or PhD

MUED 8880. Master's Research Project. (3-6 cr.; max 12 cr.; A-F only; Every Fall, Spring & Summer)
Individual projects for MM in Music Education emphases (Research/Pedagogical). prereq: Grad music ed major, instr consent

MUED 8900. Seminar: Music Education Doctoral Seminar. (3 cr.; max 8 cr.; A-F only; Every Fall & Spring)
Research-oriented collaboration between students and faculty. Models the manner in
which research is conceived, primary literature evaluated, methods designed, and research projects carried through to completion. prereq: dept consent

**MUED 8994. Directed Research.** (1-8 cr.; A-F or Audit; Every Fall, Spring & Summer) tbl prereq: instr consent

**Nanoparticle Science and Eng (NPSE)**

**NPSE 8001. Introduction to Nanoparticle Science and Engineering.** (3 cr.; A-F or Audit; Periodic Summer) A broad, interdisciplinary overview of the emerging field of nanoparticle science and engineering. This introductory course, designed for students with diverse backgrounds in science and engineering, covers a wide spectrum of topics—from the synthesis of nanoparticles, to nanoparticle growth and transport, to characterization methods for nanoparticles, to novel nanoparticle-based materials and devices.

**NPSE 8002. Nanoparticle Science and Engineering Laboratory.** (3 cr.; A-F or Audit; Periodic Summer) Practical exposure to computational and experimental techniques in nanoparticle research. Required for Ph.D. students minoring in nanoparticle science and engineering. prereq: 8001, [CSE grad student or instr consent]

**NPSE 8101. Nanoparticle Science and Engineering Seminar.** (1 cr.; S-N or Audit; Every Fall & Spring) Broad overview of current research in nanoparticle science and engineering. Topics include areas of nanoparticle synthesis, nanoparticles characterization, nanoparticle-based materials and devices, environmental impact of nanoparticles, and instrumentation for nanoparticle research. Speakers from the University of Minnesota as well as external experts. prereq: CSE grad student or

**Natural Resources Sci and Mgmt (NR)**

**NR 5021. Statistics for Agricultural and Natural Resource Professionals.** (3 cr.; Student Option; Every Fall) The primary audience for this course is graduate students in the agricultural, environmental, natural resources, and other related programs that need competence in statistics. The subject matter will be approaches and applications involving analysis of data using common statistical methods, e.g., describing and visualizing data, the design of single factor experiments, linear modeling, and the ability to examine journal articles in their field and assess their content in a critical manner. prereq: College algebra

**NR 8107. Seminar: Natural Resources Science and Management.** (1 cr.; Student Option; Every Fall & Spring) Assigned topics, student presentations, student presentation evaluations.

**NR 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

**NR 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**NR 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]) No Grade Associated; Every Fall, Spring & Summer tbl prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**NR 8777. Thesis Credits: Master's.** (1-18 cr. [max 50 cr.]) No Grade Associated; Every Fall, Spring, Summer (no description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**NR 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]) No Grade Associated; Every Fall, Spring, Summer (no description) prereq: Max 18 cr per semester or summer; 24 cr required. Must be doctoral student with advisor's consent to register.

**Neurology (NEUR)**

**NEUR 5121. Descriptive Neurology.** (2 cr.; O-N or Audit; Every Spring) Central and peripheral nervous system. Correlation of neuroanatomy, neuropathology, clinical neurology, and pathology of the nervous system. prereq: enrolled OT or PT

**NEUR 5230. Cerebrovascular Hemodynamics and Diseases I.** (4 cr.; A-F only; Every Fall) Principles of cerebrovascular disease/pathophysiology, hemodynamics, diagnostic imaging, and endovascular devices. Bench-to-bedside experiments. Clinical trials, including design constraints and biostatistics. prereq: [PHSL 3063 or PHSL 3065] [MATH 1271 or MATH 1272] [PHYS 1201W or PHYS 1301W or instr consent] or [grad student, PHSL 5061 or instr consent]

**NEUR 5240. Cerebrovascular Hemodynamics and Diseases II.** (4 cr.; A-F only; Every Spring) Principles of cerebrovascular disease/pathophysiology, hemodynamics, diagnostic imaging, and endovascular devices. Bench-to-bedside experiments. Clinical trials, including design constraints and biostatistics. Treatment options, endovascular devices, design of new clinical studies. prereq: 5230, instr consent

**NEUR 7120. Neurology Research.** (2-8 cr.; H-N only; Every Fall, Spring & Summer) Students are eligible to participate in clinical or basic science research programs conducted by members of the Department of Neurology at the Fairview-University Medical Center or affiliated hospitals. The specific nature of the project is decided upon by the student and the faculty member. The student is responsible for making their own arrangements with the faculty member.

**NEUR 7124. Sleep Disorders.** (2 cr.; H-N only; Every Fall, Spring & Summer) Students will rotate with sleep medicine physicians at one of two sites.

**NEUR 7300. Interventional Neurology Elective.** (2-4 cr.; H-N only; Every Fall, Spring & Summer) Rotation with the interventional neurology team: observe procedures, see patients in clinic, participate in research projects. Prereq 7510.

**NEUR 7510. Neurology Externship.** (4 cr.; H-N only; Every Fall, Spring & Summer) This required 4-week clerkship offers students the opportunity to work directly with neurologists in inpatient and outpatient settings.

**NEUR 7520. Pediatric Neurology Elective.** (4 cr.; H-N only; Every Fall, Spring & Summer) Offers students a chance to interact with Child Neurologists with varying focuses of practice including developmental, neuromuscular, movement, epilepsy, and miscellaneous neuro-genetic and neuro-metabolic disorders. Students will be involved in both the inpatient and outpatient aspects concurrently. As ensuring completion of this step may be difficult given limited clerkship availability, requests will be considered if at least one of the prerequisites has been completed. Ait: Required: (NEUR 7510, "Externship in Clinical Neurology")

**NEUR 7542. Pediatric Neurology.** (4 cr.; H-N or Audit; Every Fall & Spring) Successful completion of this rotation satisfies the neurology requirement (Neur 7-510). Pediatric neurology patients have a variety of problems ranging from coma, muscular dystrophy, epilepsy to learning disabilities; from inborn errors of metabolism, metabolic neurologic dysfunction to behavior disorders. Patients are seen both on service and in consultation in the hospital and in the outpatient clinic which meets three times weekly. Students will function as part of the group of physicians who evaluate and suggest therapy for these children. There will be close supervision and tutorial sessions with the senior pediatric neurology fellows as well as scheduled rounds with pediatric neurology staff members at least three times weekly. There is no night call, routinely. A teaching conference is held weekly and students are encouraged to participate during the rotation.

**NEUR 7545. Neuromuscular Diseases.** (2-4 cr.; H-N or Audit; Every Fall, Spring & Summer)
Students participate in all aspects of diagnosis/management of patients with neuromuscular disease. Rotation includes neuromuscular and Muscular Dystrophy Association clinics, clinical electrophysiology laboratory evaluations of patients, nerve/muscle biopsy histological interpretation, and clinical electromyography conferences. Diseases seen include carpal tunnel syndrome, radiculopathies, polyneuropathies, muscular dystrophy, amyotrophic lateral sclerosis, myasthenia gravis. Molecular basis of inherited neuromuscular disease. Students may participate in clinical research projects.

NEUR 7565. Neurology Subspecialty Elective. (4 cr.; H-N only; Every Fall, Spring & Summer)
Students are exposed to various neurological subspecialty outpatient clinics.

NEUR 7599. Subinternship in Clinical Neurology. (4 cr.; H-N only; Every Fall, Spring & Summer)
This hospital-based course is designed for students with special interest in the clinical and basic neurosciences who desire additional experience in clinical neurology. prereq: 7510

NEUR 7600. Epilepsy Diagnosis and Treatment. (2 cr.; H-N only; Every Fall, Spring & Summer)
The student works with an epileptologist in inpatient/outpatient settings. Emphasis is on learning diagnosis, pharmacological and surgical treatment, and the social and psychological consequences to care for the needs of epilepsy patients.

NEUR 7910. Neurology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Neurology medical residency.

NEUR 7930. Neurology Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Neurology medical fellowship.

NEUR 8201. Clinical Pediatric Neurology. (1-15 cr.; Student Option;)
Neuroscience (NSC)

NSC 5031W. Perception. (WI; 3 cr.; Student Option; Periodic Fall)
Cognitive, computational, and neuroscience perspectives on visual perception. Color vision, pattern vision, image formation in eye, object recognition, reading, impaired vision. Course is biennial: offered fall of odd years. prereq: Psy 3031 or Psy 3051 or instr consent

NSC 5040. Brain Networks: From Connectivity to Dynamics. (4 cr.; A-F or Audit; Fall Odd Year)
Brain networks. Application of emerging science of complex networks to studies of the brain. Network approaches that provide fundamental insights into the integrative nature of brain function and its relation to the brain structure. Organization of brain networks and dynamics at multiple spatial scales, ranging from the microscale of single neurons and synapses, to mesoscale of anatomical cell groupings and their projections, and to the macroscale of brain regions and pathways. Experimental studies, including electrophysiology, voltage-sensitive dye imaging, electroencephalography, magnetoencephalography, and functional magnetic resonance imaging, that allow mapping network elements and structural/functional connectivity between them at different temporal and spatial scales will be considered. Experimental/theoretical perspectives.

NSC 5202. Theoretical Neuroscience: Systems and Information Processing. (4 cr.; Student Option; Every Spring)

NSC 5203. Basic and Clinical Vision Science. (3 cr.; Student Option; Spring Even Year)
Basic and clinical vision science. prereq: instr consent

NSC 5461. Cellular and Molecular Neuroscience. (4 cr.; A-F or Audit; Every Fall)
Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers. prereq: NSc grad student or instr consent

NSC 5462. Neuroscience Principles of Drug Abuse. (2 cr.; Student Option; Periodic Spring)
Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years. prereq: instr consent

NSC 5540. Survey of Biomedical Neuroscience. (2 cr.; A-F or Audit; Every Summer)
Current topics in biomedical neuroscience, accompanied by supporting, fundamental concepts. Intensive, one week course. prereq: instr consent, intended for members of biomedical community or students with advanced scientific backgrounds

NSC 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4 cr.; S-N or Audit; Every Summer)
Intensive lab introduction to cellular and molecular aspects of research techniques in contemporary neurobiology; held at Itasca Biological Station. Electrophysiological investigations of neuronal properties, neuropharmacological assays of transmitter action, and immunohistochecmical studies in experimental preparations. prereq: Neuroscience grad or instr consent

NSC 5561. Systems Neuroscience. (4 cr.; A-F or Audit; Every Fall)
Principles of organization of neural systems forming the basis for sensation/movement. Sensory-motor/neural-endocrine integration. Relationships between structure and function in nervous system. Team taught. Lecture, laboratory. prereq: NSc grad student or instr consent

NSC 5661W. Behavioral Neuroscience. (WI; 3 cr.; A-F or Audit; Every Spring)
Neural coding/representation of movement parameters. Neural mechanisms underlying higher order processes such as memorization, memory scanning, and mental rotation. Emphasizes experimental psychological studies in human subjects, single cell recording experiments in subhuman primates, and artificial neural network modeling. prereq: Grad NSc major or grad NSc minor or instr consent

NSC 5667. Neurobiology of Disease. (2-3 cr.; S-N or Audit; Fall Even Year)
Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar course. prereq: instr consent

NSC 8014. Small RNA Biology. (2 cr.; A-F or Audit; Every Spring)
Small RNAs as major regulators of gene/protein expression. MicroRNAs and their potential use in diagnosis/prognosis of various disease conditions, including cancers. Small RNAs and their role in health and disease. prereq: BIOC 8002 or MICA 8004 or equiv or instr consent

NSC 8026. Neuro-Immune Interactions. (3 cr.; Student Option; Periodic Fall & Spring)
Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. Course is offered fall of even-numbered years. prereq: 5561, MIB 4131

NSC 8041. Cognitive Neuroscience. (4 cr.; A-F only; Every Fall)

NSC 8111. Quantitative Neuroscience. (3 cr.; A-F or Audit; Every Fall)
Principles of experimental design and statistical analysis in neuroscience research. Includes an introduction to computer programming for data analysis using both classic and modern quantitative methods.

NSC 8207. Seminar: Psychopharmacology. (1-3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Faculty and postdoctoral fellows interested in psychotropic drugs and chemicals participate. Some seminars devoted to biomedical ethics.
Neurochemistry, pharmacology, and behavior as antecedent or consequential variables. prereq: instr consent

NSC 8208. Neuropsychopharmacology. (. 3 cr. ; A-F or Audit; Fall Even Year) Methodologies to study relationships between drugs and biochemical, behavioral, and neurophysiological consequences. Functional biogenic amine, peptidergic, other pathways. How manipulations alter neuronal function or behavior. Feedback mechanisms, induction, inhibition. Reinforcement of, tolerance to, or dependence on drugs of abuse: stimulants, hallucinogens, depressants, opiates. Student presentations. prereq: [5212, 6112, PSY 5021, PSY 5061] or instr consent

NSC 8211. Developmental Neurobiology. (. 3 cr.; A-F or Audit; Every Spring) How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms. prereq: Neuroscience grad student or instr consent

NSC 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (. 1 cr.; S-N or Audit; Every Fall & Spring) Advanced seminar. Course is offered fall and spring semesters. prereq: instr consent

NSC 8217. Systems and Computational Neuroscience. (. 2 cr.; S-N or Audit; Every Fall & Spring) Advanced seminar. prereq: 5561 or instr consent

NSC 8221. Neurobiology of Pain and Analgesia. (. 3 cr.; Student Option; Periodic Fall & Spring) Pain and analgesia. Course is triennial. prereq: instr consent

NSC 8222. Central Regulation of Autonomic Function. (. 3 cr.; A-F or Audit; Every Fall & Spring) Neural/hormonal sensory pathways affecting central autonomic nuclei involved in maintenance of homeostasis. Current research on physiological control systems at cellular, organ, and integrative levels. Course is offered fall of odd-numbered years. prereq: 5561


NSC 8248. Directed Readings in Auditory Physiology. (. 1-2 cr.; Student Option; Every Fall & Spring) Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

NSC 8320. Readings in Neurobiology. (. 1-4 cr.; A-F or Audit; Every Fall & Spring) This course discusses the basic principles of cellular and molecular neurobiology and nervous systems. The main topics include: Organization of simple networks, neural systems and behavior; how the brain develops

NSC 8321. Career Skills and Understanding Responsibilities as a Neuroscientist. (. 0.5 cr.; S-N or Audit; Every Fall & Spring) Information that falls outside of core neuroscience academic curriculum. Areas of practical value for graduate school and career development. Career skills, writing skills, responsible conduct in research. prereq: Neuroscience grad major or instr consent

NSC 8333. FTE: Master's. (. 1 cr.; No Grade Associated; Every Fall & Summer) FTE: Master's prerequisite. prereq: Master's student, adviser approval

NSC 8334. Laboratory Neuroscience. (. 1-3 cr.; max 10 cr.; S-N or Audit; Every Fall & Spring) Guided research. prereq: Grad NSc major

NSC 8411. Teaching in Neuroscience. (. 1 cr.; max 4 cr.; S-N or Audit; Periodic Spring) Grad students serve as primary instructors in 4151 and work with fellow students and faculty mentors to design curriculum, classroom sessions, exams, and course evaluations. prereq: instr approval

NSC 8444. FTE: Doctoral. (. 1-4 cr.; No Grade Associated; Every Fall, Spring & Summer) No description prereq: Doctoral student, adviser and DGS consent

NSC 8481. Advanced Neuropharmaceutics. (. 4 cr.; A-F or Audit; Fall Even Year) Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutic benefit. Pharmaceutical/pharmacological issues specific to direct drug delivery to CNS. prereq: instr consent

NSC 8666. Doctoral Pre-Thesis Credits. (. 1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

NSC 8777. Thesis Credits: Master's. (. 1-18 cr.; max 50 cr.; No Grade Associated; Every Fall & Summer) Thesis Credits: Master's

NSC 8886. Thesis Credit: Doctoral. (. 1-24 cr.; max 100 cr.; No Grade Associated; Every Fall & Spring) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

NSCI 5101. Neurobiology I: Molecules, Cells, and Systems. (. 3 cr.; A-F or Audit; Every Fall & Spring) This course discusses the basic principles of cellular and molecular neurobiology and nervous systems. The main topics include: Organization of simple networks, neural systems and behavior; how the brain develops and the physiology and communication of neurons and glia; the molecular and genetic basis of cell organization; ion channel structure and function; the molecular basis of synaptic receptors; transduction mechanisms and second messengers; intracellular regulation of calcium; neurotransmitter systems, including excitation and inhibition, neuromodulation, system regulation and the cellular basis of learning, memory and cognition. The course is intended for students majoring in neuroscience, but is open to all students with the required prerequisites.

NSCI 5110. Dental Neuroscience for Graduate Students. (. 2 cr.; A-F or Audit; Every Spring) Structure/function of human nervous system. Lectures and reading assignments emphasize topics pertinent to dentistry. prereq: Credit will not be granted if credit has been received for: 6110; Biol 3021, Biol 4004, instr consent; intended for grad students who require a comprehensive grad-level neuroscience course

NSCI 5111. Medical Neuroscience for Graduate Students. (. 5 cr.; A-F or Audit; Every Spring) Survey of molecular, cellular, and systems neuroscience as related to medicine. Lecture/lab. prereq: Credit will not be granted if credit has been received for: 6111; BioC 3021, Biol 4004, instr consent; intended for grad students who require a comprehensive medically-oriented neuroscience course

NSCI 5300. Biological Microscopy & Digital Imaging. (3 cr.; Student Option; Every Spring) Optical microscopy is among the most powerful available to biologists. Course introduces graduate students and advanced undergraduates to its uses, to the principles that underlie its use and to the appropriate use of resulting digital images. Students will have access to a microscope in a research laboratory. Required Prerequisites: None. Recommended Prerequisites: PHYS 1101 or PHYS 1201 or PHYS 1301 or PHYS 1401

NSCI 5913. BrainU 101: Neuroscience in the Classroom. (. 3 cr.; A-F or Audit; Every Fall & Spring) Two-week summer workshop. Week one focuses on teaching strategies in neuroscience through lectures, activities, and discussion sessions. Week two focuses on designing inquiry-based classroom investigations based on neuroscience education given during week one. Follow-up activities held during the academic year include BrainU staff/faculty classroom presentations and use of training materials. prereq: [Elementary or middle school or high school or preschool] teacher, instr consent, application


Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu. 265
NSU 6567. Neurobiology of Disease. (2-3 cr.; Student Option; Every Fall) Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar.

NSU 7200. Surgical Specialty: Neurosurgery. (2 cr. [max 4 cr.]; P-N only; Every Fall, Spring & Summer) During the course, the student will evaluate patients in the outpatient clinic. Students will learn about basic disease processes and are encouraged to spend time in the operating room observing neurological procedures. Medical students will also participate in daily teaching rounds and should attend most regularly scheduled conferences held within the department.

NSU 7400. Surgical Specialty: Neurosurgery Elective, Duluth. (2-4 cr.; H-N or Audit; Periodic Fall & Spring) Students evaluate patients in outpatient clinic. Basic disease processes. Students spend time in operating room, observing neurosurgical procedures, and in emergency room, inpatient setting, pain clinic, inpatient setting, and office practice.

NSU 7500. Neurosurgery Externship. (4 cr.; H-N only; Every Fall, Spring & Summer) Student will be an integral part of the neurosurgical team, participating closely with the other house staff in patient care and decision-making processes. An important aspect of the externship will be the opportunity to see neurosurgical procedures in correlation with the patients for whom the student is caring.

NSU 7510. Externship at the VA Medical Center. (2-6 cr.; H-N or Audit; Every Fall, Spring & Summer) During this externship, the student attends daily ward rounds and participates in the evaluation and treatment in the outpatient department. Each student is expected to attend neurosurgical, neuroradiological and neuropathology weekly conferences.

NSU 7910. Neurosurgery Medical Residency. (6 cr. [max 150 cr.]; No Grade Associated; Every Fall, Spring & Summer) Develop skills for critically reading empirical literature within field of adolescent health.

NSU 7930. Neurosurgery Medical Fellowship. (6 cr. [max 150 cr.]; No Grade Associated; Every Fall, Spring & Summer) Neurosurgery medical fellowship.

NSU 8318. Neuroradiological Conference. (1 cr.; S-N or Audit; Every Fall, Spring & Summer) Neuroradiological conference.

NSU 8320. Neurosurgical Conference. (1 cr.; S-N or Audit; Every Fall, Spring & Summer) Neurosurgical conference.


Nursing (NURS)

NURS 5010. Foundations of Interprofessional Communication and Collaboration. (1 cr.; S-N only; Every Fall) Exploration of nature/need for interprofessional communication among health care professionals. Qualities of successful interprofessional teams/interactions. Introduction to professional identity, ethics, integrity, values. Strategies for communication/decision making, prereq: Nursing student

NURS 5011. Interprofessional Diabetes Experience. (2 cr.; A-F only; Every Spring) Explore diabetes mellitus through active, hands-on learning in an interprofessional environment. Week-long simulated experience of living with diabetes. Online learning activities focused on interprofessional teamwork for optimal care to patients with diabetes, prereq: 2nd or 3rd year in nursing curriculum, prereq: 2nd or 3rd year in nursing curriculum

NURS 5029. Introduction to Nursing Interventions. (4 cr.; A-F only; Every Fall) Evidence-based interventions for safe, culturally appropriate, and ethical nursing practice.

NURS 5030. Foundational Concepts of Professional Nursing. (3 cr.; A-F or Audit; Every Fall) Foundation of knowledge for culturally appropriate, ethical, evidence-based nursing practice across the life span. Research/theory that underlie the art/science of professional nursing. Concepts of person, environment, health, and nursing, prereq: Admission to master's in nursing program

NURS 5031. Human Response to Health and Illness: Adults and Elders. (4 cr.; A-F or Audit; Every Spring) Focus on individual responses to health and illness in the context of families and environments. The clinical component will emphasize the application of the nursing process in adult and older adult populations.

NURS 5032. Human Response to Health and Illness: Children and Childbearing Families. (5 cr.; A-F or Audit; Every Spring) Focus is on family responses to health and illness. Application of the nursing process in children and childbearing families is emphasized. The family as the unit of care is the focus of a seminar.

NURS 5033. Population-Focused Health in Public Health and Mental Health Nursing. (5 cr.; A-F or Audit; Every Summer) Focus on population-based public health and mental health nursing practice across the lifespan, with local to global perspectives. Emphasis on health equity, health promotion, and levels of disease prevention. Apply theory and research to examine interventions and outcomes.

NURS 5034. Transition to Professional Nursing Practice. (3 cr.; A-F or Audit; Every Fall) Critical analysis of issues affecting the transition to professional nursing practice including those related to the quality of healthcare, quality improvement, and the ability of nurses to improve patient outcomes across settings, prereq: NURS 5033, NURS 6200

NURS 5035. Practicum Nursing Care for Complex Health Conditions. (4 cr.; A-F or Audit; Every Fall) Clinical decision-making, comprehensive nursing care of clients with complex health problems. In collaboration with a clinical
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
NURS 5205. Clinical Seminar in Women's Health. (3 cr. ; A-F only; Every Fall)
Clinical seminar. Emphasis on integration of theoretical knowledge/skills related to caring for women/infants at risk for medical/psychosocial problems. Gain experience in management of selected high-risk perinatal conditions. Prereq: WHNP DNP student, NURS 5222, 5228, 5229, 5200, 6305, 6306, 6925, 6926 Nurse-Midwife DNP student, NURS 5222, 5228, 5229, 5200, 6305, 6306, 6925, 6210, 6211

NURS 6200. Science of Nursing Intervention. (3 cr. ; A-F or Audit; Every Fall, Spring & Summer)
Examination/application of theories and conceptual frameworks to clinical practice problems. Prereq: Admission to RN or DNP program

NURS 6210. Midwifery Care of the Childbearing Family. (3 cr. ; A-F only; Every Summer)
Evidence-based models of midwifery practice for management/support of women/families during labor, birth, and immediate postpartum period. Care of newborn. Prereq: instr consent

NURS 6211. Midwifery Care of the Childbearing Family Practicum. (2 cr. ; S-N only; Every Summer)
Implement evidence-based models of midwifery practice in the management and support of women and families during labor, birth, the immediate postpartum period, and care of the newborn. Prereq: 6305, 6306, concurrent registration is required (or allowed) in 6212

NURS 6213. Reproductive Healthcare for Women at Risk. (2 cr. ; A-F only; Every Fall)
Evidence based, theoretical/epidemiologic basis for advanced practice nursing care of women with complex reproductive health problems requiring multidisciplinary interventions. Selected high-risk gynecologic/ perinatal conditions. Prereq: (NM and WHNP) N6305, N6306, 6501, (NM only) 6210/6211, 6212 (WHNP only) 6502, 7504, 7505, 6929

NURS 6214. Reproductive Healthcare for Women at Risk Practicum. (2 cr. ; S-N only; Every Fall)
Apply advanced assessment/management skills in care of women/infants at risk for medical/psychosocial problems. Gain experience in management of selected high-risk perinatal conditions. Prereq: WHNP DNP student, NURS 5222, 5228, 5229, 5200, 6305, 6306, 6925, 6926 Nurse-Midwife DNP student, NURS 5222, 5228, 5229, 5200, 6305, 6306, 6925, 6210, 6211

NURS 6305. Women's Reproductive Health Care. (2-3 cr. ; A-F only; Every Fall)
Application of knowledge/evidence to holistic practice in women's health. Prerequisites: PHI 2101, NURS 6210. Enrollment is based on theoretical knowledge/skills related to caring for women's health issues. Prereq: DNP student

NURS 6306. Women's Reproductive Health Practicum. (1 cr. ; S-N only; Every Fall)
Clinical experience in women's reproductive health setting to develop basic skills in providing holistic, safe, competent care, including history taking, physical examination, and patient education specific to women's reproductive health issues across lifespan. Prereq: [6305 or concurrent registration is required (or allowed) in 6305]

NURS 6307. Assessment and Management of Health for APNs Practicum III. (1 cr. ; S-N only; Every Summer)
Comprehensive advanced nursing assessment and management for acute and chronic health conditions of the adult primary care population across the life span. Synthesis and application of nursing theory and evidence-based implementation and evaluation of safe and effective therapeutic interventions to promote, maintain, and restore health.

NURS 6308. Women's Primary Care Practicum. (1-2 cr. ; S-N only; Every Spring)
Practicum in women's reproductive and primary health care settings to continue development of basic skills in providing holistic, safe, competent care, including history taking, physical examination, patient education specific to reproductive and primary healthcare issues across lifespan. Prereq: 5200, 5222, 5228, 5229, 6501, 6305, 6306

NURS 6405. Advanced Practice CNS Roles Across the Lifespan. (3 cr. ; A-F only; Every Fall)
Develop expertise and leadership in the clinical nurse specialist roles within the three spheres of influence (patient, nursing, organization), using current evidence. Prereq: 5200, 7103, 7900

NURS 6406. Advanced Practice CNS Roles Across the Lifespan: Practicum. (1 cr. ; S-N only; Every Fall)
Students analyze/evaluate roles of CNS within the three spheres of influence, using current practice standards/research. Prereq: 5200, 7103

NURS 6407. Advanced Nursing Care of Older Adults. (3 cr. ; A-F only; Every Fall)
Theory/research in promotion, maintenance, and restoration of the health of older adults within the context of their families and different care settings. Independent/collaborative roles of the advanced practice nurse in different settings. Prereq: [5200, 5222, 5224, 5228, 6500, 6501, 7504, 7505] or instr consent

NURS 6408. Advanced Nursing Care of Older Adults Practicum. (1-2 cr. ; S-N only; Every Fall)
Application of theory and evidence-based knowledge for advanced practice nursing students to develop skill in assessing and managing health issues commonly experienced by older adults in a variety of care settings. Prereq: [5200, 5222, 5224, 5228, 6500, 6501, 7504, 7505] or instr consent

NURS 6501. Assessment and Management of Health for Advanced Practice Nurses, I. (3 cr. ; A-F only; Every Fall)
Advanced practice nursing. Health promotion and data-based assessment/management of common acute and stable chronic conditions for the primary care populations. Role of the advanced practice nurse, process of clinical reasoning and decision-making, and independent and collaborative practice health care plans, utilizing evidence-based practice. Prereq: DNP student or instr consent

NURS 6502. Assessment and Management of Health for Advanced Practice Nurses, II. (2-3 cr. ; A-F only; Every Spring)

NURS 6504. Assessing, Managing Psychiatric Disorders in Adv Pract Psychiatric-Mental Health Nursing. (2 cr. ; A-F only; Every Spring)
Apply advanced concepts from nursing theory and research, social sciences, neuropsychology, and neuropsychopharmacology in the differentiation and explanation of psychiatric symptoms and disorders across the age continuum.

NURS 6505. PMH/APN Prac II:Assessing, Managing Psychiatric Disorders in Adv Pract Psychiatric-Mental Health Nurs. (2 cr. ; S-N only; Every Spring)
Diagnostic interviewing skills to conduct a comprehensive psychiatric assessment for patients across the lifespan. In collaboration with an interdisciplinary team and patient, students develop an initial evidence-based, integrative treatment plan. Prereq: 5200, 5222, 5224, 5228, 6604, 6605, CSH 5101, concurrent registration is required (or allowed) in 6404

NURS 6600. Health Systems and Care Models. (3 cr. ; A-F only; Every Spring)
Current/emerging care delivery systems and nursing models are analyzed as to how they meet dynamic, social, economic, technological, political trends. Impact of disruptive technologies, business models, value networks, designing better models.
NURS 6602. PMH Advanced Practice Nursing: Group as a Health Care Intervention. (2 cr.; A-F only; Every Fall) Theoretical concepts/research findings from areas of group theory, group dynamics, group therapy applied in development of model for utilizing group as intervention for various client populations. prereq: 6802, 6803, concurrent registration is required (or allowed) in 6803

NURS 6603. PMH APN Practicum IV: Group as a Health Care Intervention. (2 cr.; S-N only; Every Fall) Develop new competencies in conducting group therapy, Diagnostic interviewing/assessment skills. Evidence-based management plans with individuals/families at risk of psychiatric disorders/mental health problems. prereq: concurrent registration is required (or allowed) in 6602, 6802, 6803

NURS 6604. Foundations for Integrative Mental Health and Psychiatric Advanced Practice Nursing. (2 cr.; A-F only; Every Fall) Examine concepts, theories, and paradigms foundational to psychiatric and mental health nursing practice and inter-professional integrative mental health care. Develop clinical interviewing methods that elicit a client's health narrative and facilitate the therapeutic relationship. Promotes beginning skill in reflective clinical practice. prereq: concurrent registration is required (or allowed) in 6605, 5200, 5222, 5226, 5228, 5229, CSH 5101

NURS 6605. Psychiatric/Mental Health Advanced Nursing Practice Practicum I. (1 cr.; S-N only; Every Fall) First clinical course in advanced practice psychiatric/mental health nursing. Mental health promotion/mental illness risk reduction. Clinical interviewing, holistic health assessment, integrative mental health care management. prereq: concurrent registration is required (or allowed) in 6604, 5200, 5222, 5226, 5228, 5229, CSH 5101

NURS 6702. Nursing Leadership Seminar: Introduction to Innovation and Leadership. (3 cr.; A-F only; Every Fall) Leadership models and recommended competencies in context of current trends. Applying design thinking/insights from nursing leaders. Innovation and expansion of nursing leadership into new settings and roles.

NURS 6703. Nursing Leadership Seminar: Organizational Culture and Leadership. (2 cr.; A-F only; Every Fall) Evaluate the evidence base for nurse executive practices and the relationships between leadership and organizational culture and performance. prereq: Grad student or instr consent

NURS 6704. Nursing Leadership Practicum: Organizational Culture and Leadership. (1-2 cr.; S-N only; Every Spring) Implement evidence-based models through projects with preceptor in area of organizational environment and culture through experiential activities, including conferences, intensive clinical experiences, clinical conferences, and simulation. prereq: concurrent registration is required (or allowed) in 6703

NURS 6705. Nursing Leadership Seminar: Quality and Change Management. (2 cr.; A-F only; Every Fall) Comprehensive background in the science of patient safety, quality improvement, error management, and change implementation. prereq: [6702, 6703] or instr consent. concurrent registration is required (or allowed) in 6704

NURS 6706. Nursing Leadership Practicum: Quality and Change Management. (1-2 cr.; S-N only; Every Fall) Gain experience in implementing evidence-based model of change related to safety promotion, quality improvement, or error management in collaboration with preceptor or designee. prereq: 6705

NURS 6707. Health Care Design and Innovation Practicum. (2 cr.; S-N only; Every Fall & Spring) A health care design and innovation practicum experience to support integration of knowledge, skills and abilities related to human centered thinking and an experienced based design innovation: product, service, or system innovation delivery change. prereq: Students in Health Care Design and Innovation certificate program or DNP students who have completed, Nurs 7610, CSPIH 5711, HUMF 5874.

NURS 6802. Psychiatric/Mental Health Advance Practice Nursing: Psychotherapy with Individuals and Families. (2 cr.; A-F only; Every Summer) Evaluate selected theories/models, research, clinical evidence, therapeutic use of self for developing/implementing psychotherapeutic interventions used to promote mental health/assist individuals. prereq: 6102, 6604, 6605

NURS 6803. Psychiatric/Mental Health Adv Prac Nurs Practicum III: Psychotherapy With Individuals, Families. (1 cr.; S-N only; Every Summer) Theories, research, clinical evidence. Psychotherapeutic interventions/therapeutic use of self to promote mental health/advance treatment, management, recovery from bio/psycho/social sequelae of psychiatric illnesses. prereq: concurrent registration is required (or allowed) in 6802, 6102, 6504, 6505

NURS 6895. Adult Acute Care Holistic Health Assessment. (2 cr.; A-F only; Every Fall) Provides nurse anesthetists and other interested APRN students with the cognitive and psychomotor skills necessary to perform an advanced health assessment for acute care adult patients and/or those in need of a preoperative assessment. prereq: Nurse anesthesia DNP student or instr consent

NURS 6900. Introduction to Principles of Anesthesia. (6 cr.; A-F only; Every Spring) First in a series of four courses that introduces the nurse anesthesia student to the safe and effective principles of nurse anesthesia. prereq: Doctorate of nursing practice program

NURS 6901. Basic Nurse Anesthesia Principles. (3 cr.; A-F only; Every Fall) Examination/application of basic principles of anesthesia to formulate nurse anesthesia care plans for care of adults undergoing anesthesia. prereq: 6900, 6910, concurrent registration is required (or allowed) in 6911

NURS 6902. Nurse Anesthesia Care: Cardiothoracic Disease. (2 cr.; A-F only; Every Spring) Principles of nurse anesthesia used to deliver anesthesia to complex patients/populations. Anesthesia for patients undergoing cardiovascular and thoracic procedures. prereq: 5222, 5228, 6900, 6901, concurrent registration is required (or allowed) in 6912, PHSL 5115

NURS 6903. Nurse Anesthesia Care: Special Populations. (2 cr.; A-F only; Every Summer) Examine/apply principles used to deliver anesthesia by nurse anesthetists to special populations: pediatric, trauma, obstetric/gynecologic, and acute and chronic pain patients. prereq: 6900, 6901, 6902, concurrent registration is required (or allowed) in 6912, admission to BSN-DNP nurse anesthesia specialty

NURS 6910. Introduction to Nurse Anesthesia Practicum I. (1 cr.; S-N only; Every Summer) Basic skills in nurse anesthesia practice. Equipment safety checks, room set up, pre-operative assessment, basic airway skills, intravenous fluid replacement, positioning of patient/management of emergence. prereq: Grad Student in Doctorate of Nursing Practice Program, concurrent registration is required (or allowed) in 6900

NURS 6911. Basic Nurse Anesthesia Principles Practicum II. (2 cr.; S-N only; Every Summer) Develop proficiency in nurse anesthesia practice including basic equipment safety checks, room set up, pre-operative assessment, basic airway skills, intravenous fluid replacement, positioning of patient, management of emergence. prereq: N6910, concurrent registration is required (or allowed) in N6901. Grad student in Doctorate of Nursing Practice Program

NURS 6912. Nurse Anesthesia Care: Cardiothoracic Disease Practicum. (3 cr.; S-N only; Every Spring) Develop proficiency in nurse anesthesia practice. Basic equipment safety checks, room set up, pre-operative assessment, basic airway skills, intravenous fluid replacement, positioning of patient and managing emergence. prereq: concurrent registration is required (or allowed) in 6902, DNP-nurse anesthesia specialty student

NURS 6913. Nurse Anesthesia Care: Special Populations Practicum. (4 cr.; S-N only; Every Summer) Develop proficiency in nurse anesthesia practice for special populations, including pediatrics, obstetrics/gynecology, trauma, and patients with acute and chronic pain. prereq: Grad student in doctorate of nursing practice
program nurse anesthesia specialty; concurrent registration is required (or allowed) in 6903

NURS 6914. Basic Nurse Anesthesia Principles Practicum III. (3 cr.; S-N only; Every Fall)
Develop progressive proficiency in nurse anesthesia practice including basic equipment safety checks, room set up, pre-operative assessment, basic airway skills, intravenous fluid replacement, positioning of patient, management of emergency. prereq: N6910, concurrent registration is required (or allowed) in N6901

NURS 6920. Primary Care: Assessment of Health and Care of Well Children. (3 cr.; A-F only; Every Fall)
Age-specific, family-centered, assessment, prevention and health promotion services for infants through adolescents. Comprehensive health supervision. Critical thinking and advanced practice nursing interventions. prereq: 5200, 5222, 5229, concurrent registration is required (or allowed) in 6921, instr consent

NURS 6921. Assessment of Health and Care of Well Children: Primary Care Practicum. (; 1-2 cr.; S-N only; Every Spring)
Age-specific, family-centered nursing assessment and interventions to promote wellness for infants through adolescence. Compiling and evaluating advanced nursing interventions for disease prevention and health promotion. Models of primary prevention. prereq: 5200, 5222, 5229, concurrent registration is required (or allowed) in 6920, instr consent

NURS 6922. Primary Care: Assessment and Management of Common Conditions Affecting Children. (; 3 cr.; A-F only; Every Fall)
Research-based evaluation and management of common conditions affecting children from infancy through adolescence. Theories and models used to explain and predict physiologic and psychological adaptation of children and their families. prereq: 6920, 6921, concurrent registration is required (or allowed) in 6923, instr consent

NURS 6923. Primary Care Practicum: Assessment and Management of Common Conditions Affecting Children. (; 2 cr.; S-N only; Every Fall)
Age-specific, family-centered nursing assessment and intervention of acute and chronic conditions of children within the family context. Nursing intervention strategies including diagnostics, therapies, education, and follow-up evaluation of outcomes. prereq: 6920, 6921, concurrent registration is required (or allowed) in 6922, instr consent

NURS 6924. Assessment and Interventions for Children and Youth With Special Health Care Needs. (; 2 cr.; A-F only; Every Fall)
Children and youth with special health care needs. Growth and development, pathophysiology, and specific conditions within a holistic, family-centered, community based, culturally competent, coordinated approach to assessment and intervention. prereq: instr consent

NURS 6925. Advanced Concepts in Women’s Health Care I. (1-3 cr.; A-F only; Every Spring)
The course builds on foundational theoretical and evidence-based content to develop advanced assessment and care planning competencies in working with patients with complex gynecological and pregnancy-related conditions. prereq: 6305, 6306, 6501

NURS 6926. Advanced Concepts in Women’s Health for WHNP Practicum I. (; 1 cr. [max 2 cr.]; S-N only; Every Spring)
Develop advanced women’s health assessment/planning skills. Experience working with women who have complex gynecological/pregnancy-related conditions. prereq: WHNP DNP student, concurrent registration is required (or allowed) in 6925, 5222, 5228, 5229, 5200, 6305, 6306

NURS 6927. Advanced Concepts in Women’s Health II. (; 3 cr.; A-F only; Every Summer)
Advanced concepts in gender-specific health care over adult lifespan and common primary health care issues. Utilization of evidence based integrated therapies and inter-professional practice competencies to promote positive outcomes in women’s health populations. prereq: 6305, 6306, 6925, 6926, concurrent registration is required (or allowed) in 6928, CSPH 5101, current DNP WHNP student

NURS 6928. Adv Concepts in Women’s Health II WHNP Prac. (; 1 cr.; S-N only; Every Summer)
Expands on advanced assessment/management skills in women's health through individualized patient centered care that encompasses primary health issues utilizing integrative approaches/interprofessional practice to promote positive outcomes in women's health populations. prereq: 6305, 6306, 6925, 6926, concurrent registration is required (or allowed) in 6927, CSPH 5101, DNP WHNP student

NURS 6929. Advanced Nursing Care of Children with Acute Illness; Practicum for PCNS. (; 2 cr.; S-N only; Every Fall)
Synthesis and application of theory, research, and evidence-based practice to effectively implement pediatric clinical nurse specialist role. Focuses on comprehensive acute, complex case, role implementation, and contextual factors affecting health of children with special health needs and families. prereq: [6405, grad student in Nursing admitted to pediatric clinical nurse specialist area] or instr consent

NURS 6930. Foundations of Advanced Public Health Nursing Practice. (; 3 cr.; A-F or Audit; Every Fall)

NURS 6931. Health Equity and Social Justice. (1 cr.; A-F only; Every Fall)
Complex relationships among social determinants of health, health disparities, population health status. Analyze/criticize both evidence-based/untested strategies for reducing health disparities. prereq: 6930 or instr consent

NURS 6934. Population-focused Assessment & Prioritization. (; 1 cr.; A-F or Audit; Every Fall)
Principles of community-based participatory methods used to conduct population-focused assessments. Review literature/identify gaps in knowledge. prereq: 6930 or instr consent

NURS 6942. Health Equity and Social Justice Practicum. (2 cr.; S-N only; Every Fall)
Practicum experiences at community site serving populations with compromised health status related to health disparities. Collaborate with agency staff/community partners to identify health disparities relevant to populations served. Develop social justice conceptual framework/propose strategies to improve population health. prereq: instr consent

NURS 6944. Population-focused Assessment & Prioritization Practicum. (1 cr.; S-N only; Every Fall)
Population-focused assessment in collaboration with community partners. Identify key informants. Develop community partnerships. Use multiple approaches to data collection/analyses. Prioritize community assets, needs, contributing factors. prereq: 6930 or instr consent

NURS 7000. DNP Proseminal. (; 1 cr.; A-F only; Every Fall)
Historical, regulatory, and professional underpinnings of advanced specialty nursing practice within a clinical doctoral framework. prereq: Admission to Post-BSN Doctorate of Nursing Practice Program

NURS 7004. Nurse Anesthesia Practicum A. (; 5 cr.; S-N only; Every Fall)
First in a series of three clinical courses that focus on developing proficiency in nurse anesthesia practice, management. prereq: 5920

NURS 7005. Nurse Anesthesia Practicum B. (; 5 cr.; S-N only; Every Spring)
Second in a series of three clinical courses that develop proficiency in nurse anesthesia practice. prereq: 7004

NURS 7006. Nurse Anesthesia Practicum C. (; 5 cr.; S-N only; Every Summer)
Third in a series of three clinical courses that develop proficiency in nurse anesthesia practice. prereq: 7004, 7005

NURS 7100. Quality Improvement and Implementation Science in Health Care. (; 3 cr.; A-F only; Every Fall)
Study of improvement and implementation science with emphasis on integration of organizational change theory, quality improvement models, guidelines, and strategies to drive evidence-based change

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
and improve patient outcomes in the context of healthcare systems.

**NURS 7101. Integrating Change Theory and Quality Improvement.** (2 cr.; A-F only; Every Spring & Summer) Analysis and evaluation of change theories in relationship to quality improvement in health care in order to integrate change theory into the design and development of the student’s DNP project. prereq: 7100 or instr consent

**NURS 7102. Scholarly Dissemination and Advanced Professional Engagement.** (2 cr.; A-F only: Every Fall, Spring & Summer) Synthesis of DNP project components with emphasis on development and dissemination of scholarly manuscript. Recognition of advancement of professional opportunities and commitment.

**NURS 7105. Knowledge Representation and Interoperability.** (2 cr.; A-F only; Every Summer) Conceptual/operational aspects of knowledge representation structures in nursing, including standards and interoperability. Representation of clinical work in the electronic health record. Critical analysis of interoperability, ethical issues, and values. prereq: NURS 5115 or instr consent

**NURS 7106. Knowledge Representation and Interoperability Practicum.** (2 cr.; S-N only; Every Summer) Knowledge representation and interoperability principles/standards to improving knowledge in clinical or public health settings. Applied knowledge representation to nursing, prereq: NURS 5115 or instr consent; [NURS 7105 or concurrent registration is required (or allowed) in NURS 7105]

**NURS 7108. Population Health Informatics.** (2 cr.; A-F only; Every Fall) Standards, interoperability, and integration of information systems for population health are examined. Population health use cases are analyzed for potential benefits, legal, ethical, and practical issues related to the development of population health information systems. prereq: [S115 or [HINF 5430, HINF 5431]] or instr consent

**NURS 7109. Population Health Informatics Practicum.** (2 cr.; S-N only; Every Fall) Apply principles, theories, and standards to integration of data to solve a particular population health problem. prereq: [S115, [7108 or concurrent registration is required (or allowed) in 7108] or [HINF 5430, HINF 5431]] or instr consent

**NURS 7110. NURS 7110 DNP Project Practicum.** (1-3 cr. [max 12 cr.]; S-N only; Every Fall, Spring & Summer) Directed application of a quality improvement process, change theory, and inter-professional collaboration through the development, implementation, evaluation and dissemination of an evidence-based intervention (DNP Project) within the context of health, a health care system and/or healing environment.

**NURS 7111. DNP Project Direction II: Implementation.** (1 cr.; S-N only; Every Fall, Spring & Summer) Directed application of quality improvement process/change theory. Inter-professional collaboration through leadership/implementation of scholarly clinical leadership project. Health care system/healing environment.

**NURS 7112. DNP Project Direction III: Evaluation.** (1 cr.; S-N only; Every Fall, Spring & Summer) Directed application of program evaluation and analysis. Interpretation of project data, dissemination of findings during evaluation phase of DNP Leadership Project. Health care system and healing environment.

**NURS 7113. Clinical Decision Support: Theory.** (2 cr.; A-F only; Every Spring) Principles and concepts of knowledge management and decision making for support of clinical practice. Students design a clinical decision support intervention and examine the legal, ethical, and practical issues related to its implementation and maintenance of CDS interventions. prereq: 5115 or HINF 5430/5431 or instr consent

**NURS 7114. Clinical Decision Support Practicum.** (2 cr.; S-N only; Every Spring) Apply clinical decision support knowledge to the development and application of a clinical decision support intervention. prereq: [5115, [7113 or concurrent registration is required (or allowed) in 7113] or [HINF 5430, HINF 5431]] or instr consent

**NURS 7118. Human Factors and Human-Computer Interaction in Health Informatics.** (3 cr.; A-F or Audit; Every Spring) Principles of human factors and human-computer interaction to optimize research/practice in nursing and health informatics. Interactive system design that accommodates/enhances capabilities of user. prereq: Biostatistics or instr consent

**NURS 7200. Economics of Health Care.** (3 cr.; A-F or Audit; Every Spring & Summer) Economic theories of health care in relation to health disparities and global health. Financing strategies, payment systems, and their effect on doctor/nursing practice. prereq: Admission to DNP program

**NURS 7202. Moral and Ethical Positions and Actions in Nursing.** (2 cr.; A-F or Audit; Every Fall & Spring) Normative ethics and theoretical underpinnings for positions taken. Implications for subsequent action. Morally defensible positions on health-related issues, corresponding actions from perspective of nursing.

**NURS 7209. Integrative Health and Healing.** (1 cr.; A-F only; Every Spring) Foundational course for advanced nursing practice. Scholarship, research, and theory underlying integrative therapies and advanced holistic nursing practice. prereq: 5101, 5200, 5222, 6200, 7000, instr consent

**NURS 7210. Integrative Health and Healing Practicum I.** (1 cr.; S-N only; Every Spring) Foundational clinical course in advanced nursing practice for integrative health and healing. Development of clinical competencies in holistic health assessment, management, and evaluation. prereq: 5101, 5200, 5222, 6200, 7000, beginning level skill in one integrative therapy, instr consent

**NURS 7211. Integrative Health and Healing Practicum II.** (2 cr.; S-N only; Every Fall) Foundational course for advanced nursing practice. Scholarship, research, and theory underlying integrative therapies and advanced holistic nursing practice within the context of disease prevention, health promotion, and teaching/learning. prereq: 5101, 5200, 5222, 6200, 7000, 7209, 7210, [7211 or concurrent registration is required (or allowed) in 7211], 7900, CSH 5701, beginning level skill in two integrative therapies, instr consent

**NURS 7212. Integrative Health and Healing Practicum III.** (2 cr.; S-N only; Every Spring) Development of clinical competencies in holistic health assessment, teaching/learning, and understanding the role of other CAM providers. prereq: 5101, 5200, 5222, 6200, 7000, 7209, 7210, [7211 or concurrent registration is required (or allowed) in 7211], 7900, CSH 5701, beginning level skill in two integrative therapies, instr consent

**NURS 7213. Midwifery Clinical and Professional Integration.** (3 cr.; S-N only; Every Spring) Integration of clinical role of nurse midwife. Role in leadership, legislation, and policy. prereq: Nurse midwifery DNP student in final semester, no incomplete cr, instr consent

**NURS 7214. Integrative Health and Healing Practicum IV.** (1 cr.; A-F only; Every Spring) Programs of integrative therapies and healing practices in a variety of clinical/organizational settings. Creation of holistic nursing health care models, sustainable business plans, and the application of leadership skills. prereq: 7211 or instr consent

**NURS 7215. Integrative Health and Healing Practicum III.** (2 cr.; S-N only; Every Spring) Application of leadership competencies in developing, implementing, and evaluating integrative health and healing services and programs. prereq: 7212 or instr consent

**NURS 7300. Program Planning and Evaluation.** (3 cr.; A-F or Audit; Every Fall & Spring) A critical analysis of methods for practical program planning and evaluation for advanced nursing professionals in leadership roles; includes evaluation of approach and design, intervention processes including stakeholder issues, measurement issues, and strategies to evaluate outcomes achievement. prereq: Admission to DNP program or instr consent

**NURS 7310. WHNP Clinical and Professional Integration.** (2 cr.; S-N only; Every Spring) Integration of the clinical and professional role of the women’s health nurse practitioner, including understanding of the role of the WHNP in leadership, legislation, and policy. prereq: WHNP DNP student in final semester, passed all courses, no incomplete credits
NURS 7400. Health Policy Leadership. (3 cr.; A-F or Audit; Every Fall)
Acquisition of policy leadership and advocacy principles and skills and engagement in the process of continuous policy development and public policy development to transform health care delivery, promote equitable distribution of health care resources, address health disparities, and improve population health. prereq: Admission to DNP program

NURS 7401. Health Policy Leadership Practicum. (0.5-1 cr.; S-N only; Every Spring)
Translation of nursing, health, and political science and application of health policy advocacy knowledge and skills to improve health care delivery, address health disparities, or advance population health.

NURS 7406. Advanced Nursing Practicum in Adult-Gerontology Health. (2 cr.; S-N only; Every Spring)
Final clinical course developing proficiency in the advanced practice specialty role. Focus is on applying/evaluating evidence for clinical practice and achieving a level of competency as a clinical nurse specialist or nurse practitioner in adult-gerontology health. prereq: [5222, 5228, 5224, 5200, 6407, 6501, 7505, not [ANP or GNP]] or [5222, 5228, 5224, 5200, 6407, 6500, 6501, 7504, 7505, [ANP or GNP]] or instn consent

NURS 7500. Health Care of Children for the Family Nurse Practitioner. (3 cr.; A-F only; Every Fall)
Application of mid-range theories, models, concepts, and research in designing age-specific plans for the promotion, maintenance, and restoration of the health of infants, children, and adolescents within the context of their families and communities. prereq: 5200, 7503, 7504, concurrent registration is required (or allowed) in 6102, concurrent registration is required (or allowed) in 7501, concurrent registration is required (or allowed) in 7506, instn consent

NURS 7501. Health Care of Children for the Family Nurse Practitioner Practicum. (1 cr.; S-N only; Every Fall)
Nursing theory, research, and evidence-based practice standards in evaluating/implementing safe and effective interventions to promote health and prevent illness in infants, children, and adolescents. Evaluation of evidence-based outcomes. prereq: 5200, 5222, 5228, 5224, 6501, 7504, 7505, instn consent

NURS 7503. Reproductive Health Care of Women Practicum for Family Nurse Practitioners. (1 cr.; S-N only; Every Spring)
Application of holistic health histories and physical assessments of women. Synthesize/use knowledge and research in clinical decision making to formulate health care management plans related to women's reproductive and sexual health throughout the life cycle. prereq: 5200

NURS 7504. Assessment and Management of Health for Advanced Practice Nurses, Practicum I. (1-2 cr.; S-N only; Every Fall)
Application of holistic health histories and physical assessments by advanced practice nurses to formulate and implement individualized patient-centered health care management plans to support positive health outcomes in primary care populations experiencing acute and stable chronic conditions. prereq: 5200, 5222, 5224, 5229, 6501

NURS 7505. Assessment and Management of Health for Advanced Practice Nurses Practicum II. (1-2 cr.; S-N only; Every Spring)
Comprehensive advanced nursing assessment/management for acute and chronic health conditions of the primary care population across the life span. Synthesis/application of nursing theory and evidence-based implementation/evaluation of safe and effective therapeutic interventions to promote, maintain, and restore health. prereq: 5200, 5222, 5224, 5229, 6501 or concurrent registration is required (or allowed) in 6501, 6502 or concurrent registration is required (or allowed) in 6502

NURS 7506. Family Practice Practicum III: Assessment and Management of Health for the Family Nurse Practitioner. (1 cr.; S-N only; Every Fall)
Evaluation of theories and research to support the development of holistic nursing practice models and clinical decision-making for health promotion, disease prevention and intervention. Evaluation of patient outcomes using nursing standards and criteria. prereq: 5200, 5222, 5228, 5229, 6501, 7504, 7505, instn consent

NURS 7507. Assessment Management of Health Practicum IV: Community Health Leadership for Family Nurse Pract. (1 cr.; S-N only; Every Spring)
Application of principles of health policy and interdisciplinary collaboration while synthesizing and utilizing evidence and evidence-based research to formulate a proposal for organizational, institutional, community, or governmental arenas to address needs related to access, health disparities, or health promotion issues. prereq: 7400 or concurrent registration is required (or allowed) in 7400, 7506

NURS 7508. Health Care of the Elderly for the Family Nurse Practitioner. (1 cr.; S-N only; Every Summer)
Synthesis and application of nursing theory, research and evidence-based practice standards in the evaluation and implementation of safe, effective interventions to promote health and prevent illness in elderly patients from family- and patient-centered contexts. Evaluation of evidence-based outcomes. prereq: 7504, 7505

NURS 7509. Assessment and Management of Health Practicum VI: Primary Care for the Family Nurse Practitioner. (1 cr.; S-N only; Every Spring)
Managing health across the lifespan in primary care settings. Health promotion, disease prevention, intervention. Implementing holistic, culturally-sensitive comprehensive, collaborative nursing practice models. Theories, ethical principles, research. prereq: 5200, 5222, 5228, 5229, 6501, 7504, 7505, concurrent registration is required (or allowed) in 7507, concurrent registration is required (or allowed) in 7508

NURS 7515. Health Care of Children for the Family Nurse Practitioner: Well Child Care. (1 cr.; A-F or Audit; Every Summer)
Development of knowledge of mid-range theories, care models. Promotion/maintenance of health of newborns, infants, children, adolescents within context of families/communities. prereq: Admitted FNP DNP student

NURS 7516. Health Care of Children for the Family Nurse Practitioner: Acute and Chronic Management. (2 cr.; A-F only; Every Fall)
Identifying diagnostic criteria for common acute/chronic pediatric conditions. Apply mid-range theories, research, models of care to restore health of newborns, infants, children, adolescents. prereq: 5200, 7515, 7504, 7505

NURS 7518. Health Care of the Elder Patient for the Family Nurse Practitioner. (1 cr.; A-F only; Every Summer)
The application of mid-range theories, models, and concepts applicable to the promotion, maintenance, and restoration of the health of the elderly patients within the context of their families and communities. Current research is evaluated and used as the basis for designing age-specific interventions for elderly patients and their families. prereq: Nurs 6502

NURS 7600. Nursing Research and Evidence Based Practice. (2-4 cr.; A-F only; Every Fall & Spring)
Examination of evidence-based nursing research and evaluation including types and levels of evidence, research process, critique and synthesis of research studies. Science of implementation. prereq: Completion of or concurrent enrollment in a 3 credit inferential statistics course

NURS 7604. Executive Leadership Seminar: Boundary Spanning Leadership. (2 cr.; A-F only; Every Spring)
Boundary spanning leadership for solving problems, driving innovation, and transforming healthcare organizations to advance the common good and improve health care by employing strategies that engage people from outside the organization in collaborative teams. prereq: [6705, 6706] or instn consent

NURS 7605. Executive Leadership Practicum: Boundary Spanning Leadership. (1-2 cr.; S-N only; Every Spring)
Application of boundary spanning leadership in comparison to other leadership theories for solving problems, driving innovation, and transforming healthcare organizations to a specific healthcare setting/organization by implementing strategies that engage people from outside the organization in collaborative teams. prereq: [6704, 6706] or instn consent

NURS 7606. Relationship-Based Leadership and Management. (3 cr.; A-F only; Every Spring)
Concepts, theories, and practices that support relationship-based leadership
NURS 7608. Health Care Finance and Resource Management. (3 cr.; A-F or Audit; Every Fall)
Financial planning, budgeting, reimbursement and decision-making concepts and strategies are applied to health care and service organizations. Emphasis is on conceptualizing resources broadly, particularly nursing, and translating practice relevant concepts and priorities into actions valued by organizational decision makers. prereq: Grad student or instr consent

NURS 7610. System Leadership and Innovation. (3 cr.; A-F only; Every Fall & Spring)
Health innovation and leadership, integrating whole systems thinking, relevant theories and generative leadership to advance innovation and achieve sustainable change in contemporary health settings.

NURS 7612. Psychiatric/Mental Health Advanced Practice Nursing: Professional Seminar. (1 cr.; A-F only; Every Spring)
Psychiatric/mental health advanced practice nursing: professional seminar. prereq: 6802, 6803

NURS 7613. Psychiatric/Mental Health Advanced Practice Nursing: Practicum V. (2 cr.; S-N only; Every Spring)
Final course provides opportunities for refinement of PMH APN roles and integration of DNP activities into clinical experiences. Providing evidence-based nursing care to persons experiencing or at risk of experiencing psychiatric disorders to positively influence health care delivery. prereq: [6802, 6803] or instr consent

NURS 7705. The Adult and Gerontological Clinical Nurse Specialist in Acute Care. (2 cr.; A-F only; Every Summer)
Development of advanced clinical reasoning, assessment of clinical outcomes, quality improvement and research based care for adult and elder patients with acute illness. Use of theory and research in the role of the CNS. prereq: 5200, 5222, 5224, 5228, 6100, 6405, 7103, 7900

NURS 7706. Implementing the Role of the Clinical Nurse Specialist in Acute Care. (1 cr.; S-N only; Every Summer)
Development of clinical expertise of CNS in provision of advanced nursing care for adults/elders. Students will utilize theory/research to implement roles of CNS. prereq: N5222, N5228, N5224, N7103, N5200, N7900, N6100, 7705 (co-requisite)

NURS 7800. Advanced Topics in Professional Nursing. (1-6 cr. [max 36 cr.]; Student Option; Every Fall, Spring & Summer)
Methods, theory, or advanced topics, including supervised projects. prereq: instr consent

NURS 7900. Scholarly Teaching and Learning in Nursing. (3 cr.; A-F only; Every Spring & Summer)
Elements of effective teaching/learning. Designing teaching-learning models, creating educational experiences that facilitate achievement of desired learner outcomes.

NURS 7902. Advanced Scholarly Teaching and Learning in Nursing. (1 cr.; S-N only; Every Fall)
Exploration of teaching-learning theory and evidence as applied to the design, development, implementation, and evaluation of effective teaching in a variety of settings.

NURS 7904. Nursing Education Practicum. (2 cr.; Student Option No Audit; Every Fall)
Design, implementation, and evaluation of evidence-based, scholarly teaching and learning in various nursing education contexts. Analysis of select nursing program in relation to meeting standards for accreditation and various other expected outcomes of nursing programs. prereq: Graduate student in nursing or NURS 7900 or equivalent.

NURS 7925. Systems of Care for Children and Youth With Special Health Care Needs Practicum. (2 cr.; S-N only; Every Spring)
Research-based evaluation/management of psychologic and physiologic responses to chronic illness of children and youth. Developing theory-based systems of nursing care that are holistic, family-centered, community-based, culturally-competent, and coordinated. prereq: 6924 or instr consent

NURS 7926. Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs. (2 cr.; A-F only; Every Spring)
In-depth, systemic, and theory-based study of family health assessment methods/intervention models. Assess, intervene, and evaluate intervention models related to patterns of functioning in families of children with complex health care needs. prereq: [6102 or equiv family theory course, 6200, concurrent registration is required (or allowed) in 7925] or instr consent

NURS 7927. Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Pract. (1 cr.; S-N only; Every Spring)
Assess, intervene, and evaluate intervention models related to patterns of functioning in families of children with complex health care needs. Prepares nurses to become members of an interdisciplinary team, working with families with special health care needs from diverse cultural backgrounds. prereq: [6102 or equiv family theory course, 6200, concurrent registration is required (or allowed) in 7925, concurrent registration is required (or allowed) in 7926] or instr consent

NURS 7930. Public Health Nursing Leadership Practicum. (2 cr.; S-N only; Every Spring)
Synthesis of advanced public health nursing research. Theory/application to health policy leadership, management, administration within public health nursing leadership situations. prereq: 6930

NURS 7939. Public Health Nurse Leadership Role. (1 cr.; A-F only; Every Spring)
Analyzes issues challenging advanced practice public health nursing including policy/practice issues. Relationships with stakeholders/constituencies involved with public health issues. Public sector financing. prereq: [6930, DNP student] or instr consent

NURS 7940. Application of Behavior Change Theory to Population Health. (1 cr.; A-F only; Every Spring)
Review of selected theories of behavior change for individuals, groups, organizations, communities, systems. Synthesizes/apply theories appropriately/effectively to guide public health nursing practice. prereq: 6930, [PubH 6020 or instr consent]

NURS 7942. Application of Behavior Change Theory to Population Health Practicum. (2 cr.; S-N only; Every Spring)
Clinical application/synthesis of selected theories of health behavior change for individuals, groups, organizations, communities, systems in population-based setting. prereq: 6930, PubH 6020

NURS 8121. Health Behaviors and Illness Responses. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Theories of health behaviors and responses to illness are analyzed/criticized. Multivariate research designs. Specification of testable, descriptive, dynamic models for health/illness that incorporate culture, biology, environment, and health systems for diverse individuals, families, communities, and populations. prereq: Doctoral student or instr consent

NURS 8124. Interventions and Outcomes Research. (3 cr.; A-F or Audit; Every Spring)
Design/evaluation of intervention/outcomes research. Use of advanced experimental design and multivariate statistical approaches to evaluate theory-based interventions with longitudinal outcomes in context. prereq: 8121, PhD student, instr consent

NURS 8152. Scholarship in Health Care Ethics. (3 cr.; A-F only; Every Fall)
Analyze the underlying values in the concepts and discourses of health/disease. Evaluate ethical frameworks regarding their capability to address issues in health care. Analyze/discuss issues related to the responsible and ethical conduct of research. prereq: Doctoral student or instr consent

NURS 8171. Qualitative Research Design and Methods. (3-4 cr.; Student Option; Every Spring)
Overview and comparative analysis of selected qualitative research methods and analytic strategies. Focuses on developing rigorous qualitative designs that contribute to development of nursing and health care knowledge for diverse populations. prereq: 8170 or equiv

NURS 8172. Theory and Theory Development for Research. (3 cr.; Student Option; Periodic Fall & Spring)
Paradigms in nursing/health, associated methods of scientific/scholarly inquiry. Inductive/deductive techniques for theory development Theory-testing using data
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

**NURS 8173. Principles and Methods of Implementing Research.** (3 cr.; Student Option; Every Spring)
Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selections, subject access, human subjects requirements, instrument selection and calibration, data management, analyses plans, grant writing, and research career issues. Field experiences required. Prereq: 8114 or other 8xxx grad research methods course, 2 grad stat courses;

**NURS 8175. Quantitative Research Design and Methods.** (3 cr.; A-F or Audit; Every Fall)
Designs for quantitative description and quasi-experimental/experimental evaluation of scientific problems across domain of nursing. Evaluation of logic of design/attribute of causality from health and social science perspectives. Prereq: PhD student in nursing, advanced applied statistics or instr consent

**NURS 8177. Advanced Nursing Research Practicum.** (2 cr.; S-N or Audit; Every Fall, Spring & Summer)
Students collaborate with research team under supervision of faculty mentor in designing/conducting a health-related research project. Prereq: PhD nursing student, instr consent, adviser consent

**NURS 8179. Biophysiological Measurement and Instrumentation in Clinical Research.** (3 cr.; Student Option; Every Fall)
Critical issues in measurement and instrumentation for clinical research. Methodological issues and critical appraisal of instruments in the study of biophysiological phenomena. Field observation experiences. Prereq: [B173, B175 or equiv, advanced level stat or concurrent registration is required (or allowed) in advanced level stat] or instr consent

**NURS 8180. Doctoral Proseminar I: Scholarly Development.** (1 cr.; S-N or Audit; Periodic Fall & Spring)
Transition to doctoral study. Begins socialization process to role of nursing scholar/scientist. Career trajectories of nursing scholars who have pursued various roles. Prereq: Doctoral nursing student

**NURS 8185. Qualitative Data Analysis for Health Care Research.** (3-4 cr.; Student Option; Every Summer)
Techniques for descriptive, interpretive, and analytic data. Data preparation and management, and analysis. Transforming data from multiple texts to theoretical conceptualizations. Writing, dissemination of findings. Prereq: 8171 or grad course in qualitative research methods

**NURS 8190. Critical Review in Health Research.** (2 cr.; A-F or Audit; Every Spring)
Skills needed to critique a body of scientific literature in focused areas of nursing research and related fields. Construction of literature reviews for planning research projects and for research utilization. Prereq: Advanced statistics course, instr consent

**NURS 8193. Special Topics in Nursing Research.** (1-6 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer)
Seminar and/or individual study of research design, methodologies, or instruments. Prereq: instr consent

**NURS 8195. Mixed Methods in the Social, Behavioral, and Applied Health Sciences.** (3 cr.; A-F only; Every Spring)
Integrate qualitative strategies with quantitative approaches in research designs. Strengths/Challenges of using mixed-methodological frameworks when studying the etiology of phenomena or evaluating clinical interventions. Prereq: instr consent

**NURS 8360. Advanced Clinical Nursing.** (1-6 cr.; Student Option; Every Fall, Spring & Summer)
Independent study or faculty seminar on special clinical topic when interest exists. Prereq: Grad nurs major, instr consent

**NURS 8361. Special Topics in Nursing.** (1-4 cr.; Student Option; Every Fall, Spring & Summer)
Students select and study a topic of interest.

**NURS 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Doctoral student, adviser and DGS consent

**NURS 8666. Doctoral Pre-Thesis Credits.** (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
Tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**NURS 8777. Thesis Credits: Master’s.** (1-16 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**NURS 8888. Thesis Credit: Doctoral.** (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Max 18 cr per semester or summer; 24 cr required

**NUTR 5622. Vitamin and Mineral Biochemistry.** (3 cr.; Student Option; Every Spring)
Nutritional, biochemical, and physiological aspects of vitamins and essential minerals in human and experimental-animal models. Prereq: BioC 3021, Phsl 3051, FSCN 4612

**NUTR 5624. Nutrition and Genetics.** (2 cr.; Student Option; Every Fall)
Overview of gene-diet interactions and relevant technologies used to study such interactions. Nutrigenomics, epigenetics, transcriptomics, proteomics, metabolomics. Examples of gene-diet interactions, implications. Current issues. Prereq: Biochemistry

**NUTR 5625. Nutritional Biochemistry.** (3 cr.; Student Option; Every Fall)
Overview of biochemical molecules and pathways important in nutritional events. Prereq: BIOC 3021 or instr consent

**NUTR 5626. Nutritional Physiology.** (3 cr.; A-F or Audit; Every Spring)
Whole body macronutrient metabolism as it relates to etiology of metabolic diseases. Signaling between tissues to control homeostasis. How dysregulation of crosstalk can lead to metabolic diseases. How diet, exercise, or starvation impact metabolism. Regulation of food intake and energy expenditure. Designing/analyzing/interpreting research data. Prereq: NUTR 5625

**NUTR 5627. Nutritional and Food Toxicology.** (3 cr.; A-F only; Every Spring)
Toxic agents, organisms, and toxic effects that are important in the toxic events, with a focus on food toxicants and nutrient-toxicant interaction. Prereq: BIOC 3021; designed for students majoring in [nutrition or food science or toxicology]

**NUTR 5833. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Master’s student, adviser and DGS consent

**NUTR 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) Prereq: Doctoral student, adviser and DGS consent

**NUTR 8611. The Role of Nutrition in Cancer Causation and Prevention.** (2 cr.; A-F only; Every Fall)
This is a lecture and seminar based course that covers issues in nutrition and cancer, with an emphasis on the role of nutritional factors in the etiology and prevention of cancer and how nutrition research is translated into dietary recommendations for cancer prevention. During the seminars, students will discuss current epidemiological, clinical and laboratory evidences on modulation of cancer risk by dietary factors. Prereq: FScN 1112 (Principles of Nutrition), FScN 4612 (Advanced Human Nutrition), NUTR 5626 (Nutritional Physiology), Toxicology, Advanced Biology/Biochemistry/Genetics/Molecular Biology

**NUTR 8620. Advances in Nutrition.** (2 cr.; Student Option; Every Fall & Spring)
Recent research or special topics (e.g., obesity, vitamin biochemistry, nutrition education).

**NUTR 8621. Presentation Skills.** (1 cr.; S-N or Audit; Every Fall)
Orientation to nutrition graduate program. Presenting scientific seminars, using electronic presentation programs/equipment. Prereq: dept consent

**NUTR 8666. Doctoral Pre-Thesis Credits.** (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
OBST 7541. Advanced Ob/Gyn: Maternal-Fetal Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer) Students will receive in-depth exposure to diagnosis and management of maternal and fetal complications of pregnancy.

OBST 7542. Advanced OB/Gyn: Urogynecology. (4 cr.; H-N only; Every Fall, Spring & Summer) Students will receive in-depth exposure to diagnosis and management of female pelvic floor disorders. Students will be under the guidance of the Urogynecology faculty. Students will be involved in both the inpatient and outpatient care of Urogynecology practice including the diagnosis and treatment of: urinary incontinence, pelvic organ prolapse, fecal incontinence, pelvic and bladder pain. Students will see urodynamics studies, office and surgical cystoscopy, complex surgical correction of pelvic floor disorders including sacral neuremodulation, midurethral slings, and sacralcolpopexy.

OBST 7550. Reproductive Health. (2 cr.; P-N only; Every Fall, Spring & Summer) This is a comprehensive course covering family planning methods, including abortion and contraception, their effectiveness, mechanism of action, advantages, disadvantages and management of complications. This course will look specifically at the etiology, prevention, diagnosis of and management plans for unplanned pregnancy.

OBST 7560. Research in Obstetrics and Gynecology. (4-8 cr.; H-N only; Every Fall, Spring & Summer) This is an individually designed course, with topics selected for each student. Most members of the ob-gyn staff are available for this one-to-one experience depending upon the establishment of joint interests with the student.

OBST 7575. Gynecological Pathology and Diagnostic Cytology. (3-6 cr.; H-N or Audit; Every Fall & Spring) The student participates in the diagnostic practice with the gynecologic pathology staff. Includes diagnostic cytology of pap smears encountered in actual practice and participation in working conferences. To be arranged in advance with the Ob/Gyn Education office. prereq: 7500.

OBST 7591. Women's Health Rotation. (2-6 cr.; H-N or Audit; Every Fall, Spring & Summer) Multidisciplinary exploration of women's health issues. Clinical experience/academic perspectives in gynecology/reproductive health, internal medicine, adolescent medicine, and psychology. Culture, economics, psycho-social status, and life span in women's health care delivery. prereq: 7500, Med 5500.

OBST 7910. Obstetrics and Gynecology Medical Residency. (6 cr.; H-N or Audit; Every Fall, Spring & Summer) Obstetrics and gynecology medical residency.

OBST 7930. Obstetrics and Gynecology Medical Fellowship. (6 cr. [max 120 cr.]) No Grade Associated; Every Fall, Spring & Summer) Obstetrics and gynecology medical fellowship.

OBST 8224. Gynecological Endocrinology I. (1-15 cr.; Student Option; Every Fall & Spring) N/A prereq: prereq 8223

OBST 8225. Gynecological Endocrinology II. (1-15 cr.; Student Option; Every Fall & Spring) N/A prereq: prereq 8224

OBST 8226. Obstetrical Physiology and Anesthesiology. (3 cr.; Student Option; Every Fall & Spring) N/A prereq: prereq 8225

OBST 8240. Human Gametes and Fertilization. (3 cr.; Student Option; Every Fall & Spring) N/A prereq: prereq 8241

OBST 8241. Human Gametes and Fertilization Laboratory. (2 cr.; Student Option; Every Fall & Spring) N/A prereq: prereq 8243

OBST 8243. Topics in Family Planning. (2-8 cr.; max 12 cr.) Student Option; Every Fall, Spring & Summer)

Occupational Therapy (OT)

OT 5122. Descriptive Neurology. (2 cr.; A-F or Audit; Every Fall) Relates neuroanatomical/neurophysiological principles to neurological conditions commonly seen in occupational/physical therapy practice. prereq: OT student or instr consent

OT 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences. (2 cr.; A-F or Audit; Every Fall) Diagnostic procedures. Medical, surgical, and rehabilitation management of patient problems in orthopedics, surgery, pediatrics, dermatology, medicine, cancer, and speech. Correlation to current practice. Presentation of patients. prereq: OT student or instr consent

OT 5182. Functional Neuroanatomy and Neurophysiology. (4 cr.; A-F or Audit; Every Spring) Neuroanatomic structures as functional systems, basic neurophysiologic concepts. Emphasizes applications for understanding/treating physical dysfunctions. prereq: Registered occupational therapy student or instr consent
OT 5300. Concepts for Occupational Therapy Practice. (4 cr.; A-F or Audit; Every Fall)
Critical thinking, ethics, professional resources/organizations, patient-therapist relationship. Level I fieldwork experience. prereq: enrolled OT student or instr consent

OT 5313. Therapeutic Occupation. (4 cr.; A-F or Audit; Every Fall)
Therapeutic occupation philosophy, history, and frames of reference. Activity analysis applied to purposeful, therapeutic activities for individuals and groups. prereq: enrolled OT student or instr consent

OT 5341. Introduction: Evaluation and Intervention I. (4 cr.; A-F or Audit; Every Spring)
Assessment concepts/techniques. Application to patient populations with both mental health/physical disabilities. Treatment planning/documentation. prereq: 5393 or instr consent

OT 5342. Compensatory Rehabilitation: Evaluation and Intervention II. (4 cr.; A-F or Audit; Every Spring)
Assessment of daily living performance areas; adaptation techniques to compensate for performance deficits. Level I fieldwork experience. prereq: 5300, 5313 or instr consent

OT 5343. Specialty Topics: Evaluation and Intervention III. (4 cr.; A-F or Audit; Every Fall)
Applied critical thinking model to assessment/intervention of selected patient populations with mental/physical problems requiring specialized approaches. Focus on habilitation/rehabilitation of populations with multiple performance component deficits. Fieldwork. prereq: 5342 or instr consent

OT 5344. Neurorehabilitation: Evaluation and Intervention IV. (5 cr.; A-F or Audit; Every Fall)
Assessment/intervention related to perception, cognition, reflexes, sensory integration, and motor control. Application to individuals with multiple performance component deficits. prereq: 5343 or instr consent

OT 5360. Dynamics of Group Models. (2 cr.; A-F or Audit; Every Fall)
Application of group/team dynamics in diverse professional settings. prereq: 5313 or instr consent

OT 5370. Theory of Occupation. (1 cr.; A-F or Audit; Every Fall)
Occupational therapy frames of reference, role of activity, and historical development of profession. prereq: enrolled OT student or instr consent

OT 5375. Community Resources and Health-Care Issues. (2 cr.; A-F or Audit; Every Fall)
Analysis of community health-care systems, including cultural/family influences on individual health and decision making. Students identify current trends in health care and determine responses to them at social, political, or legislative level. prereq: 5300, 5342 or instr consent

OT 5376. Adult Education and Planning. (1 cr.; A-F or Audit; Every Spring)
Skills needed to plan, implement, and evaluate adult educational programs/materials for patient/family education, peer/professional education, and education of others in order to carry out therapeutic interventions. Student teaching unit, community based activity. prereq: 5313 or instr consent

OT 5380. Management of Occupational Therapy Services. (3 cr.; A-F or Audit; Every Spring)
Administration/management of occupational therapy services within managed care environment. Issues in Medicare, HMOs, TQM, consultation, human resources, promotion of profession. Emphasizes program development in current organizational structures. prereq: 5360, 5375, 5376 or instr consent

OT 5391. Occupation Across the Life Span. (3 cr.; A-F or Audit; Every Spring)
The well elderly, school therapy, work-related injuries/industrial rehabilitation. Fieldwork. prereq: 5375, 5376 or instr consent

OT 5392. Research in Occupational Therapy. (3 cr.; A-F or Audit; Every Spring)
Analysis of scientific literature, development of research proposals. prereq: 5313 or instr consent

OT 5393. Functional Anatomy and Kinesiology. (4 cr.; A-F or Audit; Every Fall)
Gross human anatomy emphasizing skeletal, muscular, circulatory, and peripheral nervous systems of the extremities and trunk. Includes cadaver lab prosections. Analyzing functional human movement from a biomechanical perspective. prereq: enrolled OT student or instr consent

OT 5394. Orthotics. (3 cr.; A-F or Audit; Every Fall)
Analysis, design, and construction of orthotic devices. prereq: 5341 or instr consent

OT 5395. Independent Study in Occupational Therapy. (1-4 cr.; A-F only; Every Fall)
Student Option; Every Fall, Spring & Summer
Independent Study in Occupational Therapy prereq: Enrolled OT student or instr consent

OT 6000. Foundations of Interprofessional Communication and Collaboration. (1 cr.; S-N only; Every Fall)
Foundations of Interprofessional Communication & Collaboration (FIPCC) is the first interprofessional course in Phase I of the 1 Health curriculum. More than 1,000 health and health care students from allied health, dentistry, dietetics, medicine, nursing, pharmacy, physical therapy, psychology, public health, social work, speech-language-hearing sciences, and veterinary medicine will be enrolled in this course. The course will be delivered to interprofessional groups of approximately 30-45 students in each room. This is a hybrid course with a blended format that involves trained facilitators leading face-to-face discussions which is supported by online resources and pre-work that addresses the following topics: ? Roles and responsibilities ? Health systems and interactions ? Teams and teamwork ? Wellbeing and resiliency ? Ethics and professionalism ? Leadership prereq: Enrolled OT student

OT 6100. Public and Professional Engagement I. (0.5 cr. [max 1 cr.]; S-N only; Every Fall & Spring)
Working with an academic adviser, students establish personal/professional goals and design a series of experiences in natural setting, including a broad base of contexts/practice settings/clients across the lifespan.

OT 6101. Foundations of Occupational Science and Occupational Therapy. (4 cr.; A-F only; Every Fall)

OT 6102. Professional Identity: Behaviors and Attitudes. (2 cr.; S-N only; Every Fall)

OT 6103. Occupational Therapy Process for Society. (3 cr.; A-F only; Every Fall)
Influence of society on health, occupational participation, and practice of occupational therapy. Students analyze health care system through global comparisons and apply key concepts. Written assignments, experiential learning activities.

OT 6111. Foundations: Occupations as Therapy. (3 cr.; A-F only; Every Fall)
Students apply Occupational Therapy Practice Framework in an analyzing of a series of craft-based activities and representative daily occupations. How to grade/adapt activities to enhance performance.

OT 6113. Occupational Therapy Process for Community. (3 cr.; A-F only; Every Fall)
Application of occupational therapy process to wellness and health promotion activities in the community. Knowledge, skills, and attitudes necessary to understand influence of community health on health of individuals. Health behavior theories, program development/evaluation. Applying theoretical models to community health.

OT 6200. Public and Professional Engagement II. (0.5 cr. [max 1.5 cr.]; S-N only; Every Fall, Spring & Summer)
Continuation of 6100. Students engage in professional/community activities that align with occupational therapy practice. prereq: 6100 or instr consent

OT 6201. Functional Anatomy and Kinesiology. (3 cr.; A-F only; Every Spring)
Gross human anatomy. Emphasizes skeletal, muscular, circulatory, and peripheral nervous systems of extremities, neck, and trunk. Online Anatomy TV, videotapes, cadaver lab prosections. Students analyze/evaluate human occupations tasks and activities from...
biomechanical perspective. prereq: OT student or instr consent

OT 6202. Occupational Therapy Process for Individuals: Occupation Through Compensation. (3 cr.; A-F only; Every Spring)
Compensatory approaches to enhance an individual's participation in occupations of daily living. OT practice framework applied to evaluation/intervention of individuals. Face-to-face labs, level I fieldwork. prereq: Registered OT student or instr consent

OT 6203. Occupational Therapy Process for Family. (2 cr.; A-F only; Every Spring)
Influence of family systems on health, well-being, and occupational participation of individual members. Family theories' influence on models of care. Non-standardized OT assessment in families of very young children and of elders with dementia. At-risk families. OT in home care settings. prereq: OT student or instr consent

OT 6213. Occupational Therapy Process for Individuals: Medical Contexts. (2 cr.; A-F only; Every Spring)
Overview of medical model systems/settings (e.g. inpatient acute, long-term care, partial hospitalization). Client assessment/intervention from medical model perspective. Reimbursement. Written/verbal communication. prereq: OT student or instr consent

OT 6301. Neuroscience. (5 cr.; A-F only; Every Summer)
Neuroanatomic structures, functional systems, neurophysiologic concepts. Applications to evaluate/ treat conditions in all areas of physical, psychosocial, and cognitive dysfunction. prereq: Registered OT student or instr consent

OT 6302. Occupational Therapy Process for Individuals: Occupation Through Remediation. (4 cr.; A-F only; Every Summer)
Biomechanical approach to evaluation/treatment of clients with clinical conditions with loss of strength, endurance, range of motions, sensibility, and soft tissue integrity. Cases on how to apply OT process to specific clients. prereq: Registered OT student or instr consent

OT 6312. Occupational Therapy Process for Individuals: Psychosocial Approaches. (3 cr.; A-F only; Every Summer)
This course emphasizes concepts of occupation as a tool for support and recovery of mental health across the lifespan. Theory based client conditions: client centered interventions; and appropriate safety and documentation practices for addressing both psychological and psychosocial aspects of occupational engagement and performance are emphasized. prereq: Registered OT student or instr consent

OT 6322. Occupational Therapy Process for Individuals: Work Contexts. (2 cr.; A-F only; Every Summer)
Knowledge, skills, and attitudes needed to apply occupational therapy process with individuals injured at work settings or to promote injury prevention programs in work settings. Unique role of rehab. Includes consultant. prereq: Registered OT student or instr consent

OT 6402. Occupational Therapy Process for Individuals: Occupation Through Neurorehabilitative Approaches. (4 cr.; A-F only; Every Fall)
Major theories of sensory systems, vision, motor control/learning, perception, cognition. Evaluation/intervention of central nervous system disorders. Theories for non-CNS issues in expanded populations. prereq: Registered OT student or instr consent

OT 6403. Management of Occupational Therapy Services. (1 cr.; A-F only; Every Fall)
Management/human resource knowledge/skills to create, maintain, and evaluate occupational therapy services. Health care systems, contexts, practice. Marketing, staffing, supervision, quality improvement. prereq: Registered OT student or instr consent

OT 6412. Occupational Therapy Process for Individuals: Orthotics and Prosthetics. (3 cr.; A-F only; Every Fall)
Occupational therapy process using prosth/orthotic devices to treat selected conditions in children, adults, and elders. Lab emphasizes practical skills, critical appraisal. Physical agent modalities, wound care. Fieldwork. prereq: Registered OT student or instr consent

OT 6422. Occupational Therapy Process: Group Context. (2 cr.; A-F only; Every Fall)
Hybrid course. Therapeutic intervention to facilitate change in individuals in a group setting. Students analyze group process, generate constructive feedback, evaluate group effectiveness. Application to mental health treatment. prereq: Registered OT student or instr consent

OT 6432. Occupational Therapy Process for Individuals: Educational Context. (2 cr.; A-F only; Every Fall)
Occupational therapy assessment/intervention in early intervention. K-12 settings. Models of services delivery. Legislation that governs school-based practice. Performance areas addressed by occupational therapists in these settings. prereq: Registered OT student or instr consent

OT 6433. Foundations of Occupational Science and Occupational Therapy. (4 cr.; A-F only; Every Fall)
Online/independent study. Science of human occupation, theory development, six occupation-based theories. Examine in depth a theory, model, or approach pertaining to a select topic area. Students work closely with their research adviser. prereq: Grad student, instr consent

OT 7101. Foundations of Occupational Science and Occupational Therapy. (4 cr.; A-F only; Every Fall)
How evidence-based practice is developed, disseminated, and utilized. Students in small groups write qualitative or quantitative scholarly proposal. Appraising literature. Assessment tools. Research design. Statistical analysis. prereq: OT student or instr consent

OT 7301. Neuroscience. (5 cr.; A-F only; Every Summer)
Neuroanatomic structures, functional systems, neurophysiologic concepts. Applications. Evaluation/intervention of central nervous system disorders. Theories for use with non-CNS issues for expanded populations. prereq: Registered OT student or instr consent

OT 7394. Scholarly Project in OT I. (2 cr.; S-N only; Every Summer)
Group or individual study of a question related to occupational therapy. Students plan, conduct, and evaluate mentored scholarly project, submit written description of project, and defend through poster presentation or orally. prereq: Registered OT student or instr consent

OT 7402. Occupational Therapy Process for Individuals: Occupation Through Neurorehabilitative Approaches. (4 cr.; A-F only; Every Fall)
Major theories to explain sensory systems, vision, motor control/learning, perception, and cognition. Evaluation/intervention of central nervous system disorders. Theories with evidence to use with non-CNS issues for expanded populations. prereq: Registered OT student or instr consent

OT 7596. Occupational Therapy Level II Fieldwork I. (6 cr.; S-N only; Every Fall, Spring & Summer)
Guided, supervised OT practice in affiliated medical, educational, or community institutions. Application of client-centered, culturally-effective care during active engagement as student develops professional role. prereq: Registered OT student or instr consent

OT 7696. Occupational Therapy Level II Fieldwork II. (6 cr.; S-N only; Every Fall, Spring & Summer)
Guided, supervised OT practice in affiliated medical, educational, or community institutions. Application of client-centered, culturally-effective care during active engagement as student develops professional role. prereq: Registered OT student or instr consent

OT 7796. Occupational Therapy Level II Fieldwork III: Optional. (1-6 cr.; S-N only; Every Fall, Spring & Summer)
Supervised practice in clinic or community agency with specialty focus. Sample topics: hand therapy, school therapy, clinical research. Students apply critical thinking through supervised application of theory/skills. prereq: Registered OT student or instr consent

OT 8300. Research Seminar in Occupational Therapy. (1 cr.; S-N or Audit; Every Fall & Spring)
Critical review of research literature in occupational therapy. Issues related to ethical/successful conduct/publication of research.
Development of Plan B project outline. prereq: 5392 or instr consent

OT 8310. Research Problems in Occupational Therapy. (1-6 cr.; S-N or Audit; Every Fall & Spring) Individual, concentrated study of a problem in occupational therapy. Completion of Plan B project. prereq: [5392, Plan B OT student] or instr consent

OT 8320. Fieldwork Education in Occupational Therapy I. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer) Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills. prereq: Occupational therapy student or instr consent

OT 8321. Fieldwork Education in Occupational Therapy II. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer) Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills. prereq: Occupational therapy student or instr consent

OT 8322. Fieldwork Education in Occupational Therapy III: Optional. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer) Optional fieldwork experience involving supervised practice in clinic or community agency with specialty focus. Sample topics: hand therapy, school therapy, clinical research. Students apply critical thinking through supervised application of theory/skills. prereq: Occupational therapy student or instr consent

OT 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

OT 8777. Thesis Credits: Master’s. (1-18 cr.; max 50 cr.) (No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

Ojibwe (OJIB)

OJIB 5106. Advanced Ojibwe Language I. (3 cr.; max 12 cr.) (A-F or Audit; Every Fall) Focuses on immersion method.

OJIB 5109. Advanced Ojibwe Language II. (3 cr.; max 12 cr.) (A-F or Audit; Every Spring) Focuses on immersion method.

OJIB 5202. Ojibwe Mastery I. (3 cr.; A-F or Audit; Every Fall) The purpose of the first three years of the Ojibwe language courses at the University is to introduce students to the most common Ojibwe grammatical and conjugational systems, and to help develop their fluency through immersion. In this course and in the subsequent course in the winter semester, students will work towards Ojibwe language mastery by learning less frequent, but crucial aspects of the Ojibwe language and further working towards a more sophisticated level of talking.

OJIB 5204W. Ojibwe Mastery II. (WI; 3 cr.; A-F or Audit; Every Spring) The purpose of the first three years of the Ojibwe language courses at the University is to introduce students to the most common Ojibwe grammatical and conjugational systems, and to help develop their fluency through immersion. In this semester, students will continue refining their Ojibwe language ability by studying verb conjugational systems, more complex mi-phrases, reduplication, more grammar pattern study, and more opportunities to use and apply their language skills.

Ophthalmology (OPH)

OPH 5501. Orthoptics I. (4 cr.; S-N only; Every Summer) First semester of Orthoptics Certificate program. prereq: Admission to Orthoptics Certificate program

OPH 5601. Orthoptics II. (5 cr.; S-N only; Every Fall) Second semester of Orthoptics training program. prereq: Enrollment in Orthoptics Certificate program

OPH 5701. Orthoptics III. (5 cr.; S-N only; Every Spring) Third semester of Orthoptics certificate program.

OPH 7180. Externship in Ophthalmology. (4 cr.; H-N only; Every Fall, Spring & Summer) A variety of lectures planned during the first part of the rotation. The remaining two and one-half weeks is spent at one of the three Twin Cities teaching hospitals.

OPH 7181. Neuro-ophthalmology. (4 cr.; H-N only; Every Fall, Spring & Summer) During the rigorous 4-week rotation, students will be in clinic evaluating patients 8-10 half days per week. Students will be expected to work-up new patients at the level of a first year resident and present them to the neuro-ophthalmology attending. After clinical, students should read about diagnoses encountered in clinic. In addition, there will be required reading. Comprehension of the reading will be assessed by scheduled quizzes which will then be reviewed with the student by a faculty member. Interested students will be encouraged to engage in a research project with one of the faculty members although this is not required for the rotation.

OPH 7190. Ophthalmology Research. (4-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer) This course will introduce the student to some of the research problems in ophthalmology. It will be particularly valuable to someone who is headed for a career in ophthalmology.

OPH 7930. Ophthalmology medical fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Ophthalmology Med Fellowship

Oral Biology (OBIO)

OBIO 5001. Methods in Research and Writing. (2 cr.; Student Option; Every Fall) Skills necessary to begin a research project, including literature review, hypothesis formulation, research design, and writing. Each student develops a research protocol.

OBIO 5030. Virology Research Presentations. (1 cr.; max 10 cr.); S-N only; Every Fall & Spring) This course is designed to enhance knowledge in virology through research presentations as well as the critical evaluation of presentations of other students and researchers. Presentation will includes current virology research, both individual research projects and critical reading, and presentation of current literature.

OBIO 5050. Evolution of Emerging Viruses. (2 cr.; A-F or Audit; Every Spring) This course is designed to provide graduate students and undergraduate students with junior or senior standing a knowledge base for understanding how HIV and other emerging viruses (e.g., Ebola, influenza, SARS, West Nile virus, hantavirus, hepatitis C) evolve and become public health threats. Topics for the course will focus on the biochemical, molecular, cellular, clinical, and epidemiological aspects of emerging viruses, with an emphasis on how each plays a role in virus evolution and emergence. This course will emphasize HIV as a key example of an emerging virus disease that has had a profound impact on human health.

OBIO 8012. Basic Concepts in Skeletal Biology. (2 cr.; A-F or Audit; Every Spring) Cells (osteoblasts, osteoclasts, chondrocytes) that make up skeleton. Transcription/signaling networks that regulate cell growth/differentiation. Mechanisms of bone remodeling. Regulation of bone by such agents such as hormones. Prereq Grad student or instr consent

OBIO 8018. Topics in Oral Pathobiology. (2 cr.; max 4 cr.); A-F or Audit; Every Fall) Clinical understanding of oral disease. Correlates with underlying basic mechanisms in microbiology, immunology, cancer biology, developmental biology, neuroscience. Dialog between clinic/bench to improve preventative/treatment modalities. prereq: All students must be degree-seeking graduate students or dental fellows and should hold a PhD or DDS. instr consent for 4th year dental students and PhD students. CDE available for practitioners.

OBIO 8021. Oral Microbiology. (2 cr.; Student Option; Fall Odd Year) Role of indigenous human oral microflora in health/disease. Colonization of oral cavity. Role of specific pathogens in development of dental caries and periodontal diseases. Infections of dental pulp and periapical tissues. Oral manifestations of viral/fungal infections. Microbial considerations in specialty areas of dental practice. prereq: Dental specialist or oral research trainee or instr consent
OBIO 8022. Oral Neurosciences. (2 cr.; Student Option; Spring Odd Year)
Background lectures and student presentations on current research topics to evaluate questions in general motor/sensory function related to oral/nasal structures. Taste, smell, and other chemical senses as they relate to those structures. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8023. Physical Biology of the Oral Cavity. (2 cr.; A-F or Audit; Spring Even Year)
Structure/function of load-bearing components of human masticatory system from biophysical point of view. Mandibular form/movement. Infrastructure of hard tissues as related to occlusal wear and masticatory efficiency. Role of saliva and salivary pellicle in reduction of interocclusal friction. Computer simulation of jaw mechanics. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8024. Genetics and Human Disease. (1 cr.; Student Option; Every Spring)
Principles of medical genetics. Emphasizes oral diseases. Twins, chromosomes, recombinant DNA, major gene traits, genes in populations, chromosomal abnormalities, complex traits, facial clefts, dental caries, periodontal diseases. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8025. Topics in Cariology. (2 cr.; A-F or Audit; Spring Even Year)
Lectures, assigned readings, and discussions of basic epidemiological, biological, and chemical aspects of dental caries. Etiology, epidemiology, and pathogenesis of dental caries. Influence of dietary, salivary, plaque, and microbial factors on caries process. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8026. Salivary Glands and Secretions. (2 cr.; A-F or Audit; Fall Even Year)
Salivary gland structure/development. Mechanisms/control of macromolecule/electrolyte secretion. Salivary protein structure/function, interactions with bacteria. Salivary pellicle, salivary gland disease. Clinical studies, readings, student presentations. Each student develops a research proposal. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8027. Biomaterials in Regenerative Dentistry. (2 cr.; A-F or Audit; Fall Odd Year)
Describes most modern research strategies that are being developed by interdisciplinary groups to obtain revolutionary materials for its use in tissue engineering and regenerative medicine. The central role of biotechnology, nanotechnology, and biomimetics in these research strategies is highlighted. Focus on dental applications is provided. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8028. Molecular Basis of Cellular and Microbial Adhesion. (2 cr.; A-F or Audit; Spring Odd Year)
Biochemical basis of adhesion phenomena. Cells of immune system, development of organs, tissue formation, bacterial colonization of the human. prereq: Dental specialist or oral research trainee or instr consent

OBIO 8030. Oral Biology Seminar. (1 cr.; [max 10 cr.]; S-N or Audit; Every Fall & Spring)
Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics. prereq: instr consent

OBIO 8089. Oral Hygiene. (1-2 cr.; S-N only; Every Fall & Spring)
S-N or Audit; Every Fall & Spring

OBIO 8093. Tutorial in Oral Biology. (1-2 cr.; S-N only; Every Fall & Spring)
Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics. prereq: instr consent

OBIO 8094. Directed Research. (1-10 cr.; S-N or Audit; Every Fall & Spring)
S-N or Audit; Every Fall & Spring

OBIO 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
FTE: Master's student, advisor and DGS consent

OBIO 8371. Mucosal Immunology. (3 cr.; A-F or Audit; Every Fall)
Host immune processes at body surfaces. Innate/adaptive immunity at mucosal surfaces. Interactions/responses of various mucosal tissues to pathogens. Approaches to target protective vaccination to mucosal tissues. Lectures, journal, research. prereq: MICA 8001 or equiv or instr consent

OBIO 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
FTE: Doctoral student, advisor and DGS consent

OBIO 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; Max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
S-N or Audit; Every Fall, Spring & Summer

OBIO 8777. Thesis Credits: Master's. (1-18 cr.; Max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
S-N or Audit; Every Fall, Spring & Summer

OBIO 8888. Thesis Credit: Doctoral. (1-24 cr.; Max 100 cr.; No Grade Associated; Every Fall, Spring & Summer)
S-N or Audit; Every Fall, Spring & Summer

OSUR 5257. Ambulatory General Anesthesia for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
Clinical rotation involving experience in outpatient management and using intravenous sedation and general anesthesia. prereq: Participation in oral and maxillofacial surgery training program.

OSUR 5257. Medicine Rotation for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
Clinical rotation at Fairview-University Medical Center under the direction of the Internal Medicine Department. Involves workup, admission, and daily management of patients on medical service, specifically cardiology and pulmonary. prereq: Participation in oral and maxillofacial surgery training program.

OSUR 5277. Physical Diagnosis for Oral Surgery Residents. (2 cr.; Max 6 cr.; S-N only; Every Summer)
Six-week didactic course coupled with evaluation of patients. prereq: Participation in oral and maxillofacial surgery training program.

OSUR 8250. Oral and Maxillofacial Surgery Rotation for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
Rotations at assigned oral and maxillofacial surgery clinics and operating rooms at Fairview-University Medical Center, Hennepin County Medical Center, Veterans Administration Medical Center. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8251. Oral and Maxillofacial Surgery Core Curriculum. (0-2 cr.; S-N only; Every Fall, Spring & Summer)
Standardized curriculum of fundamental concepts of surgery and medicine. Fourteen core curriculum topics covered in a two-year cycle. prereq: Participation in oral and maxillofacial surgery training program.

OSUR 8253. Case Presentations and Chief Conferences. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
Topic-oriented journal reviews. Guest oral surgeons, specialists, or chief resident present topics in case-based format. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8254. Oral and Maxillofacial Surgery Resident Presentations. (0-6 cr.; S-N only; Every Fall, Spring, Summer)
Contemporary subjects researched and presented by current residents. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8255. General Surgery Rotation for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
Clinical rotation on general surgery, neurosurgery, and surgical intensive care unit at Hennepin County Medical Center. Seminars, clinics, and operating room experience. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8256. Contemporary Anesthesia Literature Review. (0-6 cr.; S-N only; Every Fall, Spring & Summer)
S-N or Audit; Every Fall, Spring & Summer

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
surgery patient, prereq: Participation in oral and maxillofacial surgery training program

OSUR 8260. Surgical Rounds for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer) Pre- and post-operative case discussions of patients currently being managed for surgery at all affiliated institutions. As they relate to individual patients, discussions involve medical, anesthesia, surgical, and management of post-surgical and sequela complications. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8262. Plastic Surgery Rotation for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer) Clinical rotation at HealthPartners St. Paul Ramsey Medical Center under direction of plastic and reconstructive surgery faculty. Elective or trauma cosmetic and esthetic surgery experience. prereq: Participation in oral and maxillofacial surgery training program

OSUR 8267. Anesthesia Rotation for the Oral and Maxillofacial Surgeon. (0-6 cr.; S-N only; Every Fall, Spring & Summer) Clinical rotation at Fairview University Medical Center under direction of anesthesia faculty. After a suitable period of supervision determined by anesthesia faculty, residents are assigned their own anesthesia room and are given responsibility for pre-operative patient evaluation and inter-operative management of patient's general anesthetic. prereq: Participation in oral and maxillofacial surgery training program

OCPD Leadership, Policy & Dev (OLPD)

OLPD 5000. Cultures, Schools, and Communities (Human Relations). (1 cr.; A-F only; Every Fall) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulations, presentations, professional learning communities, field assignments.

OLPD 5001. Formal Organizations in Education. (3 cr.; Student Option; Every Fall, Spring & Summer) Classical/current theories of organizations. Applications to education and related fields.

OLPD 5002. Private Colleges as Formal Organizations. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Provide certificate students with introduction to contemporary thinking on organizations/administration. Primary focus on organizational theory. prereq: Bachelors degree must be completed before starting this course.

OLPD 5003. Borderland, Education Policy, Immigrant Experience. (3 cr.; Student Option; Every Spring) Borderland, Education Policy and Immigrant Student Experience brings to focus the history of individual, institutional (educational) and cultural forms of marginalization and discrimination of immigrant communities from US history. This class includes a Spring Break trip to Tucson and the Sonora Desert led by the non-profit Borderlinks (www.borderlinks.org) Service learning opportunities may include water drops in the desert, interpreting for newly arrived migrants and serving as a supportive witness for migrants at deportation court. Both in Minnesota and Tucson, participants will dialogue with local stakeholders, advocates and agents of change including migrants, activists, border patrol, ranchers, faith communities, lawyers and lawmakers. Students will also have the opportunity to compare and contrast US immigrant issues with those across the globe.

OLPD 5005. School and Society. (2 cr.; A-F or Audit; Every Fall, Spring & Summer) Readings in history, philosophy, social sciences, and law revealing diverse educational values in a pluralistic society. Multiple expectations of schools. Civil liberties, rights, community. Varying cultural backgrounds of students, family circumstances, exceptional needs. prereq: Jr or sr or MEd/initial licensure student or CLA music ed major or preteaching major or instr consent

OLPD 5009. Human Relations: Applied Skills for School and Society. (1 cr.; A-F or Audit; Every Fall, Spring & Summer) Issues of prejudice/discrimination in terms of history, power, social perception. Knowledge/skills acquisition in cooperative learning, multicultural education, group dynamics, social influence, leadership, judgment/decision making, prejudice reduction, conflict resolution, teaching in diverse educational settings. prereq: MEd/ini lic or CLA music ed or preteaching or instr consent

OLPD 5010. Cultures, Schools, and Communities (Human Relations). (2 cr.; A-F only; Every Fall) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulation, presentations, professional learning communities, field assignments. prereq: Enrolled in initial licensure program

OLPD 5011. Leading Organizational Change: Theory and Practice. (3 cr.; Student Option; Every Fall) How theory is incorporated, affects the change process/outcomes. Leadership/policy effects.

OLPD 5020. Cultures, Schools, and Communities (Human Relations). (1 cr.; A-F only; Every Spring) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulation, presentations, professional learning communities, field assignments. prereq: Enrolled in teacher initial licensure program

OLPD 5033. Foundations of Individual/Organizational Career Development. (3 cr.; Student Option; Every Spring) Introduction to individual and organizational career development theory and practice.

Examines critical issues in work patterns, work values, and workplaces in a changing global society, with implications for career planning, development, and transitions, emphasizing individual and organizational change. For nonmajors: serves students in adult ed, HRD, IR, college student advising, and other related fields.

OLPD 5041. Sociology of Education. (3 cr.; Student Option; Every Spring) Structures and processes within educational institutions; linkages between educational organizations and their social contexts, particularly related to educational change.

OLPD 5044. Introduction to the Economics of Education. (3 cr.; Student Option; Periodic Fall & Spring) Costs and economic benefits of education, with a focus on K-12; educational markets, prices, and production relationships; investment and cost-benefit analysis.

OLPD 5048. Cross-Cultural Perspectives on Leadership. (3 cr.; Student Option; Every Fall & Summer) Introduction to cultural variables of leadership that influence functioning of cross-cultural groups. Lectures, case studies, discussion, problem-solving, simulations. Intensive workshop.

OLPD 5056. Case Studies for Policy Research. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Qualitative case study research methods and their applications to educational policy and practice. Emphasis on designing studies that employ open-ended interviewing as primary data collection technique.

OLPD 5057. Research in International Education. (3 cr.; Student Option; Every Summer) Key skills/proficiencies for rigorous graduate research. Quantitative/qualitative/mixed methods. How to be a critical consumer of policy-related, comparative/intercultural research. Conducting cross-cultural/comparative research. Related ethical issues.

OLPD 5061. Ethnographic Research Methods. (3 cr.; Student Option; Every Fall & Spring) Practice in aspects of field methodology below the level of full field study; detailed reading; analysis of studies in anthropology and education for methodological content.

OLPD 5080. Special Topics: Organizational Leadership, Policy, & Development. (1-3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) Topical issues in organizational leadership, policy, development.

OLPD 5087. MA Research Seminar. (1-3 cr. [max 24 cr.]; S-N only; Every Fall, Spring & Summer) This research seminar is designed for students who are in their final year of completing Plan A theses or Plan B papers as part of their degree program requirements. During this seminar we will work towards the completion of your paper
by writing solid drafts of the first three chapters of your thesis.

OLPD 5095. Problems: Organizational Leadership, Policy, and Development. (1-3 cr. [max 24 cr.]; Student Option; Periodic Fall, Spring & Summer)
Course or independent study on specific topic within department program emphasis.

OLPD 5096. Internship: Organizational Leadership, Policy, and Development. (1-9 cr. [max 24 cr.]; Student Option; Every Fall & Spring)
Internship in elementary, secondary, general, postsecondary administration, or other approved field related setting.

OLPD 5103. Comparative Education. (3 cr.; Student Option; Every Fall)
Examination of systems and philosophies of education globally with emphasis upon African, Asian, European, and North American nations. Foundations of comparative study with selected case studies.

OLPD 5104. Strategies for International Development of Education Systems. (3 cr.; A-F or Audit; Periodic Fall)
Strategies for improving quality/efficiency of schooling in developing countries. Introduction to current research on what policy/programmatic interventions have proven most successful in increasing access, raising quality, and improving efficiency of education in developing countries. prereq: Grad student

OLPD 5107. Gender, Education, and International Development. (3 cr.; A-F or Audit; Every Fall)
Role of gender/gender relations in international development/education. Interdisciplinary body of literature from development studies, political science, economics, anthropology, cultural studies, gender/women's studies.

OLPD 5121. Educational Reform in International Context. (3 cr.; Student Option; Every Spring)
Critical policy analysis of educational innovation and reform in selected countries. Use theoretical perspectives and a variety of policy analysis approaches to examine actual educational reforms and their implementation.

OLPD 5124. Critical Issues in International Education and Educational Exchange. (3 cr.; Student Option; Every Spring)
Analysis of comprehensive policy-oriented frameworks for international education; practices of U.S. and other universities; conceptual development of international education and its practical application to programs, to employment choices, and to pedagogy.

OLPD 5128. Anthropology of Education. (3 cr.; Student Option; Periodic Spring)
Insights from educational anthropology for educators to address issues of culture, ethnicity, and power in schools.

OLPD 5132. Intercultural Education and Training: Theory and Application. (3 cr.; Student Option; Periodic Fall, Spring & Summer)
Examination of intercultural education; formal and nonformal education programs intended to teach about cultural diversity, promote intercultural communication and interaction skills, and teach students from diverse background more effectively.

OLPD 5201. Strategies for Teaching Adults. (3 cr.; A-F or Audit; Periodic Fall, Spring & Summer)
Psychological theories of adult learning; learning styles and personality types; teaching styles; group and team learning; moderating and study circles; teaching technologies and distance learning; gender, race, and cultural communication. Applications of strategies. prereq: Grad student only

OLPD 5202. Perspectives of Adult Learning and Development. (3 cr.; Student Option; Periodic Fall & Summer)
Emphasis on major adult development theorists, theories, and current applications. Transformative learning, self-directed learning, experiential learning, and cooperative learning provide theoretical framework for exploring physiological, psychological, sociological, and cultural aspects of adult development through the life span.

OLPD 5204. Designing the Adult Education Program. (3 cr.; A-F or Audit; Periodic Spring)
Designing and implementing educational programs for adults. Application of concepts, theories, and models in different adult learning situations.

OLPD 5211. Introduction to the Undereducated Adult. (1 cr.; A-F or Audit; Every Summer)
Definitions of literacy in workplace, community, and family. Issues: poverty/welfare, ethnicity, cultural diversity, social class, language/learning, immigrants.

OLPD 5212. Introduction to Adult Literacy in the Workplace. (1 cr.; A-F or Audit; Every Summer)
Review workplace literacy programs, funding, program planning, and needs assessment. Reaching/recruiting workers. Role of employers and the unions. Writing for low literacy employees. prereq: 5211 or ADED 5211

OLPD 5213. Introduction to Adult Literacy in the Community. (1 cr.; A-F or Audit; Every Summer)
Community programs in United States. Literacy building. Family literacy skills. Correctional education in reintegrating offenders back into community. Integrating people with disabilities through community literacy programs. Literacy/development in developing countries. Reaching/recruiting indigenous, migrant, immigrant groups. Social action approaches to literacy education. prereq: 5211 or ADED 5211

OLPD 5224. Formal Assessment of Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Assessment of adult English/literacy skills for work, family, community, and continuing education. Formal testing policy, techniques, standardized tests. Assumptions about testing, cultural bias, and interpretation of formal tests.

Test preparation programs. prereq: 5211 or ADED 5211

OLPD 5225. Informal Assessment of Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment. prereq: 5211 or ADED 5211

OLPD 5226. Advanced Assessment of Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Applications/case studies. Educational planning for work, family, community. prereq: 5211 or ADED 5211

OLPD 5233. Methods of Teaching Beginning Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Learning English/literacy as an adult. Initial approaches to teaching reading, writing, and communications skills. Theories of learning/curriculum design. Technology as teaching tool. Teaching students with disabilities or with cultural/gender differences. prereq: 5211 or ADED 5211

OLPD 5234. Methods of Teaching Intermediate Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Learning English/literacy as an adult. Approaches to teaching reading, writing, and communications skills. Communication/comprehension in oral/written English. English reading/oral communication skills for workplace. Evaluating commercial materials/software. prereq: [5211 or ADED 5211], [5233 or ADED 5233]

OLPD 5235. Methods of Teaching Advanced Adult Literacy. (1 cr.; A-F or Audit; Periodic Fall)
Approaches to teaching reading, writing, study, communication skills. Preparing students for college/continuing education. English in workplace/on Internet. Problem solving, analytical thinking. Technology as teaching tool. Evaluating commercial material/software. prereq: 5211 or ADED 5211

OLPD 5296. Field Experience in Adult Education. (1-6 cr.; S-N or Audit; Every Fall, Spring & Summer)
Supervised fieldwork and practice. Presentations and evaluations of adult education practices.

OLPD 5321. The Principal as Leader of High-Performing Schools. (3 cr.; Student Option; Every Fall, Spring & Summer)
Role of principal: qualifications, duties, problems.

OLPD 5322. Leaders in the Superintendent and Central Office. (3 cr.; Student Option; Every Fall & Summer)
Role/responsibility of superintendent in school district. Real life experiences, leadership potential as CEO. Purposes, power, politics, practices of position. Interplay of internal school forces, community forces. Leadership in public, high-profile appointment.

OLPD 5323. Women in Leadership. (3 cr.; Student Option; Every Fall)
Women in leadership, in context of larger systems and their own lives. Supporting equity/equality across areas of difference. prereq: Technology access

OLPD 5324. Strategic Financial Planning and Policy for Educational Leaders. (3 cr.; Student Option; Periodic Fall, Spring & Summer)
State-local school finance systems, budgeting, governmental fund accounting. Interpretation of financial information. prereq: Grad student pursuing licensure as elementary-secondary [principal or superintendent]

OLPD 5332. Personal Leadership and the Private College. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Recognize/develop leadership skills and competencies necessary for team work, consensus building, group leadership within private colleges. Blend practice/ theoretical perspectives to develop leadership competencies of students. prereq: Must have Bachelors degree awarded prior to taking this course.

OLPD 5344. School Law. (3 cr.; Student Option; Every Spring & Summer)
Legal foundations of elementary/secondary education. Statutory themes, relevant case law, emergent policy issues. Implications for educational organizations and for administrative practice.

OLPD 5346. Politics of Education. (3 cr.; A-F or Audit; Every Fall & Spring)
Political dimensions of policy formulation/ implementation in education. Use of power/ influence in shaping educational policies and in resolving conflicts over educational issues. Analysis of consequences/cross-impacts.

OLPD 5348. Leaders of Human Resources Administration. (3 cr.; Student Option; Every Spring & Summer)
Skills for administrator/leader. Human resources administration, employee recruitment, selection, orientation/support, supervision, performance appraisal of school district personnel. prereq: Designed for students working on licensure for [dir of community educ or superintendent or K-12 principal or dir of special educ]

OLPD 5356. Disability Policy and Services. (3 cr.; Student Option; Every Spring & Summer)
Policy, research, and current practices related to education, health, and social services that support children, youth, and adults with special needs, and that support their families. Federal, state, and local perspectives.

OLPD 5361. Project in Teacher Leadership. (3 cr.; Student Option No Audit; Every Fall, Spring & Summer)
Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review of related literature, proposal development, project development, implementation and evaluation, critical reflection, sharing learning outcomes. prereq: MEd student in Teacher Leadership Program

OLPD 5364. Context and Practice of Educational Leadership. (3 cr.; A-F or Audit; Every Fall & Summer)
Current research/practice on educational leadership. Focuses on creating school cultures conducive to continuous improvement/ change. Strategies for personal/organizational leadership in PK-12 settings.

OLPD 5368. Leadership for Special Education Services. (3 cr.; Student Option; Every Fall & Spring)
Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at federal, state, and local levels. prereq: Administrator or supervisor or professional responsible for managing general or special or alternative education program.

OLPD 5374. Leadership for Professional Development. (4 cr.; Student Option; Every Fall) Designing, implementing, evaluating staff development in preK-12 settings. Research-based standards for effective staff development. Nickels for embedded time for collaborative learning, evaluating staff/student outcomes, prereq: Postbacalaureate, at least 3 yrs teaching experience.

OLPD 5385. Licensure Seminar: Program Policies and Inclusionary Leadership. (1 cr.; S-N or Audit; Every Fall, Spring & Summer) Preparation for licensure program. Program overview, preassessment, reflective practice, APA writing, exit panel review, administrative employment interview.

OLPD 5386. Leadership Portfolio Seminar. (1 cr.; S-N or Audit; Every Fall, Spring & Summer) Development of electronic administrative licensure portfolio to earn endorsement for license as school superintendent, K-12 principal, director of special education, or director of community education. prereq: 5385 or concurrent registration is required (or allowed) in 5385 or EDPA 5395

OLPD 5387. Leadership for Teaching and Learning. (3 cr.; Student Option; Periodic Fall, Spring & Summer) Multiple aspects of administrating teaching/ learning. Administration of teaching/learning as system in inclusive schools. Questions administrator must ask as leader of learning for students/adults.

OLPD 5388. Leadership for Master(ful) Scheduling. (2 cr.; Student Option; Every Fall & Summer) Work of high-performing professional learning communities. Implications for moving from building master schedule to leadership for master(ful) scheduling of time, space, motion, people. Hands-on work with infinite campus software/scheduling-building logic.

OLPD 5389. Community Education Leadership. (3 cr.; Student Option; Every Spring) Competencies of leadership, community relations, communication, community assessment, program development, program evaluation. Philosophy/administration of community/alternative education programs.

OLPD 5391. Special Education Law for Leaders. (1 cr.; Student Option; Every Fall & Summer) Competencies of leadership, policy, and political influence. Legal/regulatory applications focusing on special education law. prereq: Designed for students working on licensure in PK-12 administration.

OLPD 5392. Special Education Finance: Program Models, Policy, and Law. (2 cr.; Student Option; Every Spring) How special education revenue is a resource to accomplish student-related objectives. Revenue sources, compliance, budget monitoring. Key policy, case law, program models from perspective of director of special education. prereq: [5324 or concurrent registration is required (or allowed) in 5324 or EDPA 5324 or concurrent registration is required (or allowed) in EDPA 5324], knowledge of special education.

OLPD 5393. Leading School Finance Elections. (1 cr.; S-N or Audit; Every Spring) Comprehensive planning model for conducting school finance elections. Emphasizes systems, strategies, and campaign tactics.

OLPD 5394. Leadership in Community Education Finance and Law. (1 cr.; S-N or Audit; Every Summer) Interplay between finance and laws directly applicable to community education. MN Statute 124D, revenues/expenditures, and UFARS approached from revenue development. prereq: [5324 or EDPA 5324] recommended.

OLPD 5396. Field Experience in PK-12 Administration: Authentic Practice in Leadership. (3 cr.; max 12 cr.); S-N or Audit; Every Fall & Spring) Field experience or internship arranged for students seeking licensure as PK-12 principal/ superintendent. Content/credit depend on licensure requirements specified in individual field experience agreement. prereq: instr consent.

OLPD 5476. Field Based Projects in Business and Industry. (1-4 cr.; S-N or Audit; Every Fall, Spring & Summer) Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

OLPD 5501. Principles and Methods of Evaluation. (3 cr.; Student Option; Every Fall, Spring & Summer) Introduction to program evaluation. Planning an evaluation study, collecting and analyzing information, reporting results; evaluation strategies; overview of the field of program evaluation.

OLPD 5502. Theory and Models of Evaluation. (3 cr.; Student Option; Every Fall & Summer) Evaluation theories/models currently available to practitioners. Communication with clients
about value/utility of program. Systems theory. prereq: [5501/EPsy 5243] or PA 5311 or PubH 6034 or another introductory evaluation course approved by instructor.

OLPD 5521. Cost and Economic Analysis in Educational Evaluation. (3 cr.; Student Option; Every Fall) Use and application of cost-effectiveness, cost-benefit, cost-utility, and cost-feasibility in evaluation of educational programs and programs.

OLPD 5524. Evaluation Colloquium. (1 cr. max 24 cr.; S-N or Audit; Every Fall & Spring) Informal seminar of faculty/students. Issues/problems of program evaluation. prereq: [5501 or EDP5A], [5501 or EPSY 5243]

OLPD 5528. Focus Group Interviewing Research Methods. (3-1 cr.; Student Option No Audit; Every Fall) Students get an overview of the critical features of designing and conducting focus group interviews. Students practice moderating skills and then develop questions for a focus group project.

OLPD 5601. Foundations of Human Resource Development. (1 cr.; Student Option; Every Fall, Spring & Summer) Introduction to human resource development as a field of study and practice.

OLPD 5604. Systems Foundation of Human Resource Development. (1 cr.; Student Option; Every Fall, Spring & Summer) Introduction to system theory as a core discipline supporting the theory and practice of human resource development. prereq: 5601

OLPD 5605. Strategic Planning through Human Resources. (3 cr.; A-F or Audit; Periodic Spring) Strategic nature of organizations. How HRD can align its goals with those of organization. Strategic planning, systems thinking. Ways HRD managers can become strategic players in organization. prereq: 5607 or 5615 or HRD 5201 or HRD 5301

OLPD 5607. Organization Development. (3 cr.; A-F or Audit; Periodic Fall, Spring & Summer) Introduction to major concepts, skills, and techniques for organization development/change. prereq: Grad student only

OLPD 5610. Survey of Research Methods and Emerging Research in Human Resource Development. (3 cr.; A-F or Audit; Periodic Spring) Role of research in HRD. Standards/criteria for evaluating research, critique of conference research papers, identification of emerging research themes. Offered in conjunction with the annual conference of Academy of HRD. prereq: [Registered, in attendance] at conference of Academy of HRD

OLPD 5611. Facilitation and Meeting Skills. (1 cr.; Student Option; Every Fall, Spring & Summer) Introduction to the disciplines of planning and running effective meetings. Tools and methods for meeting management and evaluation are presented within the context of organization development.

OLPD 5612. International Human Resource Development. (3 cr.; Student Option; Every Fall, Spring & Summer) Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally. prereq: Grad students only; ugrad seniors with instr consent

OLPD 5615. Training and Development of Human Resources. (3 cr.; A-F or Audit; Periodic Spring & Summer) Training/development of human resources in organizations. Process phases of analysis, design, development, implementation, and evaluation. prereq: Grad student only

OLPD 5616. Training on the Internet. (3 cr.; Student Option; Every Spring & Summer) Major concepts, skills, and techniques for giving and receiving training on the Internet. prereq: Grad student only

OLPD 5619. Planning and Decision-Making Skills. (1 cr.; Student Option; Every Fall, Spring & Summer) Introduction to the disciplines of planning and decision making typically used in process improvement interventions. Tools and methods for facilitating group decisions and problem solving.

OLPD 5696. Internship: Human Resource Development. (1-10 cr.; S-N or Audit; Periodic Fall & Spring) Students apply/contract for human resource development positions. prereq: [[3901 or HRD 3601], [3896 or HRD 3196], [3620 or HRD 3201 or HRD 3301], [3202 or ADED 3101], undergrad] or [5607 or 5615 or HRD 5201 or HRD 5301], [5801 or WHRE 5001], grad student[], instr consent

OLPD 5697. International Field Study in Human Resource Development. (3 cr. max 6 cr.; A-F only; Every Spring & Summer) Engage in international travel/study for one week with an HRD faculty leader. Visit a variety of sites in business and industry to become aware of how HRD is practiced outside the United States. prereq: 5001

OLPD 5701. U.S. Higher Education. (3 cr.; Student Option; Every Fall & Summer) U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.

OLPD 5704. College Students Today. (3 cr.; Student Option; Every Spring & Summer) Issues involving population of students in colleges/universities. College student development theory, students' expectations/interests. How college affects student outcomes. Role of curricular/extracurricular activities. Student-faculty interaction.


OLPD 5712. Multicultural Theories of College Student Development Applied to Teaching and Learning. (3 cr.; A-F only; Every Fall, Spring & Summer) Multicultural student development theories/theorists. Implications for teaching/learning. Students reflect on The Student Personnel Point of View and Learning Reconsidered: Campus-wide Focus on the Student Experience and other collaborative efforts.

OLPD 5721. Race and Ethnicity in Higher Education. (3 cr.; Student Option; Every Fall, Spring & Summer) Review of research. Theoretical frameworks, methodological perspectives, and research strategies used to study students, staff, and faculty. Historical perspectives.

OLPD 5724. Leadership and Administration of Student Affairs. (2-3 cr.; Student Option; Periodic Fall & Spring) Scope, administration, coordination, and evaluation of programs in college and university student affairs.

OLPD 5732. The Law and Postsecondary Institutions. (3 cr.; Student Option; Periodic Fall & Spring) Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

OLPD 5734. Institutional Research in Postsecondary Education. (2-3 cr.; A-F or Audit; Periodic Fall) Scope, role, administration, research strategies, and evaluation of institutional research in postsecondary institutions. Methodologies, disciplinary foundations of research. Use of institutional, state, and national databases in addressing institutional missions/functions. prereq: [5701, [EPSY 5231 or EPSY 8261], grad student] or instr consent

OLPD 5736. Public Engagement and Higher Education. (3 cr.; A-F only; Every Fall) Study/practice of public engagement in higher education. Civic roles of post-secondary education institutions.

OLPD 5795. Plan B Research Design. (3 cr. max 6 cr.; A-F or Audit; Periodic Fall) Foundation to design Plan B research project relevant to student's professional interests. Literature review strategies to establish conceptual framework for project. Relates research question to design alternatives and to associated qualitative/quantitative analysis techniques. Issues such as human subjects and APA guidelines for preparing research papers. prereq: Grad student

OLPD 5796. Supervised Practicum in Multicultural Postsecondary Teaching and Learning. (3 cr.; S-N only; Every Fall, Spring & Summer) Postsecondary teaching experience in supervised settings. Weekly group supervision session. Classroom experiences, learning centers, and other postsecondary teaching venues. prereq: Grad student in PsTL
OLPD 5801. Survey: Human Resource Development and Adult Education. (3 cr.; Student Option; Every Fall, Spring & Summer) Overview of fields of human resource development and adult education. Societal context, theories, processes, definitions, philosophies, goals, sponsoring agencies, professional roles, participants, and resources. Unique characteristics and ways fields overlap and enhance one another. Prereq: Grad student only


OLPD 5811. Education for Work. (3 cr.; Student Option; Periodic Spring) Examination of contextual bases underlying education for work; implications for practice.

OLPD 5812. Consulting Skills for Organization Change. (3 cr.; Student Option No Audit; Every Fall & Spring) This course is an introduction to major theories, concepts, skills, and techniques of consulting for industry, education, and government.

OLPD 5813. Enhancing Work-based Learning Through Collaboration. (2 cr.; Student Option; Every Summer) Interagency policy issues/practices relating to special populations for educational, business, and human service organizations. Focus on professional socialization, family members, and advocates.

OLPD 5816. Distance Learning in Adult Education and Training. (3 cr.; A-F or Audit; Every Fall & Spring) Distance learning concepts, theory, history, present practice, delivery systems, course design, major issues, future directions.

OLPD 5819. Evaluating and Using Research in Organizations and Education. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Role of educational research in professional practice. Problems of practice for research. Alternative modes of synthesis/application of results of research. Prereq: Grad student

OLPD 5823. Work-Based Learning Policies. (2 cr.; Student Option; Periodic Fall & Summer) Aims/purposes of federal, state, and local policies, related to work-based learning.

OLPD 5829. Course Development for Business and Industry. (2 cr.; A-F or Audit; Every Fall, Spring & Summer) Designing instructional programs/courses that help learners develop desired competence. Designing instruction for performance based training and vocational/technical education. Developing course syllabus components that clarify course expectations. Developing academic/community-based elements that complement course goals. Reflect on and compare performance-based instruction with other curriculum models for the field.

OLPD 5845. The Entrepreneurial Private College. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Financial management/entrepreneurial strategies for private college. Enrollment management, revenue generating strategies, branding/marketing, fundraising, developing/sustaining entrepreneurial institutions. Design strategies for private colleges. Prereq: Must have completed Bachelor's degree before taking this course.

OLPD 5861. Instructional Methods for Business and Industry. (2 cr.; Student Option; Every Spring) Theory/practice in instructional methods for career/technical education (CTE) instructors and human resources/development (HRD) professionals. How to select various teaching methods and plan for their delivery. Preparing an instructional methods plan to clarify course content, teaching methods selected, rationale for their selection, and how a student organization might facilitate student learning.

OLPD 5893. Directed Study in OLPD. (1-4 cr.; Student Option; Every Fall, Spring & Summer) Self-directed study, with faculty advice, in areas not covered by regular courses.

OLPD 5902. Leading Change in Private Colleges. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Theories of organizational change process/application for leading private colleges with unique cultures/distinctive missions. Factors impacting change process/implications for leading private colleges. Prereq: Must have Bachelor's degree awarded prior to taking this course.

OLPD 6402. Integrative Leadership Seminar. (3 cr.; A-F or Audit; Every Fall & Spring) Basic concepts, practices, people, and organizations associated with integrative leadership. Case material, related readings, presentations, interactive discussion.


OLPD 8002. Critical Issues in Contemporary Education. (3 cr.; Student Option; Every Fall & Spring) Meanings of difference from sociological, psychological, historical and philosophical perspectives as related to current and emerging critical issues in education. Participants help design, facilitate, and present the course. Prereq: EdD or PhD student

OLPD 8011. Doctoral Research Seminar I. (1 cr.; S-N or Audit; Every Fall & Summer) Introduction/planning for individual program development, preliminary examinations, and dissertation prospectus. Modes of inquiry used in current research in education, databases related to education, relevant writings on literature synthesis, key contributions to education literature. Prereq: EdPA or WHRE doctoral student

OLPD 8012. Doctoral Research Seminar II. (1 cr.; S-N or Audit; Every Fall & Spring) Introduction to quantitative/qualitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research. Prereq: EdPA doctoral student

OLPD 8013. Doctoral Research Seminar III. (1 cr.; S-N or Audit; Every Fall & Spring) Introduction to most important quantitative/qualitative approaches employed in educational policy research. Prereq: EdPA doctoral student

OLPD 8015. Inquiry strategies in educational and organizational research. (3 cr.; A-F only; Every Fall) Logic of research design, from research questions and audience considerations to selecting a design for collecting/analyzing quantitative, qualitative, and mixed-method data. Prereq: [8011 or EDPA 8011], OLPD PhD student

OLPD 8016. Research Design and Educational Policy. (3 cr.; max 6 cr.; Student Option; Every Fall) Logic of research design, from research questions to selecting a design for collecting/analyzing quantitative, qualitative, and mixed-method data. Writing proposals that build a reasoned statement of research problem. Prereq: [8015 or EDPA 8015], CEHD doctoral student, instr consent

OLPD 8020. Leadership: From Theory to Reflective Practice. (3 cr.; A-F or Audit; Periodic Fall) Leadership theory. Emphasizes seminal scholars' work from related social science disciplines. Implications of theory for practice of leadership. Knowledge, behaviors, values, and skills needed in educational and other public settings.

OLPD 8022. Education and Globalization: Anthropological Perspectives. (3 cr.; A-F or Audit; Every Spring) Anthropological/considerative perspectives used to understand educational processes in a globalized world. What can be gained by adopting translocal view of educational phenomena.

OLPD 8087. Seminar: Organizational Leadership, Policy, and Development. (1-3 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Topical issues.

OLPD 8095. Problems: Organizational Leadership, Policy, and Development. (1-3 cr. [max 24 cr.]; Student Option; Periodic Fall, Spring & Summer) Independent study on issues of educational policy/administration. Arranged with instructor.
OLPD 8096. Internship: Organizational Leadership, Policy, and Development. (1-9 cr. [max 24 cr.]; Student Option; Every Fall & Spring) 
Internship on issues of educational policy/administration. Arranged with instructor.

OLPD 8101. International Education and Development. (3 cr.; A-F or Audit; Every Fall) 
History of international development in post-World War II era. Theories of how education affects economic, political, social development. Case studies of contemporary international development/education issues. prereq: Doctoral student or instr consent

OLPD 8103. Comparative Education. (3 cr.; A-F or Audit; Every Fall) 
Doctoral-level course. History, methodologies, and major debates in the field of comparative education. Major research paper or extensive literature review.

OLPD 8104. Innovative Systems Thinking in Education and Culture. (3 cr.; Student Option; Every Fall) 
Critical aspects of historical/contemporary systems philosophy, thinking, and analysis. Development of concepts/skills applicable to understanding multiple dimensions of educational systems in diverse contexts. Implications for leadership and fostering organizational and systemic change.

OLPD 8121. Doctoral Seminar: Comparative and International Development Education. (1-6 cr.; S-N or Audit; Every Fall & Spring) 
Focuses on needs of students while writing the dissertation; general guidance in how to construct the thesis. prereq: EdPA PhD candidate

OLPD 8302. Educational Policy Perspectives. (3 cr.; Student Option; Every Spring) 

OLPD 8314. Data Analysis for Educational Management. (3 cr.; Student Option; Periodic Fall, Spring & Summer) 
Managers of educational organizations are faced with problems that require analysis of a wide range of information. Outlines a frame for data analysis and introduces a set of computer-based tools suited to the practice of educational administration.

OLPD 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) 
(No description) prereq: Master’s student, adviser and DGS consent

OLPD 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) 
(No description) prereq: Doctoral student, adviser and DGS consent

OLPD 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3 cr.; Student Option; Every Spring) 
Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s. prereq: 5501 or EDPA 5501 or EPSY 5243

OLPD 8595. Evaluation Problems. (1-6 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) 
Independent study of an issue in theory or practice of program evaluation. prereq: [5501 or EDPA 5501 or EPSY 5243], instr consent

OLPD 8596. Evaluation Internship. (1-9 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) 
Hands-on experience in conducting program evaluation in real-world setting under supervision of evaluation professional. prereq: [5501 or EDPA 5501 or EPSY 5243], instr consent

OLPD 8601. Advanced Training and Development of Human Resources. (3 cr.; A-F or Audit; Periodic Fall) 
Personnel training/development research. Critical review of selected/innovative practices. prereq: 5615 or HRD 5201

OLPD 8602. Advanced Organization Development. (3 cr.; A-F or Audit; Periodic Spring) 
Organization development research. Critical review of selected, innovative practices.

OLPD 8603. HRD Capstone Research Experience. (3 cr. [max 6 cr.]; A-F only; Every Fall & Spring) 
The goal of this course is to assist doctoral students in developing their ability to conduct research and theory building in human resource development (HRD). Designed as a capstone experience for students in their second year of doctoral studies, the course will not only strengthen their understanding of approaches to disciplined inquiry and knowledge of current theories and advanced scholarly work in HRD, but will also provide them with an opportunity to develop practical research skills, by developing proposals for research projects aimed at addressing real-life needs of various organizations, and conducting these projects. Through this course students will be able to: 1. Further develop their understanding of the philosophical foundations of theory and theory development 2. Understand and discuss current approaches to research and theory building, used in HRD and related fields 3. Examine different perspectives on research and theory building 4. Develop and demonstrate critical thinking skills necessary to understand, interpret, and evaluate research and theories in HRD 5. Identify, compare and critique examples of cutting-edge HRD research and theory building efforts 6. Become part of a community of scholars and contribute to the viability and productivity of this community 7. Understand issues of research ethics and apply ethics principles in their own scholarly work 8. Gain hands-on experience conducting HRD research in organizations 9. Learn how to write successful research proposals and practice developing proposals for dissertation research 10. Understand how to develop research reports for submission to industry clients and to academic publications, and practice writing and submitting papers to academic publications. This course will be offered over two semesters. During the fall semester sessions will consist of lectures and discussions, and during spring semester, in addition to regular class meetings, students will be working on their field research projects (on-site with client organizations). Students will be expected to make one presentation in each of the two semesters: present a proposal for a dissertation research project in fall, and present the results of the field project at the end of the spring semester.

OLPD 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) 
Pre-thesis credit prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations. up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

OLPD 8702. Administration and Leadership in Higher Education. (3 cr.; Student Option; Every Fall, Spring & Summer) 
Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, conflict. prereq: [5001 or EDPA 5001], [5701 or EDPA 5701]

OLPD 8703. Public Policy in Higher Education. (3 cr.; A-F or Audit; Every Fall) 
Theories, analytic methods, and critical issues in postsecondary education policy at national/state levels. Equality of educational opportunity, affirmative action, system governance/coordination, research funding, student financial aid, public accountability. prereq: [5001 or EDPA 5001], [5701 or EDPA 5701]

OLPD 8715. Plan B Capstone Seminar. (3 cr.; S-N only; Every Fall, Spring & Summer) 
Determining topic, creating timeline, and initiating project in conjunction with year 2 internship. prereq: 5206, grad student admitted to master’s program in multicultural college teaching/learning; if Plan B project includes research with human subjects, application to Institutional Review Board is required

OLPD 8721. Instruction and Learning in Higher Education. (2-3 cr.; Student Option; Every Spring) 

OLPD 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Spring & Summer) 
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]
OLPD 8796. Supervised Internship in Postsecondary Teaching and Learning. (3-12 cr.; S-N only; Every Fall, Spring & Summer) Classroom-based or online group supervision. Weekly supervised experiences. Internship settings based on students’ interests/goals. prereq: 5196; [grad student admitted to Multicultural College Teaching and Learning MA or College Student Development and Counseling Psychology PhD]

OLPD 8800. Organizational Leadership, Policy, and Development Colloquium. (1-3 cr. [max 12 cr.]; Student Option; Every Fall, Spring & Summer) Selected topics regarding work/human resource education professionals. Topics based on interest/demand.

OLPD 8801. Advanced Theory in Human Resource Development and Adult Education. (; 3 cr.; A-F or Audit; Periodic Fall) Theory of individuals/organizations as adaptive entities. Roles of human resource development and adult education in mediating complex demands. prereq: 5801 or ADED 5001 or WHRE 5001

OLPD 8812. Quantitative Research in Education. (3 cr.; Student Option; Every Fall) Assumptions, procedures for, considerations in planning/conducting quantitative research in education.

OLPD 8815. Ethics and Responsible Research. (; 1 cr.; A-F or Audit; Periodic Fall, Spring & Summer) Introduction to ethical/legal issues involved in practicing responsible educational research. Key issues, formal/informal codes of conduct, ethical reasoning.

OLPD 8841. Foundations of Organizational Leadership, Policy, and Development. (3 cr.; Student Option; Periodic Fall) Key historical/philosophical concepts in work, career, adult development. Individual/organizational change. Learning through experience.

OLPD 8842. Comparative Systems in Organizational Leadership, Policy, and Development. (3 cr.; Student Option; Periodic Spring) Looking critically across/within countries/regions at structures intended to deliver work/career-related education/training. prereq: 8141 or WHRE 8141

OLPD 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

OLPD 8890. Research Seminar. (1 cr.; S-N or Audit; Periodic Fall) Developing, reporting, and evaluating research. Participants make/react to presentations. prereq: [4811 or WHRE 8911] [8121 or WHRE 8912 or WHRE 8913 or WHRE 8914] or instr consent

OLPD 8896. Internship. (; 1-10 cr.; S-N or Audit; Every Fall, Spring & Summer) Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship. Ed.D. program requirement.

Orthodontics (OTHO)

OTHO 7101. Growth & Development. (; 0-5 cr.; A-F or Audit; Every Summer) Head growth, development, osteology, and myology. Both normal and abnormal morphology and function, with emphasis on cephalometric methods. prereq: Admission to graduate orthodontic program.

OTHO 7102. Growth & Development. (; 0-5 cr.; A-F or Audit; Every Fall & Spring) Head growth, development, osteology, and myology. Both normal and abnormal morphology and function, with emphasis on cephalometric methods.

OTHO 7103. Growth & Development. (; 0-5 cr.; A-F or Audit; Every Spring) Head growth, development, osteology, and myology. Both normal and abnormal morphology and function, with emphasis on cephalometric methods.

OTHO 7110. Diagnosis & Treatment Planning. (; 0-5 cr.; A-F or Audit; Every Summer) Etiology, treatment and prognosis of clinical orthodontic patients. prereq: Admission to graduate orthodontic program.

OTHO 7112. Diagnosis & Treatment Planning. (; 0-5 cr.; A-F or Audit; Every Fall) Etiology, treatment and prognosis of clinical orthodontic patients. prereq: Admission to graduate orthodontic program.

OTHO 7113. Diagnosis & Treatment Planning. (; 0-5 cr.; A-F or Audit; Every Spring) Etiology, treatment and prognosis of clinical orthodontic patients. prereq: Admission to graduate orthodontic program.

OTHO 7201. Clinical Orthodontics. (; 0-5 cr.; A-F or Audit; Every Spring & Summer) Students assigned patients for complete management of orthodontic and orthodontically related occlusal problems under direct staff supervision. prereq: Admission to graduate orthodontic program.

OTHO 7202. Clinical Orthodontics. (; 0-5 cr.; A-F or Audit; Every Fall & Spring) Students assigned patients for complete management of orthodontic and orthodontically related occlusal problems under direct staff supervision. prereq: Admission to graduate orthodontic program.

OTHO 7203. Clinical Orthodontics. (; 0-5 cr.; A-F or Audit; Every Spring) Students assigned patients for complete management of orthodontic and orthodontically related occlusal problems under direct staff supervision. prereq: Admission to graduate orthodontic program.

OTHO 8121. Orthodontic Seminar. (; 0-5 cr.; A-F or Audit; Every Summer) Evaluating orthodontic literature, including preparation and presentation of literature reviews. prereq: Orthodontic grad student

OTHO 8122. Orthodontic Seminar. (; 0-5 cr.; A-F or Audit; Every Fall) Evaluating orthodontic literature, including preparation and presentation of literature reviews. prereq: Orthodontic grad student

OTHO 8123. Orthodontic Seminar. (; 0-5 cr.; A-F or Audit; Every Spring) Evaluating orthodontic literature, including preparation and presentation of literature reviews. prereq: Orthodontic grad student

OTHO 8131. Topics in Orthodontics. (; 0-5 cr.; A-F or Audit; Every Spring & Summer) Theoretical aspects of kinematics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management. prereq: Orthodontic grad student

OTHO 8132. Topics in Orthodontics. (; 0-5 cr.; A-F or Audit; Every Fall & Spring) Theoretical aspects of kinematics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management. prereq: Orthodontic grad student

OTHO 8133. Topics in Orthodontics. (; 0-5 cr.; A-F or Audit; Every Summer) Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature. prereq: Orthodontic grad student

OTHO 8142. Research in Orthodontics. (; 0-5 cr.; A-F or Audit; Every Fall & Spring) Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature. prereq: Orthodontic grad student

OTHO 8143. Research in Orthodontics. (; 0-5 cr.; A-F or Audit; Every Fall & Spring) Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature. prereq: Orthodontic grad student

Orthopaedic Surgery (ORSU)

ORSU 7180. Orthopaedics I. (; 3-6 cr.; H-N or Audit; Every Fall, Spring & Summer) A brief survey course with exposure to a large number of patients, rather than a didactic and highly structured course. Instruction is given by audiovisual technique, conference, and seminars, in addition to teaching primarily in the outpatient clinic. There are opportunities for participation in the inpatient service and in surgery for the student interested in this additional experience. To round out the somewhat limited experience inherent in
a three week rotation, independent study of the text, Disorders and Disease of the Musculoskeletal System, by Robert B. Salter, is strongly recommended.

**ORSU 7185. Externship in Orthopaedic Surgery.** (4-6 cr.; H-N only; Every Fall, Spring & Summer)

This course provides a more comprehensive, detailed exposure to orthopaedics for those students with a special interest in orthopaedics or another surgical specialty, or who desire more experience in preparation for a career in family practice.

**ORSU 7186. Orthopaedic Surgery Research.** (6-12 cr. [max 24 cr.]; H-N only; Every Fall, Spring & Summer)

Orthopaedic Surgery Research

**ORSU 7188. Pediatric Orthopaedics.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This course provides an opportunity for students with a special interest in pediatric orthopaedics and the care of the multiply-handicapped child.

**ORSU 7190. General, Reconstructive and Geriatric Orthopaedics.** (4 cr.; H-N only; Every Fall & Spring)

This course consists of supervised clinical experience in the primary care of both adult inpatients and outpatients with an emphasis on reconstructive types of orthopaedic surgery. The student has a great deal of individual ward and surgical responsibility and is expected to present their cases. The student functions at the junior resident level. While the student does not take call individually, they may choose to take call with the resident to whom they are assigned. Recommended for the student interested in an orthopaedic surgery career and for the student choosing a non-orthopaedic surgery career. Primary text for externship: Salter RB: Textbook of Disorders and Injuries of the Musculoskeletal System, Baltimore, Williams & Wilkins.

**ORSU 7191. Orthopaedic Trauma Surgery.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This course provides detailed exposure to orthopaedic reconstruction and trauma.

**ORSU 7192. Primary Care Orthopaedics.** (4 cr.; H-N only; Every Fall, Spring & Summer)

The students will be observing and assisting orthopaedic surgeons in a general orthopaedic practice. The student's interest and initiative will determine the level of responsibilities and the extent of participation in surgical procedures. Students are responsible for weekly case conference presentations.

**ORSU 7194. Orthopaedic Extremity-MC.** (3-6 cr.; H-N or Audit; Every Fall & Spring)

An introductory course to outpatient orthopaedic evaluation and treatment in a private office setting. The student observes and, under direct supervision, participates in efficient evaluation of pediatric and adult patients with musculoskeletal complaints. This includes obtaining pertinent history and doing a complete musculoskeletal exam appropriate to the patient's complaints. Emphasis is on physical diagnosis and evaluation of diagnostic data including x-rays and other imaging modalities. *(The student spends most of their time with Dr. Aadalen at his Edina office, but they also accompany him to Children's Health Care-Minneapolis, Fairview-University Medical Center (Riverside Campus) and Shriner's Hospital.)*

**ORSU 7195. Orthopaedics for the Generalist.** (4 cr.; H-N or Audit; Every Fall, Spring & Summer)

Provides the opportunity to recognize and treat common orthopaedic problems. The experience consists of emergency room, ambulatory setting, and operating room exposure with an emphasis on problems encountered in primary care. The student may also have an opportunity to work with a sports medicine physician in the office and travel to rural site visits for orthopaedic consultations. Text: Disorders and Disease of the Musculoskeletal System, Robert B. Salter. Texts are available (no charge) through the UMD Department of Family Medicine for students use while on this rotation. SPECIAL INSTRUCTIONS: To request the Duluth site, contact the UMD Department of Family Medicine, 10 University Drive, Duluth, MN 55812 (218-726-7916) at least one month prior to quarterly cancel/add deadline.

**ORSU 7200. Surgical Subspecialty Orthopaedics.** (4 cr.; max 8 cr.; P-N only; Every Fall, Spring & Summer)

The orthopaedic surgery selective consists of a 2 week rotation concentrating on the areas of general orthopaedics, sports medicine, and pediatrics.

**ORSU 7910. Orthopaedic Surgery Medical Residency.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

Orthopaedic surgery medical residency.

**ORSU 7930. Orthopaedic Surgery Medical Fellowship.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

Orthopaedic surgery medical fellowship.

**Tolaryngology (OTOL)**

**OTOL 5101. Introduction to the Basic Sciences in Otolaryngology I: Ear.** (2 cr.; A-F or Audit; Every Fall & Spring)

Multidisciplinary introduction to the basic sciences of the ear. Acoustics and psychoacoustics, temporal bone anatomy, external and middle ear mechanisms, cochlear physiology, auditory neurophysiology, ear embryology, ear biochemistry, immunology, fine structures, vestibular mechanisms and measurement. S-N grading option for nonmajors only. prerequisite: Otolaryngology major or instr consent

**OTOL 5102. Introduction to the Basic Sciences in Otolaryngology II: Head and Neck.** (2 cr.; A-F or Audit; Every Fall & Spring)

Multidisciplinary introduction to the basic sciences of the head and neck. Laryngeal anatomy and physiology, nasal anatomy and physiology, immune biology, embryology of head and neck. S-N grading option for nonmajors only. prerequisite: Otolaryngology major or instr consent

**OTOL 5993. Directed Studies.** (1-12 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer)

Directed readings and preparation of reports on selected topics. prerequisite: instructor consent

**OTOL 7200. Introduction to Otolaryngology.** (2 cr. [max 4 cr.]; P-N only; Every Fall, Spring & Summer)

This elective is intended for early third-year students interested in exploring the specialty of ENT. This course will include clinical experiences in the specialty and interactive presentations emphasizing primary care problems related to the field.

**OTOL 7501. Otolaryngology Acting Internship.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This advanced elective is designed for the late third-year or early fourth-year student wanting to be competitive for residency selection. Working closely with residents, the student will have increased responsibility in patient care and management.

**OTOL 7503. Otolaryngology Research.** (2-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)

Opportunities are provided to work with otolaryngology faculty and basic scientists within the Department of Otolaryngology. Additional opportunities for clinical otolaryngology are provided if relevant.

**OTOL 7910. Otolaryngology Medical Residency.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

Otolaryngology medical residency.

**OTOL 7930. Otolaryngology Medical Fellowship.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)

Otolaryngology medical fellowship.

**OTOL 8230. Clinical Otorhinolaryngology.** (4 cr.; A-F or Audit; Every Fall, Spring & Summer)

Diagnostic and management instruction and experience in all phases of clinical otorhinolaryngology. Both inpatient and outpatient services are provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practice and weekly special group conferences. prerequisite: Grad otol major

**OTOL 8231. Surgery of the Ear, Nose, and Throat.** (3 cr.; A-F or Audit; Every Fall, Spring & Summer)

Surgical training and experience with broad scope of surgical problems encountered in otorhinolaryngology provided at Fairview-University Medical Center, St. Paul Ramsey Medical Center, Veterans Administration Medical Center, and Hennepin County Medical Center. Clinical practice and weekly special group conferences. prerequisite: Grad otol major

**OTOL 8232. Maxillofacial Surgery.** (1 cr.; A-F or Audit; Every Fall, Spring & Summer)
Basic science and management principles of maxillofacial diseases. Problems of maxillofacial trauma. Experience with these problems in the hospitals of the training program, especially the county hospitals. prereq: Grad otol major

OTOL 8233. Plastic and Reconstructive Surgery: Head and Neck. (1 cr.; A-F or Audit; Every Fall, Spring & Summer)
Otolaryngologic cosmetic surgery emphasizing rhinoplasty and otoplasty. prereq: Otol major

OTOL 8234. Anatomy of the Head and Neck and Temporal Bone Dissection. (2 cr.; Student Option; Every Fall, Spring & Summer)
Head and neck anatomy studied from cadaver through programmed learning. Temporal bones dissected to learn anatomy and to practice otologic surgical procedures. S/N for nonmajors only. prereq: Grad otol major or instr consent

OTOL 8235. Roentgenology of the Head and Neck. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Principles and procedures in roentgenology for otolaryngologic and head and neck problems. prereq: Grad otol major

OTOL 8236. Pharmacology in Otolaryngology. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Principles of pharmacology as they relate to otolaryngology. prereq: Grad otol major

OTOL 8237. Endoscopy. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized. prereq: Grad otol major

OTOL 8238. Pathology of the Ear, Nose, and Throat. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions. prereq: Grad otol major

OTOL 8239. Otoneurology. (1-2 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer)
Instruction and experience in diagnosis and management of otoneurologic problems, including training in electronystagmographic analysis of vestibular function. prereq: Grad otol major or instr consent

OTOL 8240. Allergy. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Concepts and management of otolaryngologic allergy. prereq: Grad otol major

OTOL 8241. Cancer of the Head and Neck. (1 cr.; max 12 cr.; A-F or Audit; Every Fall, Spring & Summer)
Clinical head and neck oncology; etiology, treatment (both surgical and nonsurgical), and other principles of management. prereq: Grad otol major

OTOL 8242. Audiology and Speech Pathology. (2 cr.; Student Option; Every Fall & Spring)
Clinical audiology and speech-language pathology, including diagnosis and treatment of conductive, sensorineural, and central hearing loss; voice disorders; swallowing disorders; velopharyngeal insufficiency related to cleft lip/palate and craniofacial anomalies; alaryngeal speech; and speech disorders related to head and neck cancer. prereq: Grad otol major or instr consent

OTOL 8243. Introduction to Research Methodology. (1 cr.; Student Option; Every Fall & Spring)
Statistical methods, experimental design, and execution of otolaryngologic research. Ethics of research with human and animal subjects. prereq: Grad otol major or instr consent

OTOL 8244. Seminar: Current Literature. (1 cr.; Student Option; Every Fall, Spring & Summer)
Presentation and discussion of selected articles. Required for all otolaryngology graduate students. prereq: Grad otol major or instr consent

OTOL 8247. Anatomy and Physiology of Hearing and Balance. (3 cr.; Student Option; Every Spring)
Structure and function of auditory and vestibular systems. Network analysis of middle and inner ear mechanics, hair cell biophysics, auditory nerve and CNS electrophysiology, information processing, neural mechanisms subserving balance and gaze, cellular morphology, and computer models. prereq: instr consent

OTOL 8248. Directed Readings in Auditory Physiology. (1-2 cr.; Student Option; Every Fall & Spring)
Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed. prereq: instr consent

OTOL 8249. Current Topics in Cochlear Anatomy. (1 cr.; Student Option; Every Fall & Spring)
Review of current research papers concerning cochlear anatomy and pathology. prereq: instr consent

OTOL 8250. Advanced Biochemistry of the Auditory System. (1 cr.; Student Option; Every Fall, Spring & Summer)
Review of recent progress in biochemical aspects of auditory end organs. prereq: MdBc 6100, MdBc 6101 or equiv or instr consent

OTOL 8251. Molecular Carcinogenesis of Head and Neck Squamous Cell Carcinoma. (2 cr.; max 6 cr.; Student Option; Every Fall, Spring & Summer)
Current topics in molecular carcinogenesis of head and neck squamous cell carcinoma. prereq: MICA 8009 or concurrent registration is required (or allowed) in MICA 8009 or instr consent

OTOL 8252. Advanced Clinical Audiology. (2 cr.; Student Option; Every Fall, Spring & Summer)
Comprehensive reading and practicum in auditory evaluation of patients. Assumes basic knowledge of clinical audiology. Each session devoted to aspect of auditory evaluation or aural rehabilitation, including behavioral audiometry, electrophysiologic evaluation, hearing aid selection, and cochlear implants. prereq: Grad otol major, 8242 or instr consent

OTOL 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

OTOL 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

OTOL 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

OTOL 8777. Thesis Credits: Master's. (1-18 cr.; max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

OTOL 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

Pathology (PATH)

PATH 7865. Departmental Seminar. (1 cr.; max 2 cr.; H-N or Audit; Every Fall, Spring & Summer)

Pediatric Dentistry (PDEN)

PDEN 7000. Directed Research in Pediatric Dentistry. (1 cr.; S-N or Audit; Every Fall, Spring & Summer)
Completion of senior project, prepare table clinic presentation, and prepare AAPD presentations through regular progress meetings with faculty.

PDEN 7010. Fundamentals of Pediatric Dentistry. (0-2 cr.; A-F only; Every Summer)
Comprehensive introductory course in pediatric dentistry. Cariology/oral prevention, oral radiology, diagnosis/treatment planning, behavior guidance, analgesia/anesthesia, restorative dentistry, pulpal therapy, nitrous oxide-oxygen inhalation, periodontal disease.

PDEN 7020. Introduction to Pediatric Hospital Dentistry. (0-2 cr.; A-F only; Every Summer)
PDEN 7030. Parenteral and Oral Moderate Sedation for Children and Young Adults in Dental Settings. (0-2 cr. ; A-F only; Every Fall) Learn to provide evidence-based, safe, effective mild/moderate sedation to children/adolescents. Patient case selection for office based sedation, pre-sedation pediatric physical examination/history taking, parenteral/enteral administration, physiology/monitoring, pharmacology, emergency planning/simulation, post-operative management.

PDEN 7040. Primer in Pediatric Medicine. (0-2 cr. ; A-F only; Every Fall) Provides foundation knowledge in pediatric patient assessment, history taking, communication with pediatric healthcare community. Arranged as 8 modules covering topics of medical home care, health history taking, physical examination, diet/nutrition, health screening, prevention of injury/disease, management of disease, hospital admission.

PDEN 7100. Advanced Clinical Pediatric Dentistry. (1-6 cr. ; max 36 cr.; S-N or Audit; Every Fall, Spring & Summer) Faculty-supervised treatment of patients, including treatment of difficult or unusual pediatric dentistry problems.

PDEN 8010. Pediatric Dentistry Diagnosis and Treatment Planning. (1 cr. ; max 5 cr.; S-N only; Every Fall, Spring & Summer) Systematic approach to diagnosis of and treatment planning for various pediatric dentistry problems. Faculty/peer review of selected patient cases managed by students. Patient care is reviewed/discussed to ensure appropriate treatment protocols and quality of care.

PDEN 8031. Independent Study in Pediatric Dentistry. (2 cr. ; S-N only; Every Fall, Spring & Summer) Independent readings from pediatric dentistry textbooks in preparation for an oral exam. May include additional clinical experiences.

PDEN 8100. Hospital Pediatric Dentistry. (1 cr. ; S-N or Audit; Every Fall, Spring & Summer) Faculty-supervised diagnosis/treatment of pediatric dentistry problems at Fairview-University Medical Center and Hennepin County Medical Center. Rotation seminars in pediatrics/anesthesia. Pre/post-operative discussion/evaluation of treatment plans.

PDEN 8110. Pediatric Dentistry Outreach Experiences. (1 cr. ; max 3 cr.; S-N or Audit; Every Fall, Spring & Summer) Faculty-supervised diagnosis and treatment of pediatric dentistry problems at Hennepin County Medical Center, the CUHCC Clinic, and other off-site locations. Participation on a rotation basis in seminars in pediatrics and anesthesia. Pre/postoperative seminar discussion and evaluation of treatment plans.

Current studies of biological bases (e.g., evolutionary adaptation, genetic, physiological substrates), behavioral expression (e.g., roles of environment, development, learning/motivation, personality, psychopathology), and social interactions (e.g., culture, criminal violence, warfare, genocide). prereq: Ped 6121/ PUBH 6121

PED 6996. Department of Pediatrics-Summer Internship in Pediatrics. EPAC Explore Students Only. (0 cr.; No Grade Associated; Every Summer) Exposure to clinical general pediatrics early in medical school. Two-week preceptorship with general pediatrician during summer hiatus between first/second year of medical school. Only available to students part of EPAC Explore group. Participating students need to be in academic good standing at the medical school.

PED 7091. Independent Study in the Neural Basis of Anger, Tantrums, and Aggression. (2 cr. ; A-F only; Periodic Fall) Neural and other biological bases for emotional expression of anger and for tantrum/aggression. prereq: consent

PED 7501. Pediatric Externship. (4 cr.; H-N only; Every Fall, Spring & Summer) Provides basic pediatric skills and knowledge necessary for each student, no matter what field of medicine they select.

PED 7512. Pediatric Acting Internship. (2-6 cr.; H-N or Audit; Every Fall, Spring & Summer) An intensive learning experience focusing on children with diseases treated by subspecialty services, generally cardiology, nephrology, or oncology. The student functions as an acting intern. prereq: 7501

PED 7531. Pediatrics-Psychology Internship. (12 cr.; max 48 cr.; No Grade Associated; Every Fall, Spring & Summer) The aim of the University of Minnesota Medical School Psychology Internship is to prepare interns to meet the mental health needs of children and to function as psychological consultants in academic health centers or other clinical contexts. Interns provide clinical assessments and care for children and their families in a broad mix of clinical settings within a teaching hospital. In addition to extensive supervised clinical experiences, interns participate in a blend of didactics, conferences, and team meetings to further their professional development. The internship year provides ample opportunities for interns to collaborate closely with faculty and develop collegial relationships with our faculty, staff, and each other. The Internship has been continuously accredited since 1965 by the American Psychological Association making it the longest APA-accredited internship in this region, and is known for its quality assessment and improvement activities. William Robiner, PhD, ABPP, is the Internship Director.

PDEN 7533. Clinical Allergy at Fairview-University Medical Center. (3-6 cr.; H-N or Audit; Every Fall, Spring & Summer) Emphasizes the practical aspects of allergic and immunologic work-ups and treatments. The particular content of the course is modified depending upon individual needs.

PED 7534. Pediatric Cardiology. (4 cr.; H-N only; Every Fall, Spring & Summer) The elective rotation in Pediatric Cardiology is open to third and fourth year medical students who are interested in pediatric cardiovascular disease. The rotation is primarily an outpatient one.

PED 7535. Pediatric Infectious Disease. (4 cr.; H-N only; Every Fall, Spring & Summer) The student works closely with the infectious disease fellow and pediatric resident on service, and contribute to the diagnosis and management of patients with suspected or proven infections. prereq: Med Student Yr 3 or 4/PED 7501 or equivalent courses/one other pediatric elective

PED 7536. Pediatric Hematology/Oncology/Bone Marrow Transplantation. (4 cr.; H-N only; Every Fall, Spring & Summer) This course provides inpatient and outpatient experience in clinical management of children, adolescents and young adults with various blood, cancer, immunologic, or other diagnoses.

PED 7537. Pediatric Endocrinology & Diabetes. (4 cr.; H-N only; Every Fall, Spring & Summer) The student works with faculty, fellows, and residents in a small group. This course is particularly suitable for students planning to pursue residency programs in Internal Medicine and in Pediatrics.

PED 7538. Pediatric Gastroenterology and Nutrition. (4 cr.; H-N only; Every Fall, Spring & Summer) The student sees GI and nutrition consults on the pediatric stations, attends clinic and observes all diagnostic and biopsy procedures pertaining to gastrointestinal patients.

PED 7539. Neonatal Medicine Internship. (4 cr.; H-N only; Every Fall, Spring & Summer) This course offers the student an opportunity to be an extern in one of the neonatal intensive care units. For assigned patients, the student will assume the responsibility of a first year resident: the student will make rounds with the house officers and attending staff on all patients, write orders and progress notes on assigned patients, and carry out necessary procedures under supervision.

PED 7540. Pediatric Neurology. (4 cr.; H-N or Audit; Every Fall, Spring & Summer) Successful completion of this rotation satisfies the Department of Neurology 7-510 requirement. Pediatric neurology patients have a variety of problems ranging from coma, muscular dystrophy, epilepsy to learning disabilities; from inborn errors of metabolism, metabolic neurologic dysfunction to behavior disorders.

PED 7541. Children’s Hospitals and Clinics of MN Pediatric ENT Elective. (2 cr.; P-N only; Every Fall, Spring & Summer) Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
This rotation would be geared towards those with strong interest in ENT or strong interest in Pediatrics with the objectives to improve ENT assessment of the pediatric patient and gain proficiency in head and neck exam. Reading about pertinent issues that the student is encountering in clinic, rounds or the operating room will be expected.

**PED 7542. Pediatric Palliative Medicine and Hospice.** (4 cr.; H-N only; Every Fall & Summer)

This course is designed to introduce students to the fields of pediatric hospice and palliative medicine. Students will primarily spend time with the Pain and Advanced/Complex Care Team (PACCT), the pain and palliative consult service at the University of Minnesota Masonic Children's Hospital (UMMCH), as well as its broader interdisciplinary team members (nurse practitioners, social workers, child life specialists, music therapists, and spiritual health providers). Students will also spend at least one day with the interdisciplinary pediatric home hospice and palliative care team members at Fairview Homecare and Hospice. Depending on availability, students may also rotate in the outpatient clinic at UMMCH. They will be expected to engage in patient care planning, including family meetings and interdisciplinary team collaborations.

**PED 7543. Pediatric Nephrology.** (2 cr.; H-N only; Every Fall, Spring & Summer)

Daily working rounds with the staff will be made, and the team will make formal rounds with the students to discuss the patients in hospital. Outpatient management of a wide variety of problems, both nephrologic and urologic, are considered in clinics.

**PED 7544. Pediatric Pulmonary Disease.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This pediatric course will focus on care of pulmonary problems of patients with diverse lung diseases and will include work with the pediatric pulmonary health care team.

**PED 7545. General Pediatrics Outpatient Elective.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This is a general pediatric care elective. It will allow students to work closely with an outpatient clinical practice team to provide care for patients and families seeking ongoing pediatric primary care.

**PED 7547. Children's Hospitals and Clinics of MN Pediatric Sleep Medicine Elective.** (2 cr.; P-N only; Every Fall, Spring & Summer)

Pediatric sleep disorders are common in all ages and populations. There is limited exposure during medical school and residency to sleep medicine in general and pediatric sleep medicine specifically. This rotation will explore the common pediatric sleep disorders that every pediatrician should be aware of.

**PED 7548. Clinical Genetics.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This course will be valuable for students interested in any discipline and allows exposure to patients in pediatrics, medicine, and obstetrics/perinatology.

**PED 7550. Children's Hospitals and Clinics of MN Pediatric Ethics Elective.** (4 cr.; H-N only; Every Fall, Spring & Summer)

Clinical ethics is an integral part of the practice of medicine. This course is designed to introduce students to ethical practice. Taking the time to understand how the ethical principles work in day to day clinical decision making is paramount to the development of ethically astute clinicians. In order to provide students with an immersive experience in clinical ethics this elective has been created for those who seek more directive knowledge on how ethics affects patient care.

**PED 7553. Adolescent Medicine.** (4 cr.; H-N only; Every Fall, Spring & Summer)

This elective involves two adolescent interviewing workshops and one adolescent pelvic exam workshop. Special emphasis is placed on acquisition of effective clinical communication skills. Students are exposed to a variety of community-based services for youth, including general adolescent medicine clinics, programs for at-risk youth, and for youth in foster care.

**PED 7555. Neonatal Clerkship - Marshfield, WI.** (4 cr.; H-N or Audit; Every Summer)

This elective revolves primarily around medical problems related to the newborn, including neonatal infections, metabolic problems, cardiovascular problems, shock, pulmonary insufficiency, central nervous system asphyxia and hemorrhage. prereq: Med 7501, enrolled yr 4 med

**PED 7556. Pediatrics Clerkship - Marshfield, WI.** (4 cr.; H-N or Audit; Every Fall & Summer)

The student functions as a house officer on the pediatric ward and in the emergency room and has night call every third or fourth night. prereq: 7501, enrolled yr 4 med

**PED 7557. Children's Hospitals and Clinics of MN Pediatric/Adolescent Gynecology Elective.** (4 cr.; H-N only; Every Fall & Spring)

Pediatric and Adolescent Gynecology (PAG) is an important aspect of clinical education for Pediatrics training programs. Furthermore, PAG is an integral part of Pediatrics and Adolescent Medicine licensing exams. Specific PAG learning objectives, like those found in the American Board of Pediatrics must be fulfilled. Residents have indicated that they do not feel they get enough exposure to PAG topics and have expressed a desire to learn more about this population during their training.

**PED 7559. Pediatric Critical Care Medicine.** (4 cr.; H-N only; Every Fall, Spring & Summer)

The student works as a member of the resident-fellow-attending physician team in assessing and treating all medical and surgical patients on the pediatric intensive care unit.

**PED 7560. Pediatric Research.** (2-8 cr. max 16 cr.; H-N only; Every Fall, Spring & Summer)

A research experience in pediatrics can be arranged on an individual basis with various members in the Pediatrics Department. This course affords the student opportunity to work with a pediatric faculty member on a predetermined research project.

**PED 7566. Evolution of American Pediatrics.** (6 cr.; H-N or Audit)

This course explores the evolution of American Pediatrics from the post-Civil War period to the present. American Pediatrics may be divided into several distinct eras based on the forces which defined its boundaries and identity. These include societal and governmental influences, changing norms of medical practice, emerging scientific knowledge, and reforms in medical education. The course will also examine Pediatrics’ contribution to medical knowledge and the influence of pediatrics on the attitudes of government and society toward children. Team teaching format combines formal lectures, assigned readings, and student/faculty discussion.

**PED 7583. Fundamentals of Clinical Oncology.** (4 cr.; H-N or Audit; Every Fall, Spring & Summer)

This multidisciplinary course provides an introduction to the fundamentals of clinical oncology (adult and pediatric) and is designed for the medical student interested in entering any specialty. prereq: Med 7500 or 7501

**PED 7700. Primary Care Selective - Pediatrics.** (4 cr.; P-N only; Every Fall, Spring & Summer)

A 4-week ambulatory experience with a focus on both the specialty specific content areas and the process-of-care in the ambulatory setting.

**PED 7800. Advanced Selective in Pediatrics.** (4 cr.; H-N only; Every Fall, Spring & Summer)

The Advanced Selective in Pediatrics is an opportunity for students to serve patients in a community-based general inpatient setting. Advanced selective students will take on the responsibility of an acting intern on the general pediatrics inpatient teams. They will collaborate with pediatric and medicine-pediatric interns and medical students in their foundational training. They will be supervised by pediatric and medicine-pediatric senior residents and faculty attendings.

**PED 7910. Pediatric Medical Residency.** (6 cr. max 120 cr.; No Grade Associated; Every Fall, Spring & Summer)

Pediatric medical residency.

**PED 7930. Pediatric Medical Fellowship.** (6 cr. max 120 cr.; No Grade Associated; Every Fall, Spring & Summer)

Pediatric medical fellowship.

**Performance of Veterinary Serv (PVS)**

**PVS 5881. Food Production, Manufacturing/Processing, and Supply Chains.** (1 cr.; S-N only; Every Summer)

Food commodities and agricultural crops play critical roles relevant to public health, energy and economic vitality, feeding the increasing global human population, and providing multiple outputs from feed for animals to fuel for vehicles, transportation and energy. Each time the course is offered it will focus...
on a different agricultural commodity which provides critical outputs for the state of MN. Some examples include corn, sugar beets, and soy beans. Individuals working or interested in complex food systems will benefit from the knowledge, networking, and breadth of understanding about agricultural commodities, as a means to think more critically about the interconnection of food, animal feed, fiber and fuel in the economics, culture and health of our society.

PVS 5882. Food governance, Policy and Regulation. (1 cr. : S-N only; Every Spring) This course provides an overview of food governance, policy, and regulation in the United States. The roles of legislative bodies and regulatory agencies at local, state, and national levels will be reviewed in order to explore the complexity of food policy. Current issues will be analyzed.

PVS 5883. Global Food Systems: Geography, Politics and Trade. (1 cr. : S-N only; Every Spring) This course explores the global distribution of food production and consumption in order to understand the dynamics of food systems including both domestic production and trade. The course provides students an opportunity to expand their knowledge about the drivers of global food systems and the complexity of the issues such as food security, global economic development and the implications of climate change, and sustainability.


PVS 5992. Animal Health and Food System Policy and U.S. Federal Government. (1 cr. : S-N only; Every Fall) This course is designed to immerse students in the national policy-making arena for animal health and food systems. Participants will interact with officials in relevant Federal government agencies as well as national stakeholder organizations and policy-relevant think tanks. The course will explore the role of scientific evidence in developing and implementing policy as well as the impact of politics and beliefs. The course will provide students an understanding and experience regarding the policy-making process as it pertains to trade, animal health, and food systems at the national levels.

PVS 5993. Animal Health and Food System Policy and Intergovernmental Organizations. (1 cr. : S-N only; Every Spring) Evidence-based policy development. Relevant global animal health and food system issue. Role of scientific evidence in developing/implementing policy. Policy-making process as it pertains to trade, animal health, and food system across intergovernmental organizations. Role of scientific evidence in intergovernmental organization's policy development. prereq: DVM or equiv degree or current DVM student or instr consent

PVS 5995. Engaging Intergovernmental Organizations. (2 cr. : S-N only; Every Fall & Spring) Each enrolled student will be expected prepare for the program prior to traveling to the off-campus site by becoming familiar with the relevant organizations which includes reading the background materials provided online. Prior to the off-campus component of the course, students will be asked to participate in an online webinar and work as a member of a virtual team in preparing an executive overview of one of the intergovernmental organizations to share with the entire class at the first meeting. Each student is also expected to participate in directed discussions, interact with key officials, perform group task assignments, and ultimately develop and share a presentation to foster professional networks and public-private-academic partnerships with relevant stakeholders.

PVS 5996. Professional Communications: Policy Issue Briefs. (1 cr. [max 2 cr.] : S-N or Audit; Every Fall & Spring) Critical review of scientific and lay literature. Principles of risk communication. Presentation of scientific information. Prepare and critique executive summaries of current topics for CAHFS Daily News. Support media interactions of CAHFS faculty. Generate fact sheets for use on CAHFS website. prereq: Students must have a professional or graduate degree related to human, animal, or ecosystem health or be pursuing a graduate degree (MS/PhD) or professional masters (MPH/MPA) or instruct consent

PVS 5997. Farm to Table Study Program. (1.5 cr. : Student Option; Every Fall) Explore the food system within a specific country while considering aspects of animal welfare/health, food safety, food protection, public health. Site visits along food supply chain. Discussions with government/private sector leaders. Interactive cross-culture group activities. prereq: instr consent


PVS 5999. Professional Communications: Daily News. (1 cr. [max 2 cr.] : S-N only; Every Fall & Spring) Meetings are commonplace in most organizations yet the effectiveness of these meetings is commonly questioned. Students will learn and practice some proven techniques for enhancing the effectiveness of meetings such as agendas, note-taking and preparation of minutes and meeting summaries. Most professionals utilize email as one of their most common forms of communication yet they’ve never learned how to maximize the likelihood that emails will be effective. Students will write and critique emails to enhance the effectiveness of their email communications.

### Periodontics (PERO)

**PERO 5123. Practice Management Externship.** (1 cr. : Student Option; Every Spring) Familiarizes periodontal students with the private practice environment and prepares them to select the type of practice they want to purchase or build and successfully manage their office. prereq: Resident in advanced education program in periodontology

**PERO 7321. Periodontics/Orthodontics Seminar.** (1 cr. : S-N only; Every Fall & Spring) Seminar related to postdoctoral work in periodontics/orthodontics.

**PERO 7322. Multidisciplinary Treatment Seminar in Dentistry Related to Periodontics.** (1 cr. : S-N or Audit; Every Summer) Series of multidisciplinary treatment seminars related to specialized fields in periodontology, endodontics, pediatric dentistry, AEGD/GPR, and prosthodontics dentistry, prereq: Resident enrolled in [periodontology, endodontics, pediatric dentistry, AEGD/GPR, prosthodontics]

**PERO 8000. Advanced Clinical Periodontology.** (1-3 cr. : A-F or Audit; Every Fall, Spring & Summer) Clinical training in examination, diagnosis, treatment planning, and various phases of prevention and treatment of periodontal diseases in patients. prereq: Resident in advanced education program in periodontology

**PERO 8200. Clinical Seminars.** (1 cr. : Student Option; Every Fall, Spring & Summer) bd prereq: Resident in advanced education program in periodontology

**PERO 8250. Anatomy of the Periodontium.** (1 cr. : A-F or Audit; Fall Odd Year) Gingival tissues, cementum, periodontal ligament, and alveolar bone discussed from histological, physiological and pathological point of view. prereq: Resident in advanced education program in periodontology

### Pharmaceutics (PHM)

**PHM 5200. New-Drug Development Process.** (1 cr. : Student Option; Periodic Fall & Spring) New-drug development process in the U.S. pharmaceutical industry.

**PHM 6738. Pharmacokinetics.** (0 cr. : A-F or Audit; Every Fall) Designed to give generalist practitioners fundamental skills to solve pharmacokinetically-based problems in patient care, particularly in regards to dosage regimen design/adjustment. Follows path of drug molecule from incorporation into dosage form to release/disposition in biological system. Requires instructor consent.

**PHM 8100. Seminar: Pharmaceutics.** (1 cr. [max 4 cr.] : S-N or Audit; Every Fall & Spring) Prereq: Grad Phm major
PHM 8110. Readings in Pharmaceutics. (1 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring)
Current literature. prereq: Grad Phm major

PHM 8120. Readings in Central Nervous System (CNS) Drug Delivery. (1 cr. [max 4 cr.]; S-N only; Every Fall & Spring)
Weekly discussion of recent publications or new techniques, methods, and analyses on delivery of drugs to central nervous system. Topics vary. Informal presentations from CNS drug delivery researchers. prereq: instr consent

PHM 8150. Pharmacokinetics Research Seminar. (1 cr. [max 12 cr.]; S-N or Audit; Every Fall & Spring)
Current concepts and literature review. prereq: Grad Phm major

PHM 8210. Pharmacokinetics Module. (1 cr. [max 2 cr.]; S-N only; Every Fall)
Foundational materials in pharmacokinetics for pharmaceutics graduate students.

PHM 8220. Physical Pharmacy Module I. (1 cr. [max 2 cr.]; S-N only; Every Fall)
First course in a two course sequence which provides foundational materials in physical pharmacy for pharmaceutics graduate students.

PHM 8230. Physical Pharmacy Module II. (1 cr. [max 2 cr.]; S-N only; Every Spring)
Second course in a two course sequence which provides foundational materials in physical pharmacy for pharmaceutics graduate students.

PHM 8240. Biopharmaceutics Module. (1 cr. [max 2 cr.]; S-N only; Every Spring)
Foundational materials in biopharmaceutics for pharmaceutics graduate students.

PHM 8295. Research Problems in Pharmaceutics. (1-12 cr. [max 72 cr.]; S-N or Audit; Every Fall, Spring & Summer)
Experimental investigation of problems in pharmaceutics. prereq: instr consent

PHM 8333. FTE: Master’s. (1 cr. [max 12 cr.]; S-N only; Every Fall & Spring)
Student-presented seminars. prereq: Grad student or instr consent

PHM 8411. Solubility and Solid-State Properties of Drugs. (3 cr.; A-F or Audit; Fall Odd Year)
Physical/physicochemical properties of drugs in solid state as related to drug delivery. prereq: Physical chem course survey or instr consent

PHM 8443. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

PHM 8481. Advanced Neuropharmaceutics. (4 cr.; A-F or Audit; Fall Even Year)
Delivery of compounds to central nervous system (CNS) to activate proteins in specific brain regions for therapeutics benefit. Pharmaceutical/pharmacological issues specific to direct drug delivery to CNS. prereq: instr consent

PHM 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PHM 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

PHM 8900. Special Topics in Pharmaceutics. (1-4 cr.; Student Option; Periodic Fall & Spring)
Special topics in Pharmaceutics

Pharmacology (PHCL)

PHCL 5102. Pharmacology for Pharmacy Students II. (2 cr.; A-F only; Every Spring)
Action/fate of drugs. prereq: 5101 or instr consent

PHCL 5109. Problems in Pharmacology. (1-18 cr.; Student Option; Every Fall, Spring & Summer)
Research projects and special problems by arrangement. prereq: Upper div or grad student or instr consent

PHCL 5110. Introduction to Pharmacology. (3 cr.; A-F or Audit; Every Fall)
Basic principles of Pharmacology. Focuses on molecular mechanisms of drug action. prereq: Grad student or instr consent

PHCL 5111. Pharmacogenomics. (3 cr.; A-F or Audit; Every Spring)
Human genetic variation, its implications. Functional genomics, pharmacogenomics, toxicogenomics, proteomics. Interactive, discussion-based course. prereq: Grad student or instr consent

PHCL 5112. A Graduate Toolkit I: An Introduction to the Scientific Research Lab. (1 cr.; A-F only; Every Fall)
Basic operating principles/techniques of scientific research lab. Personnel structure, professionalism, authorship/publication. Recombinant protein production/purification, DNA/RNA purification/analysis, molecular biology methods, microscopy, model systems/bioinformatics. prereq: instr consent

PHCL 5113. A Graduate Toolkit II: Scientific Speaking and Writing for Graduate Students. (2 cr.; A-F only; Every Fall)
Guidance on PowerPoint design, public speaking, question/answer sessions at scientific talks. Practice sessions are videotaped/analyzed to highlight strategies for improvement. Guidance in writing thesis research topic. prereq: Completion of one yr of a grad program

PHCL 5462. Neuroscience Principles of Drug Abuse. (2 cr.; Student Option; Periodic Spring)
Current research on drugs of abuse, their mechanisms of action, characteristics shared by various agents, and neural systems affected by them. Offered biennially, spring semester of even-numbered years. prereq: instr consent

PHCL 8014. Small RNA Biology. (2 cr.; A-F or Audit; Every Spring)
Small RNAs as major regulators of gene/protein expression. MicroRNAs and their potential use in diagnosis/prognosis of various disease conditions, including cancers. Biology of small RNAs and their role in health and disease. prereq: BIOC 8002 or MICA 8004 or equiv or instr consent

PHCL 8026. Neuro-Immune Interactions. (3 cr.; Student Option; Every Fall)
Regulatory systems (neuroendocrine, cytokine, autonomic nervous systems) linking brain/immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. prereq: MICA 8001 or equiv or instr consent

PHCL 8100. Laboratory Research in Pharmacology. (4 cr.; [max 8 cr.]; S-N only; Every Fall & Spring)
Supervised independent research in pharmacology. Modern biomedical/pharmacology research methodology, data generation/analysis. Formulation/testing of basic science hypotheses. prereq: Grad student or instr consent

PHCL 8200. Seminar: Selected Topics in Pharmacology. (1 cr.; [max 8 cr.]; A-F only; Every Fall & Spring)
Student-presented seminars. prereq: 5212 or instr consent

PHCL 8207. Seminar: Psychopharmacology. (1 cr.; Student Option; Every Fall & Spring)
For graduate students and postdoctorals interested in studies and research associated with psychotropic drugs and chemicals. Neurochemistry, pharmacology, and behavior as antecedent or consequential variables.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

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Some seminars devoted to biomedical ethics. prereq: instr consent

PHCL 8208. Neuropsychopharmacology. (3 cr.; A-F or Audit; Fall Every Year) Relationships between drugs/biochemical, behavioral, neurophysiological consequences. Functional biogenic amine, peptidergic. How manipulations alter neuronal function or behavior. Feedback mechanisms, induction, inhibition. Reinforcement of, tolerance to, or dependence on drugs. prereq: [5212, Psy 5021, Psy 5061] or instr consent

PHCL 8209. Substance Abuse at the Bedside. (1 cr.; S-N only; Every Fall & Spring) Clinical management of addictive diseases. Students discuss how observed clinical interactions can influence a basic science project in which they are involved. prereq: Grad student in any basic-science program

PHCL 8211. Advanced Medical Pharmacology I. (5 cr.; A-F only; Every Spring) Online content focused on organ system-based study of medical therapeutics. In-class content focused on current biomedical literature. Develop critical reasoning skills needed to interpret/critique basic science, translational, clinical research papers/presentations. prereq: [max 5110]. [grad student or instr consent]

PHCL 8212. Advanced Medical Pharmacology II. (3 cr.; A-F only; Every Summer) Online content focused on organ system-based study of medical therapeutics. In-class content focused on current biomedical literature. Develop critical reasoning skills needed to interpret/critique basic science, translational, clinical research papers/presentations. prereq: 8211 or instr consent

PHCL 8217. Problems in Investigative Pharmacology. (0 cr.; S-N or Audit; Every Fall) Presentation and discussion of contemporary research problems, investigative approaches, and methodologies in experimental pharmacology. Related to cardiovascular, renal, endocrine, and autonomic pharmacology: neuropharmacology; psychopharmacology; chemotherapy; toxicology; and molecular pharmacology.

PHCL 8221. Neurobiology of Pain and Analgesia. (3 cr.; Student Option; Periodic Fall & Spring) Course offered triennially. prereq: instr consent

PHCL 8222. Transdisciplinary Tobacco Research. (1 cr.; max 2 cr.; S-N or Audit; Fall Odd Year) Transdisciplinary science, its application to nicotine/tobacco research. Transdisciplinary theories/methods, examples of their application/integration. Draws on TTURC/local investigators, public health advocates. Offered every other year. prereq: instr consent

PHCL 8320. Readings in Neurobiology. (1-4 cr.; Student Option; Every Fall & Spring) Topics in neurobiology/neurophysiology. prereq: instr consent

PHCL 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

PHCL 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

PHCL 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; max 12 cr.) No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

PHCL 7777. Thesis Credits: Master’s. (1-18 cr.; max 50 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PHCL 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Pharmacy (PHAR)

PHAR 5200. Drugs and the US Health Care System. (3 cr.; Student Option; Every Fall & Spring) Being an empowered patient is important when discussing ethics-driven issues within the U.S. health care system. This course will expose students to current controversial issues surrounding medications and national health care and help students examine their own role as a participant in this system. Students will learn to draw comparisons between medication use systems around the world and analyze other controversies related to access, choice, and quality of health care. During this course, students will understand how their choices, ethics and behavior affect societal decisions surrounding the availability of medications in the US and what their rights are as a citizen-participant during the health care debate. This is a completely online course with weekly due dates offered each Fall and Spring term. For more information, contact phar5200@umn.edu or 612-624-7976.

PHAR 5205. Obesity: Issues, Interventions, Innovations. (2 cr.; Student Option; Every Fall & Spring) This course will focus on the role of the pharmacist in treating obesity. Students will learn the pharmacology of past and current medications to treat obesity, as well as the pathophysiology of the disease to understand why more options aren’t available. Students will explore drug information sources for dietary supplements for weight loss, discuss the care of an obese patient including nonpharmacologic treatments for obesity, as well as recognizing the potential for bias and its effect on patient care. Finally, students will look at bariatric surgery and discuss some specific adjustments in care for bariatric patients. This is a completely online course with weekly due dates offered each Fall and Spring term. For more information, contact phar5205@umn.edu or 612-624-7976. Prereq: Second or third year pharmacy student, or student enrolled in a graduate science or health-related program. Biochemistry and physiology suggested.

PHAR 5212. Survey of Pediatric Metabolic, Genetic, and Oncologic Disease. (2 cr.; A-F only; Every Fall & Summer) Appraisal of major genetic/metabolic disorders and oncologic diseases of childhood. Disease state epidemiology, pharmacotherapy, monitoring, practical applications. prereq: Second year or higher in College of Pharmacy or instr consent

PHAR 5230. Principles of Clinical Pharmacology Research. (2 cr.; A-F only; Every Fall) Drug therapy investigation. Topics include experimental design of drug studies in human research subject volunteers. Topics related to individualization of therapy including effects of genetic polymorphisms, demographic variables, physiologic variables, age on drug disposition treatment outcomes. prereq: 3rd Year Pharmacy Student or instr consent


PHAR 5700. Applied Fundamentals of Pharmacotherapy. (0 cr.; A-F only; Every Fall, Spring & Summer)
Pharmacotherapy, the treatment of disease through the administration of medications, is a field particularly interesting to many health care workers. This course is designed to introduce students to some of the main drug classes available for the treatment of particular diseases. Students will also learn about basic pharmacology, recognize brand and generic drug names, and explore their common uses and therapeutic classes. A basic understanding of treatment options available for common disease states will also be developed during this course. Additionally, the course develops basic proficiency in the use of drug information resources. This is a completely online course with due dates throughout the semester, though students have the option to work ahead if they choose. This course is offered each Fall, Spring, and Summer term. For more information, contact phar3700@umn.edu or 612-624-7976. Prereq: Medical terminology recommended.

PHAR 5800. Pharmacotherapy for the Health Professions. (3 cr.; A-F only; Every Fall) Pharmacotherapy, the treatment of disease through the administration of medications, is a topic central to the practice of nursing. This course is designed to introduce you to the main drug classes available for the treatment of particular diseases and the monitoring parameters for patients taking these medications. You will also learn about basic pharmacology, recognize brand and generic drug names, and explore their common uses and therapeutic classes. A basic understanding of contraindications and precautions related to various classes of medications will also be covered. Additionally, the course develops basic proficiency in the use of drug information resources. This is a completely online course with weekly due dates offered each Fall term. For more information, contact phar5800@umn.edu or 612-624-7976. Prereq: Anatomy and physiology.


PHAR 6123. Pharmacotherapy III: Patient-centered Pathophysiological Approach. (5 cr.; A-F only; Every Fall) Pathophysiology/pharmacotherapy of common neurologic, psychiatric, pulmonary, geriatric disorders. prereq: 6122, 6163, concurrent registration is required (or allowed) in 6175, PHCL 5101, PHCL 5102.


PHAR 6131. Pharmacy and the Health Care System. (3 cr.; A-F only; Every Spring) Delivery of pharmaceuticals/pharmacy services in U.S. health care system. Issues in hospital/community practice, characteristics of pharmaceutical industry. Economic/financial issues in delivering pharmaceutical services. prereq: 2nd year pharmacy student.

PHAR 6133. Pharmacy Practice Management. (3 cr.; A-F only; Every Spring) Principles of pharmacy management, including inventory control, purchasing, pricing, financial analysis, personnel management. prereq: 3rd year pharmacy student.

PHAR 6135. Pharmacy Outcomes. (2 cr.; A-F only; Every Spring) How to integrate knowledge of basic sciences, pharmacotherapy, pharmacy practice management, pharmaceutical care, written communication, literature evaluation, drug information retrieval, law/ethics, and pharmacoconomics to manage patients with multiple medical conditions. prereq: 6123, 6175.

PHAR 6137. Ethics in Pharmacy Practice. (1 cr.; A-F only; Every Spring) Theories of ethics, ethical analysis of practical ethical issues experienced by pharmacists. Relationship of ethical reasoning to public policy and law. Readings from peer-reviewed publications and popular media. Case studies. prereq: 3rd yr pharmacy student.

PHAR 6150. CoP Honors: Medicinal Chemistry Seminar. (1 cr.; [max 2 cr.]; A-F only; Every Fall & Spring) Current topics in medicinal chemistry. prereq: instr consent.

PHAR 6151. Biochemistry of Medicinals I. (3 cr.; A-F only; Every Fall) Biochemistry topics required for understanding pharmacodynamic action/therapeutic use of medicinal agents. prereq: 1st yr PHAR, 6171.


PHAR 6155. Medicinal Agents II. (2 cr.; A-F only; Every Spring) Chemical/biological properties and therapeutic uses of drugs affecting central nervous, endocrine, and intermediary metabolism systems. prereq: 6154, concurrent registration is required (or allowed) in 6174 and PHCL 5102.

PHAR 6156. Medicinal Agents III. (4 cr.; A-F only; Every Fall) Therapeutic properties/use of antiviral, antinfective, antineoplastic agents. prereq: 6151, 6141.

PHAR 6157. Human Nutrition and Drug Therapy. (3 cr.; A-F only; Every Spring) Basic concepts of human nutrition and clinical application. prereq: 6152.

PHAR 6158. Recombinant DNA-Derived Drugs. (1 cr.; A-F only; Every Spring) Biotechnology as it relates to basic/clinical pharmacological sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease. prereq: 6151.

PHAR 6160. CoP Honors: Experimental and Clinical Pharmacology Seminar. (1 cr.; A-F only; Every Fall & Spring) Selected topics in experimental/clinical pharmacology. prereq: instr consent.

PHAR 6164. Biopharmaceutics. (3 cr.; A-F only; Every Fall) Applied theory of dosage form design for optimal drug activity/bioavailability for all routes of drug administration. prereq: 6161, 6162, 6163.

PHAR 6174. Pharmaceutical Care Skills IV. (2 cr.; A-F only; Every Spring) Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting. prereq: concurrent registration is required (or allowed) in 6122.

PHAR 6175. Pharmaceutical Care Skills V. (2 cr.; A-F only; Every Fall) Integrates basic/clinical science curriculum lab setting. prereq: concurrent registration is required (or allowed) in 6171, 6172, 6173, 6174, 6111, 6112 or instr consent.


PHAR 6182. Pharm.D. IV Seminar. (1 cr.; S-N only; Every Fall) Students present thesis topics to peers and faculty evaluators. prereq: 4th yr pharmacy student, 6181.

PHAR 6183. Pharm.D. IV Paper. (2 cr.; S-N only; Every Fall, Spring & Summer) Final paper describing hypothesis-driven research project, patient-care oriented project, management project, drug-usage evaluation, or extensive literature review. prereq: 6181.

PHAR 6203. College of Pharmacy Community Outreach. (1-2 cr.; [max 3 cr.]; A-F only; Every Fall, Spring & Summer) Apply knowledge gained in classroom and teaching laboratories to community-based patient care activities. prereq: Current student pharmacist in College of Pharmacy.

PHAR 6205. Interprofessional Teamwork for the Health Professions. (1 cr.; A-F only; Every Fall) Interprofessional education that provides an introductory experience to interprofessional teamwork skills with a focus on patient-centered care, especially end of life care. prereq: Major in [public health or nursing or medicine or dentistry or social work or pharmacy].

PHAR 6208. Community-based Immunization Delivery. (1 cr.; S-N or Audit; Every Fall)
Students will learn about, plan, and implement influenza immunization clinics.

PHAR 6211. Non-Prescription Drug Therapy: Focus on Patient Self-Care. (2 cr.; A-F or Audit; Every Spring)
Over-the-counter medications. Diagnostic/durable medical equipment available in community pharmacies. Use of alternative medications. prereq: 6112

PHAR 6212. Dermatology. (1 cr.; A-F or Audit; Every Fall)
Pathophysiology/pharmacotherapy of dermatologic disorders. prereq: 3rd yr Pharmacy student

PHAR 6215. Applied Pharmacokinetics. (2 cr.; A-F or Audit; Every Spring)
Applying clinical pharmacokinetics and assay methodologies to patient care. Assessing drug therapy outcomes. prereq: 6163

PHAR 6217. Advanced Pharmaceutical Care Clinic. (1-2 cr.; Student Option; Every Spring)
Expanded, direct patient care opportunities. Students conduct comprehensive pharmaceutical care assessments in presence of practitioners. Weekly student case presentations/discussions. prereq: [6230] or 3rd yr pharmacy student

PHAR 6219. Building a Pharmaceutical Care Practice. (2 cr.; A-F only; Every Spring)
Initiating pharmaceutical care practice. Building personal practice plan. prereq: 2nd or 3rd year pharmacy student

PHAR 6220. Pediatric Drug Therapy. (2 cr.; A-F only; Every Spring)
Pathophysiology/therapeutics of disease states. Common issues encountered in providing pharmaceutical care to pediatric patients.

PHAR 6222. Advanced Pharmaceutical Compounding. (2 cr.; A-F only; Every Fall & Spring)
Expands skills gained in pharmaceutical care lab. prereq: 2nd or 3rd year pharmacy student

PHAR 6223. Pharmacokinetics Research Seminar. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring)
Evaluate literature in pharmacokinetics/pharmacodynamics/drug metabolism. prereq: 6163 with grade of "B" or better

PHAR 6224. Pharmacogenomics: Genetic Basis for Variability in Drug Response. (2 cr.; A-F only; Every Spring)
Theory/practice of pharmacogenomics. Principles of human genetics/genomics. Applications to scientific education, problems in drug therapy optimization, patient care. prereq: At least 3rd year or later in healthcare or related program or equivalent experience or instr consent

PHAR 6226. Interprofessional Diabetes Experience. (2 cr.; A-F only; Every Spring)
Diabetes mellitus through active, hands-on learning in interprofessional environment. Participate in week-long experience of living with diabetes. Online learning activities. prereq: 2nd year or later pharmacy student

PHAR 6227. Leading Adaptive Change. (2 cr.; S-N only; Every Fall)
Hands-on experience leading change initiative. Create vision for change, plan approach, implement plan, evaluate outcomes. Project focuses on area of pharmacy practice or education.

PHAR 6230. Ambulatory Pharmaceutical Care Clinic. (2 cr.; Student Option; Every Spring)
How to conduct pharmaceutical care assessments, for patients with actual drug-related needs, in a controlled clinic setting. prereq: Enrolled pharmacy student

PHAR 6231. Community Pharmacy Management. (2 cr.; A-F only; Every Spring)
Management techniques needed in community pharmacy practice. Emphasizes marketing/service.

PHAR 6232. Health System Pharmacy Management. (2 cr.; A-F only; Every Spring)
Management techniques needed in various institutional pharmacy settings. Integrating distributive/clinical components of institutional practice. prereq: 2nd or 3rd yr pharmacy student

PHAR 6233. Drug Use Review and Management. (2 cr.; A-F only; Every Fall)
Principles of drug use review in various health care settings. Optimizing quality, minimizing cost. prereq: 3rd year Pharmacy student

PHAR 6234. Pharmaceutical Economics and Public Policy. (2 cr.; A-F only; Every Spring)
Economic and public policy aspects of the U.S. health care system. Health economic principles and trends applied to the pharmaceutical market.

PHAR 6235. Pharmaceutical Industry: Business and Policy. (2 cr.; A-F or Audit; Every Spring)
Developing, manufacturing, distributing, economically evaluating, purchasing, managing, and ordering pharmaceuticals in health sector. Unique market characteristics, complex regulatory processes, rapid technological change, high expense growth, public policy issues.

PHAR 6236. Clinical/Pharmacy Management in Modern U.S. Health-Care and Regulatory Landscape. (2 cr.; A-F only; Every Fall)
This interactive course provides diverse introductory exposure to key non-traditional pharmacy topics within the broader, complex, and evolving US healthcare and managed care landscape. Class entails expertise and critical evaluation of clinical and pharmacy management topics such as utilization & care management, formulary, clinical planning, HEOR, healthcare policy and strategy, clinical account management, specialty pharmacy, Medicare, benefits consulting, pharmaceutical industry, business issues in managed care, and clinical pharmacy leadership. Relevant regulatory topics such as drug development are included as complementary topics, time permitting.

PHAR 6237. Leading Change in Pharmacy I. (2 cr.; S-N only; Every Fall)
Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6238. Leading Change in Pharmacy II. (2 cr.; S-N or Audit; Every Spring)
Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6249. Addiction Medicine, Substance Abuse, and Chemical Dependency. (2 cr.; A-F or Audit; Every Spring)
Addiction, chemical abuse, chemical dependency. How pharmacists can impact those affected. prereq: 2nd or 3rd yr Pharmacy student

PHAR 6250. CoP Honors: Social and Administrative Pharmacy Seminar. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring)
Current topics in hospital pharmacy. prereq: instr consent

PHAR 6260. CoP Honors: Pharmaceutics Seminar. (1 cr.; A-F or Audit; Every Fall & Spring)
Contemporary topics in pharmaceutics research. prereq: instr consent

PHAR 6293. Directed Research I. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology. prereq: instr consent

PHAR 6294. Directed Study I. (1-5 cr.; Student Option; Every Fall, Spring & Summer)
Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, experimental or clinical pharmacology.

PHAR 6301. Veterinary Pharmacotherapy. (2 cr.; A-F only; Every Spring)
Pharmacotherapy of common medical conditions of small animals. prereq: 3rd year pharmacy student

PHAR 6393. Directed Research II. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology. prereq: instr consent

PHAR 6394. Directed Study II. (1-5 cr.; A-F or Audit; Every Fall, Spring & Summer)
Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

PHAR 6493. Directed Research III. (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer)
Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology. prereq: instr consent

PHAR 6494. Directed Study III. (1-5 cr.; S-N only; Every Fall, Spring & Summer)
Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.
PHAR 6700. Becoming a Pharmacist. (2 cr.; S-N only; Every Fall)
Introduction to knowledge, skills, attitudes necessary for success in professional pharmacy curriculum/practice of pharmacy.

PHAR 6701. CoP Community Outreach. (0 cr.; No Grade Associated; Every Fall, Spring & Summer)
Teaching laboratories to community-clinic-based interprofessional patient care model.

PHAR 6702. Integrated Biochemical Sciences. (4.5 cr.; A-F only; Every Fall)
Foundation in structure/function of medications. Familiarize students with structural/physical properties of proteins, nucleic acids, lipids, carbohydrates, ligands/drugs. Basic concepts central to structure-function relationships of therapeutics. prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 6704. Foundations of Social and Administrative Pharmacy. (2.5 cr.; A-F only; Every Fall)
Foundation for how one should think about rational use of drugs in system of care. Content/skills learned will be applied in subsequent courses continuing through 4th year of curriculum. Module focused on Drug Literature Evaluation (DLE), prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 6706. Foundations of Pharmaceutical Care. (1.5 cr.; A-F only; Every Fall)
How pharmacist should think about rational use of drugs in caring for patients. Content/skills learned will be applied in provide framework for all subsequent courses continuing through 4th year of curriculum/lifelong into practice. prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 6708. Drug Delivery I. (2.5 cr.; A-F only; Every Fall)
Fundamental physicochemical principles applicable to dosage forms. Foundational scientific principles (continued in DDI) illuminated with examples of solution drug dosage forms. Concepts relevant to current/future dosage forms. prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 6710. Pharmaceutical Care Skills Lab I. (2 cr.; S-N only; Every Fall)
Introduction to profession/building skills necessary to become competent, caring pharmaceutical care practitioner. Course consists of laboratory section and lecture. prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 6715. Professional Development and Assessment Sequence I. (1 cr.; A-F only; Every Spring)
Knowledge acquisition. Career/professional development. prereq: Successful completion of Becoming a Pharmacist

PHAR 6716. Applied Pharmaceutical Care. (3.2 cr.; A-F only; Every Spring)
Common medical conditions/medications students are likely to encounter during their introductory pharmacy practice experiences (IPPEs). prereq: Successful completion of Becoming a Pharmacist

PHAR 6717. Drug Delivery II. (2.4 cr.; A-F only; Every Spring)
Builds on Drug Delivery I. Dosage forms, mostly solid dispersed. Chemical kinetics, chemical stability, buffer systems, polymers/ proteins, thermodynamics. Physicochemical principles relevant to design, preparation, storage, use, efficacy, evaluation of pharmaceutical dosage forms. prereq: Successful completion of Drug Delivery I

PHAR 6720. Pharmaceutical Care Skills Lab II. (2 cr.; A-F only; Every Spring)
Part of pharmaceutical care learning center curriculum spanning six semesters. Introduction to profession. Begin building skills necessary to become competent/caring pharmaceutical care practitioner. prereq: Successful completion of Drug Delivery I

PHAR 6722. Principles of Medicinal Chemistry. (2.1 cr.; A-F only; Every Spring)
Discipline of medicinal chemistry. Principles of drug design/drug metabolism. prereq: Successful completion of Integrated Biochemical Sciences

PHAR 6724. Immune System and Infectious Disease. (3.1 cr.; A-F only; Every Spring)
Immunological, epidemiological, pathogenic basis of viral, bacterial, protozoal, fungal, helminthic disease. Biological composition of vaccines/immunologic response to live attenuated pathogens/microbial extracts. Chemical, cellular, biological principles of immune system, prereq: Successful completion of Integrated Biochemical Sciences

PHAR 6726. Principles of Pharmacology. (2.3 cr.; A-F only; Every Spring)
Builds on information in basic science courses offered in first semester of PharmD program. Foundational content necessary for comprehension/application of all subsequent pharmacotherapy modules that require application of pharmacological concepts/knowledge. prereq: Successful completion of Foundations of SAPh

PHAR 6728. Pharmaceutical Calculations. (0.7 cr. [max 3.1 cr.]; A-F only; Every Fall)
Accurately performing pharmaceutical calculations is a critical component of patient care in every pharmacy practice environment. Calculations contribute just as much to good patient outcomes as the newest methods and guidelines for diagnosis, treatment, and prevention. The challenge of pharmacy calculations lies not in the cutting edge of science or their mathematical complexity, but in the need for consistent accuracy to prevent patient harm and possible fatality. To obtain this level of accuracy, an understanding of methods and deliberate, unfiltered attention to detail is required. Students must understand and master the basic concepts of pharmaceutical calculations with organization, consistency, and accuracy in order to provide optimal care to their future patients every day. Students should be committed to becoming a competent generalist practitioner who assumes responsibility and is willing to be held accountable for their patients’ medication outcomes. prereq: enrolled in the PharmD program, successful completion of Pharm 6700

PHAR 6730. Career and Professional Foundations II. (0.5 cr.; S-N only; Every Fall)
Emphasis on reinforcing, supporting, developing, assessing competencies/skills exercised in multiple courses. Includes work in career/professional development. prereq: Prior concurrent registration is required (or allowed) in I

PHAR 6732. Medicinal Chemistry and Pharmacology of Cardiovascular Agents. (2.3 cr.; A-F only; Every Fall)
Builds upon foundational concepts learned in Principles of Pharmacology/Principles of Medicinal Chemistry, applies them to drug classes primarily used for treatment of cardiovascular diseases. prereq: Principles of Pharmacology, Principles of Medicinal Chemistry

PHAR 6734. Cellular Metabolism and Nutrition. (2.8 cr.; A-F only; Every Fall)
Basic principles of intermediary metabolism/how such processes are used by body. Basic nutrients used by body/their roles as OTC products in community pharmacies. prereq: Integrated Biochemical Sciences

PHAR 6736. Cardiovascular Pharmacotherapy. (1.9 cr.; A-F only; Every Fall)
Key topics critical to preparing generalist practitioner to have input on optimizing care of patients with common conditions such as hypertension, dyslipidemia, ischemic heart disease (angina, acute myocardial infarction) supraventricular arrhythmias (atrial fibrillation), chronic heart failure. prereq: All PharmD year one coursework, Physiology Competency Exam

PHAR 6738. Pharmacokinetics. (3.7 cr.; A-F only; Every Fall)
Designed to give generalist practitioners fundamental skills to solve pharmacokinetically-based problems in patient care, particularly in regards to dosage regimen design/adjustment. Builds on concepts learned in Drug Delivery I/II. Follows path of drug molecule from incorporation into dosage form to release/disposition in biological system. prereq: Drug Delivery I concurrent registration is required (or allowed) in II

PHAR 6740. Pharmaceutical Care Skills Lab III. (2 cr.; S-N only; Every Fall)
Designed for second year pharmacy students to continue to build skills necessary to become pharmaceutical care practitioner. Laboratory section/discussion. prereq: Pharmaceutical Care Skills Lab I concurrent registration is required (or allowed) in II, Applied Pharmaceutical Care

PHAR 6742. Evidence based problem analysis I. (1 cr.; S-N only; Every Spring)
Practice skills necessary to research, prepare, present scholarly paper/seminar. Builds on Biostatistics/Drug Literature Evaluation material from "Becoming a Pharmacist, Foundations of Social/Administrative Pharmacy, Foundations of Pharmaceutical Care." prereq: Becoming a Pharmacist, Foundations of Social and
Administrative Pharmacy, Foundations of Pharmaceutical Care

PHAR 6745. Professional Development and Assessment III. (0.5 cr.; A-F only; Every Spring)
For the second year of the Professional Development and Assessment Sequence, the emphasis is on knowledge comprehension. Class includes work in career and professional development. Successful completion of Professional Development and Assessment I concurrent registration is required (or allowed) in II

PHAR 6748. Biopharmaceutics. (2.6 cr.; A-F only; Every Spring)
Biopharmaceutics is the final course in a four-course sequence that comprises the curriculum in pharmaceutics. Biopharmaceutics integrates core knowledge obtained in the previous three courses (Drug Delivery I & II and Pharmacokinetics), and also relies on general knowledge in anatomy, physiology, mathematics, general chemistry, and pharmacology. prereq: Courses and/or content: Calculus, thermodynamics, viscosity, sedimentation, diffusion, chemical kinetics, novice to developing level understanding of dosage forms, developing understanding of pharmacokinetics/pharmacodynamics, physiology, general chemistry, physics, biochemistry, enzyme kinetics, and metabolic pathways. It is strongly recommended that students review course materials in Drug Delivery I concurrent registration is required (or allowed) in II and Pharmacokinetics as well as anatomy, physiology, calculus, and physics with consideration of the application of the concepts to the delivery of drugs to patients.

PHAR 6750. Pharmaceutical Care Skills Lab IV. (2 cr.; A-F only; Every Spring)
This course is designed for second-year pharmacy students to continue to build the skills necessary to become a competent, caring pharmaceutical care practitioner. prereq: Students must have successfully completed Pharm Care Skills 1, 2, and 3, and Applied Pharmaceutical Care. Students must be concomitantly registered in all required PD2 courses in order to have the content required to complete integrated activities, e.g., students must be enrolled in Diabetes in order to successfully complete the patient care sequence utilizing diabetes content in this course. Exceptions may be made on a case by case basis.

PHAR 6752. Integrated Endocrinology. (2.1 cr.; A-F only; Every Spring)
This course will integrate all pertinent endocrinology topics (excluding diabetes) into one course. Specifically, the pathophysiology, medicinal chemistry, pharmacology and the therapeutic application of the this knowledge will be covered in an integrated approach via specific modules. All major endocrine pathways will be taught including: hypothyroid/pituitary, steroids, female sex hormones, hormonal contraception, menopause/hormone therapy, bone health, male gonadal hormones, drugs in pregnancy and lactation, sexual dysfunction and thyroid hormone. prereq: Students will need to have successfully completed: - Cellular Metabolism/Nutrition, - Cardiovascular Pharmacotherapy - Pharmaceutical Care Skills Labs 1-3. Students should be concurrently enrolled in Kidney, Fluids, and Electrolytes, and Diabetes and Metabolic Syndrome. Students should be able to describe the function of the overall endocrine systems and the multiple roles of hormones in the body.

PHAR 6754. Diabetes and Metabolic Syndrome. (2.1 cr.; A-F only; Every Spring) In this course, students will learn the principles of the pathophysiology of diabetes, pharmacology of the antidiabetic agents, evaluate key research on diabetes, interpret and apply clinical guidelines for diabetes, assess socioeconomic aspects of diabetes, and apply this information to patient cases. Special populations with diabetes will also be discussed including pediatic, gestational, and geriatric diabetes. Students will also learn the the pathophysiology of metabolic syndrome, pharmacology of obesity treatments, nonpharmacological and pharmacological ways to treat metabolic syndrome, including the implications of bariatric surgery on use of pharmacologic agents in general, and apply this information to patient cases. prereq: Students will have to successfully completed: Molecular Metabolism/Nutrition, Cardiovascular Pharmacotherapy concurrent registration is required (or allowed) in Pharmaceutical Care Skills Lab 1-3. Students should be able to describe the physiology of insulin action, incretin hormones, amylin, and the fasting and fed states. Students should be able to describe how insulin is designed and manufactured. Students should be able to describe the following biochemistry topics: carbohydrate metabolism and lipid metabolism, and protein. Students should be able to assess a patient and determine most appropriate pharmacotherapy treatment options for a patient's hypertension and dyslipidemia treatments, including ability to describe, interpret and apply evidence-based guidelines. Students should be able to describe how nutrition impacts energy production, utilization and storage, and obesity. Students need to be able to describe the caloric content of carbohydrates, proteins and lipids and be able to apply that knowledge to reading food labels and evaluating a patient's nutritional status.

PHAR 6756. Kidney, Fluid, and Electrolytes. (2.1 cr.; A-F only; Every Spring)
About 75% of new cases of chronic kidney disease (CKD) are due to diabetes and hypertension. Patients with CKD often experience congestive heart failure and anemia. In addition, the kidney is the main excretory route for many drugs. Thus, this course offers an opportunity to integrate material learned in previous and concurrent courses. In this course, students will learn key concepts and develop specific skills in the management of common fluid and electrolyte and single acid/base disorders and in prevention and management of chronic kidney disease and associated conditions. prereq: Students must have completed the following courses successfully: - Applied Pharmaceutical Care, - Foundations of Social and Administrative Pharmacy, - Medicinal Chemistry and Pharmacology of Cardiovascular Agents, - Pharmacokinetics, - Cardiovascular Pharmacotherapy, - Cellular Metabolism and Nutrition See the course syllabus for more detailed prerequisites.

PHAR 6758. Pulmonary Pharmacotherapy. (1.1 cr.; A-F only; Every Spring)
This course will provide students with the requisite pathophysiology and pharmacotherapeutic knowledge to care for patients with common pulmonary diseases. It will integrate concepts of pediatric and geriatric pulmonary dosing and infectious diseases. prereq: Students must have completed the following courses successfully: - Applied Pharmaceutical Care - Foundations of Social and Administrative Pharmacy - Medicinal Chemistry and Pharmacology of Cardiovascular Agents - Pharmacokinetics, - Cardiovascular Pharmacotherapy, - Cellular Metabolism and Nutrition See the course syllabus for more detailed prerequisites.

PHAR 6760. Career and Professional Foundations IV. (0.5 cr.; S-N only; Every Fall)
For the third year of the Professional Development and Assessment sequence, the emphasis will be on deeper exploration into career options, as well as the tools needed for contemporary pharmacy practice. Students will have the opportunity to engage with their peers as well as practicing pharmacists as they learn about the expectations of contemporary professional practice. prereq: PHAR 6715, 6730, 6745

PHAR 6762. Medicinal Chemistry and Neuropharmacology. (2.8 cr.; A-F only; Every Fall)
Neuropharmacology and Medicinal Chemistry of Neurological Treatments builds upon the foundational concepts learned in Principles of Pharmacology and Principles of Medicinal Chemistry, and applies them to drug classes primarily used for the treatment of central nervous system (CNS) and peripheral nervous system (PNS) dysfunction. prereq: PHAR 6722, 6726, and 6732

PHAR 6766. Biotechnology-Derived Drugs. (1 cr.; A-F only; Every Fall)
Biotechnology-derived drugs are where the future is, and pharmacy students need to understand how they are made, how they act and what special considerations are involved. This course will provide the foundational knowledge necessary to dispense current biotechnology-derived drugs and provide the basis for self-education needed to understand the biotechnology-derived drugs of the future. prereq: PHAR 6702, 6722, 6726, 6724, 6734, and 6752

PHAR 6768. Infectious Diseases. (3 cr.; A-F only; Every Fall)
Course will focus on the pharmacology, pharmacokinetics, and pharmacodynamics of antibiotics and the pharmacotherapy of infectious diseases. prereq: PHAR 6702, 6706, 6718, 6724, 6736, 6738, 6748, 6756, 6758

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
PHAR 6770. Pharmaceutical Care Skills Lab V. (2 cr.; S-N only; Every Fall)
This course is designed for third-year pharmacy students to continue to build the skills necessary to become a competent, caring pharmaceutical care practitioner.

PHAR 6772. Topics in Pharmacotherapy. (1.6 cr.; A-F only; Every Fall)
Course provides students with the pharmacologic, pharmacotherapeutic, and pharmacoeconomics knowledge they need to understand therapies for dermatologic, gastrointestinal, and genitourinary conditions, and arthritis and gout. Prepares future generalist pharmacists to be knowledgeable about common conditions of aforementioned topics and appropriate pharmacotherapy options for treatment. It will focus primarily on pharmacotherapy, but will have an overview of pathophysiology of these conditions. Students will be expected to apply knowledge to design and monitor a patient-centered pharmaceutical care plan and to appropriately educate patients regarding proper use of medications covered in the course. This course prepares students to identify clinically relevant information in the modern healthcare setting, learn it at a depth beyond memorization, and apply and interpret its application to relevant patient case vignettes. prereq: All required PharmD year two coursework

PHAR 6774. Pharmacotherapy of Neurologic and Psychiatric Disorders. (3.1 cr.; A-F only; Every Fall)
Course prepares future generalist pharmacists to be knowledgeable about common psychiatric and neurologic disorders and about the appropriate use of medications used to treat them. Course primarily focuses on the pharmacotherapies used to treat psychiatric and neurologic disorders. This course will additionally provide an overview of the presentation and pathophysiology of specific psychiatric and neurologic disorders, an overview of the differences between the practices of psychiatry and neurology and a discussion of stigmas associated with mental illness. An overview of non-pharmacologic therapies will be introduced to the extent relevant to the generalist pharmacists. At the conclusion of the course students will be expected to apply knowledge learned in the course in order to design and monitor a pharmacotherapeutic plan for specific patients and to appropriately counsel patients regarding proper use of the various psychiatric and neurologic medications covered in the course. prereq: All required PharmD year two coursework

PHAR 6776. Acute Patient Care Pharmacy. (3.4 cr.; A-F only; Every Spring)
Course prepares students to approach patients with multiple medical problems and the dynamic changes that patients can experience in the acute care settings. Students will then learn about the pharmacotherapy approach related to managing those disease states/conditions. Students will be expected to develop therapeutic plans for patient case scenarios at the onset of a hospital admission as well as additional problem that could present over the course of a hospitalization or result in readmission. Additional scenario problems will be incorporated into the cases as the course progresses and the cases and problems will become more complex. By the end of the course, students will have had an opportunity to address multiple medical problems and make pharmacotherapy decisions and will be evaluated based on those decisions. Knowledge gained in this course will prepare students for the APPE acute care/institutional rotation. prereq: successful completion of all 1st year, 2nd year, and fall 3rd year coursework

PHAR 6778. Pharmacy Law. (0.7 cr. [max 1 cr.]; A-F only; Every Spring)
The course covers both federal and state laws that impact and regulate the practice of pharmacy including federal regulation of medications, regulation of controlled substances, and the Minnesota Pharmacy Practice Act. The course will be offered entirely online.

PHAR 6780. Pharmacy Outcomes. (2.5 cr.; A-F only; Every Spring)
Course facilitates integration of knowledge of basic sciences, pharmacotherapy, pharmacy practice management, pharmaceutical care, written communication, literature evaluation, drug information retrieval, law and ethics, and pharmacoconomics to manage patients with multiple medical conditions. This course is where students are required to perform and demonstrate knowledge during curricular assessments. prereq: Phar 6700, 6702, 6704, 6706, 6708, 6710, 7310, 6716, 6718, 6720, 6722, 6724, 6726, 7325, 6732, 6734, 6736, 6738, 6740, 6742, 7330, 6748, 6750, 6752, 6754, 6756, 6758, 7340, 7345, 6770, 6774, 6768, 6762

PHAR 6782. Evidence Based Problem Analysis II. (0.8 cr. [max 1 cr.]; S-N only; Every Fall)
Third year PharmD students practice skills necessary to perform evidence based reviews and prepare written and verbal presentations of inquiries/ investigations to peers. prereq: Phar 6700, 6704, 6706, 6742

PHAR 6784. Integrated Oncology. (2.8 cr.; A-F only; Every Spring)
This course focuses on the etiology and molecular biology of tumorogenesis, medicinal agents, and pharmacology of anticancer agents, treatment of the most common cancers, supportive care of the patient with cancer, and social and ethical considerations of the treatment of the patient with cancer including end of life directives. prereq: PD3 in good academic standing, students will find it helpful to review the following topic areas: Principles of Biochemistry (Lipids [Structure/Function], Proteins [Folding/ Conformation]), Cellular Physiology Molecular Biology, Genetics (Cell Biology [signal transduction, DNA replication, transcription, protein translation, cell cycle, apoptosis], Immunology, Tumorogenesis, Angiogenesis, Genetics principles, Anatomy/Physiology [GI tract, pulmonary, hormone and feedback regulation])

PHAR 6786. Acute Patient Care Pharmacotherapy. (0.1 cr.; S-N only; Every Fall)
Students will practice applying content through patient cases and writing a patient care plan. This is a completely online course with weekly due dates offered each Summer term. For more information, contact phar6800@umn.edu or 612-624-7976.

PHAR 6799. Being a Pharmacist. (0.1 cr.; S-N only; Every Spring)
The Pharm.D. curriculum at the University of Minnesota is anchored by the basic, clinical, and social sciences relevant to the practice of pharmacy. This course serves as a culmination of academic and intellectual expression of the basic, clinical, and social pharmaceutical sciences and connects them to pharmacy practice. Future growth in knowledge and skill of our graduates/practitioners will predominantly occur through collegial exchange and conference-based learning environments. Being A Pharmacist will model how our students will continue to grow in knowledge and skill as they enter practice. In this course, students will be encouraged to think critically, reflect, and apply their skills.

PHAR 6800. Rehabilitation Pharmacotherapy. (2 cr.; A-F only; Every Summer)
The goal of this course is to equip physical therapy students with a general understanding of the impact of medications on rehabilitation and how rehabilitation affects medication use. Students will practice applying content through patient cases and writing a patient care plan. This is a completely online course with weekly due dates offered each Summer term. For more information, contact phar6800@umn.edu or 612-624-7976.

PHAR 6900. Curricular Studies for Internship and Pharmacy Employment. (1 cr. [max 4 cr.]; S-N only; Every Fall, Spring & Summer)
This course is designed for students pursuing an internship or pharmacy-related employment to receive course credit (typically for visa requirements). The course does NOT count toward elective credit requirements. If applicable, students must remain visa compliant and are solely responsible for doing so. The vast majority of the course is the hours a student spends at their internship/employment site. A written assignment is required at the end of the course. Students will meet once during the semester, which is arranged with instructors.

PHAR 6901. Pharmaceutical Care Experience. (1 cr.; S-N only; Every Spring)
The Pharmaceutical Care Experience builds on Foundations of Pharmaceutical Care and provides an early opportunity to practice pharmaceutical care in a primary care clinic setting. This elective will allow students to assess each patient’s unique medication experience and drug-related needs through patient interviews. Students will use this information to develop a patient-centered care plan under the guidance of a practitioner mentor. The pharmaceutical care process
will be applied and assessed in all future coursework, including, but not limited to, pharmacotherapy patient case work-ups, applied learning in the Pharmaceutical Care Learning Center, and during experiential education experiences.

PHAR 6902. Foundations for Integrative Mental Health and Psychiatric Practice. (2 cr.; A-F only; Every Fall)
This course is design to allow students to examine concepts, theories, and paradigms foundational to psychiatric/mental health practice and interprofessional integrative mental health care. Students develop clinical interviewing methods that elicit a client’s health narrative and facilitate the therapeutic relationship. Students also practice techniques that promote beginning skills important in reflective clinical practice. The course is primarily online, with 3 required 3-hr patient care simulations. There will be content posted on the course website for student learning. Activities and assessments include quizzes, patient scenario cases, reflective papers (upon re-watching the video of their interactions with the interprofessional teams and standardized patients during the simulation sessions), and individual and interprofessional group. Pharmacy students need to be PD3 students committed to earning the Interprofessional Mental Health Focus Area designation. We ask pharmacy students to commit to the entire series (fall and spring electives, and mental health APPE).

PHAR 6903. Assessment and Management of Psychiatric Disorders. (2 cr.; A-F only; Every Spring)
This course is design to allow students to apply advanced concepts from integrative mental health theory and research, social sciences, neuropsychology, and neuropsychiology in the differentiation and explanation of psychiatric symptoms and disorders across the age continuum.

PHAR 6906. Introduction to Pharmacy Research. (1 cr.; A-F only; Every Spring)
Overview of principles to research in particular area. Forum for scientists involved in research in particular area to discuss research, environment, careers with students. Prereq: consent of course director.

PHAR 6908. Drugs of Abuse. (2 cr.; S-N only; Spring Odd Year)
Basic medicinal chemistry of substances of abuse, associated paraphernalia. Prereq: Organic Chemistry I and Phar 6702

PHAR 6913. The Science and Spirit of Wellbeing. (1 cr.; A-F only; Every Spring)
Care, in general, and healthcare in particular, requires a certain degree of wellbeing on the part of the provider. This elective survey course introduces students to evidence based wellbeing. The course explores individual wellbeing as well as implications for practice and the health and wellbeing of others. prereq: instr consent

PHAR 6937. Foundations of Leadership. (2 cr.; A-F only; Every Fall & Spring)
Leadership development/its relation to advancing the profession of pharmacy. prereq: PDII or PDIII Pharmacy student

PHAR 6938. Developing Adaptive Leadership. (1 cr.; A-F only; Every Spring)
Directed Study: Developing Adaptive Leadership prereq: Pharm.D. student

PHAR 6939. Leading Change Experience I. (2 cr.; S-N only; Every Fall)
In collaboration with a faculty advisor, students implement a change that requires adaptive leadership. Work will focus on building a “short term win” and a team that can continue efforts into the future. Students will also gain experience in collecting and managing data to assist the change process (e.g., needs assessment and/or outcomes assessment). In addition, working with their faculty advisor, students will create and implement an individualized plan for their own personal leadership development. Students will also gain experience in supporting the leadership development of others. To support individualized development, a leadership networking partner (pharmacist) is assigned and periodic networking events and/or meetings are held. prereq: PHAR 6937 and 6938

PHAR 6940. Leading Change Experience II. (2 cr.; S-N only; Every Spring)
Continues leading change and development work initiated in Leading Change Experience I. During this term, students continue with their networking partners, present their leading change work, facilitate transition of the work to new leaders, conduct a critical appraisal of their leadership development, and support second year students as they initiate their projects. Students will also evolve their roles into shifting from personal development to the development of others. Assisting in a mentoring role in several capacities 1) transitioning new leaders into the leading change experience and 2) providing guidance, ideas and encouragement to those students interested in change initiatives. prereq: PHAR 6937 and 6938

PHAR 6941. Leadership Best Sellers for Pharmacists. (2 cr.; A-F only; Every Fall & Spring)
Part of the leadership track in pharmacy.

PHAR 6942. Leadership Capstone. (2 cr.; S-N only; Every Fall, Spring & Summer)
Supports completion of Leadership Emphasis Designation. Documentation/self-reflection of leadership learning experiences pursued inside/outside of classroom. Prerequisites: This course is for students who are in the fourth year of the Leadership Emphasis Area. Successful completion of Phar 6937, 6938, 6939 and 6940. Completion or concurrent enrollment in 6941 (Leadership Best Sellers).

PHAR 6961. Women’s Health. (2 cr.; A-F or Audit; Every Spring)
During this course, students will have the opportunity to actively learn and discuss women’s health issues taught in the core curriculum to a greater extent. The core curriculum focuses on the pharmacotherapy around women’s health, we will focus on the patient’s perspective, pathophysiology, and other quality care considerations specific to women including cultural, religious, psychosocial, and socioeconomic factors affecting health. Health topics will range from social issues to menstrual health, breast cancer to eating disorders, with a specific focus on preparing students for professional practice and the pharmacist’s role. prereq courses: Endocrinology pharmacotherapy sequence in the PD2 year; prereq topics: Contraceptive agents, emergency contraception, hormonal contraception.

PHAR 6962. Ethics in Pharmacy Practice. (2 cr.; A-F only; Every Spring)
Ethical principles, selected schools of ethical thought. Students discuss/debate ethical dilemmas in pharmacy practice/health care. prereq: Pharm.D. 3rd year student

PHAR 6964. Clinical Toxicology. (1 cr.; A-F only; Every Spring)
This course will cover the clinical signs/symptoms, general management and treatment of poisonings and toxicologic emergencies that are not covered in the main curriculum. It will also cover decontamination and laboratory principles associated with poisonings and toxicologic emergencies. This class will be comprised of lecture format presentations. Students will be given 1 hour to complete the final exam and midterm. prereqs: All students will have successfully completed the first year professional pharmacy program, as well as successfully completed fall semester of the second year. All students will have also successfully completed or be in the process of completing anatomy, physiology, pharmacology, and pharmacology. The student is responsible for this material to the extent necessary as a framework for toxicologic therapeutics. Thus, students are encouraged to review basic anatomy and physiology and specifically encouraged to review the section of the pharmacology textbook relevant to the classes of drugs covered.

PHAR 6966. Food Medicine: Contemporary Issues. (1 cr.; Student Option No Audit; Every Fall & Spring)
Food contributes to the prevention, and conversely, the development of disease processes. In order to better understand the interrelatedness of food and health, this course offers a critical perspective on how the ubiquity of food; race, class, gender; and indigeneity; colonization and corporatization affect people? food experiences; and subsequently, individual and population health. Students will examine modern food systems and describe implications for social determinants of health, health promotion, chronic disease management and IP collaborative practice. We will address questions such as: How do food systems impact our health? What makes food a political and environmental issue? Are we what we eat? Why do we categorize things that are not food as food? What is food sovereignty?

PHAR 6968. Critical Care. (1 cr. [max 2 cr.]; A-F only; Every Spring)
Critical Care is an elective that consists of two main components: a faculty/clinician presentation on an important topic to contemporary critical care practice, followed by a student evaluation and presentation on a selected primary literature topic that applies and integrates the presentation with current practice challenges. Key topics that are covered include discussion of the Surviving Sepsis Guidelines with discussion on the role of corticosteroids, identification and management of the anxious or delirious ICU patient, and application of the updated PAD guidelines, systems of the second 50-minutes a student (or pair of students) present the faculty-selected study using PowerPoint slides, and encourage group discussion of the paper’s merits and application to current critical care practice or future research. Challenges of critical care research are incorporated into the weekly discussions. prereq: Successful completion of P1, P2, and Fall of P3 professional pharmacy program. Interest in critical care pharmacy practice and/or clinical research.

PHAR 6970. Immunization Tour. (1 cr.; A-F or Audit; Every Fall) Role of health care practitioners. Population based disease prevention. Planning/delivering influenza vaccination clinics. Collaborative public health intervention. prereq: 6175, Completion of CPR

PHAR 6971. Geriatric Pharmacotherapy. (2 cr.; A-F only; Only Spring) Pharmacokinetic/pharmacodynamic changes and their implications in elders. Effects of drug-drug/disease interactions. Drug adherence barriers to provide optimum pharmacotherapy to elderly persons. prereq: 3rd or 4th year Pharmacy student

PHAR 7000. Early Pharmacy Practice Experience I. (1 cr.; A-F only; Every Fall) First in series of four courses. Focuses on patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentor program. prereq: Criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7002. Early Pharmacy Practice Experience II. (1 cr.; A-F only; Every Fall) Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentor program. prereq: 7001, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7003. Early Pharmacy Practice Experience III. (0.5 cr.; A-F only; Every Fall) 3rd in series of four courses. Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentoring. prereq: 7002 or instr consent, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7004. Early Pharmacy Practice Experience IV. (0.5 cr.; A-F only; Every Spring) Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentoring. Upcoming patient care opportunities. prereq: 7003 or inst consent, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7005. Introductory Community-Practice Pharmacy Experience. (2.5 cr.; S-N only; Every Spring) Experience in patient care at community practice setting. Three weeks. 40 hrs/week. prereq: 6111, 6171, 7001, 1st year pharmacy student

PHAR 7006. Introductory Institutional-Pharmacy Practice Experience. (2.5 cr.; S-N only; Every Spring) Experience in patient care in hospital setting. Three-week, 40 hours/week. prereq: College of Pharmacy student, 6121, 6122, 6131, 6132, 6173, 6174, 7003 and 7004 with passing grade, registered with Minnesota Board of Pharmacy as intern

PHAR 7010. APPE Continuing Professional Development Portfolio. (1.5 cr.; S-N only; Every Spring) Continuing professional development. Systematic maintenance, development, and broadening of knowledge, skills, and attitudes. Students self-assess performance/learning needs and create/follow/evaluate a learning plan. Documentation for peer review/support, regulatory review. prereq: 3rd yr pharmacy student

PHAR 7128. Acute Patient Care Practice Experience II. (4 cr.; A-F only; Every Fall, Spring & Summer) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks. prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7213. Elective Practice Experience III. (4 cr.; A-F only; Every Fall, Spring & Summer) Experience in inpatient or outpatient pharmacy practices where direct patient contact/ care occurs for 5 weeks, or experience in non-patient care setting. Sites vary widely from governmental agencies to pharmacy associations to specialized practices for 5 weeks. prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7228. Infectious Disease. (3 cr.; S-N only; Every Summer) Experience in inpatient or outpatient pharmacy practice where direct patient contact/ care occurs for 5 weeks, or experience in non-patient care setting. Sits vary widely from governmental agencies to pharmacy associations to specialized practices for 5 weeks. prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7310. Introduction to Community Health and Interprofessional Engagement. (1 cr.; S-N only; Every Fall) Course builds on content learned in Becoming a Pharmacist to provide opportunities for broadening of knowledge, skills, and attitudes required of competent, caring general pharmacist practitioners. Content is integrated with concurrent first year didactic courses and prepares students for Pre-APPE. prereq: Successful completion of Becoming a Pharmacist (BaP)

PHAR 7325. Introductory Community-Practice Pharmacy Experience. (3 cr.; S-N only; Every Summer) The purpose of the Community IPPE is to introduce you to the fundamentals of pharmacy practice and developing professional attitude and behavior in the community pharmacy setting. The course will build upon knowledge gained in the first year didactic curriculum, specifically Foundations of SAPh and Foundations of Pharmaceutical Care. The format of the IPPE course includes: in person, online, and an experiential component. The experiential component is a combination of observation, application of current knowledge, and feedback and assessment between you, the preceptor, and others. prereq: College of Pharmacy students must complete PHAR 6700 (Becoming a Pharmacist), 6706 (Foundations in Pharmaceutical Care), 6716 (Applied Pharmaceutical Care), 6728 (Pharmaceutical Calculations), 6710 (Pharmaceutical Care Skills Lab 1), 6720 (Pharmaceutical Care Skills lab 2), 6704 (foundations of SAPh), 6730 (first year seminar), 6718 (drug delivery), 6722 (med chem), 6726 (pharmacology) with a passing grade. You must be registered with the Minnesota Board of Pharmacy as an intern prior to the onsite experiential component of this course.

PHAR 7330. Community Teachers I. (0.4 cr.; S-N only; Every Fall) EpHECT is a service learning experience which pairs second year students with a volunteer Community Teacher (CT). Students develop a working/professional relationship with their CT and learn from CT's health and life experiences. Students will work with their CT to choose and complete activities unique...
to each CT's health profile. CTs benefit by gaining better understanding of their health by discussing and evaluating their health profile with professional students. CTs will also better understand the pharmacist's role in healthcare.

prereq: Students must have completed or be currently enrolled in the following courses:

- Becoming a Pharmacist, Foundations of Pharmaceutical Care, Applied Pharmaceutical Care, Pharmaceutical Skills Lab I and II

PHAR 7340. Community Teacher Experience II. (0.4 cr.; S-N only; Every Spring)

EPheCT is a service learning experience which pairs second year students with a volunteer Community Teacher (CT). Through this course students develop a working/professional relationship with their CT and learn from their CT's health and life experiences. Students will work with their CT to choose and complete activities unique to each CT's health profile.

prereq: Students must have completed or be currently enrolled in the following courses:

- Becoming a Pharmacist, Foundations of Pharmaceutical Care, Applied Pharmaceutical Care, Pharmaceutical Skills Lab I, II, and III,
- EPheCT I, and Foundations of SAPh

PHAR 7345. Introductory Institutional-Practice Pharmacy Experience. (3 cr.; S-N only; Every Summer)

The purpose of the Institutional IPPE is to introduce students to the fundamentals of pharmacy practice in the institutional pharmacy setting. The course will build upon knowledge gained in the first two years of the didactic curriculum. The student will spend 120 hours at the institutional site with their preceptor (who is approved by the MN BOP) and the College. An Additional 36 hours is allocated between assignments and online course materials. prereq: Students must have successfully completed Pharm 7325 (Community IPPE), Pharm 6730 (Professional Development I), Pharm 6736 (Cardiovascular Pharmacotherapy), Pharm 6738 (Pharmacokinetics), Pharm 6740 (Pharmaceutical Care Skills III), Pharm 6742 (Colloquium I: Scholarly Presentation Skills). Students must be enrolled concurrently in PD2 Spring semester courses. Students must also be registered intern in the state of Minnesota.

PHAR 7401. Acute Patient Care Practice Experience. (12 cr.; S-N only; Every Fall, Spring & Summer)

Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for twelve weeks. prereq: Pharm.D. I-II, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7411. Ambulatory Patient Care Practice Experience I. (5 cr.; S-N only; Every Fall, Spring & Summer)

Experience in an ambulatory setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

prereq: Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR

PHAR 7412. Ambulatory Care 2. (5 cr.; S-N only; Every Fall, Spring & Summer)

Experience in an ambulatory setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

prereq: Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7413. Community Pharmacy Practice Experience. (5 cr.; S-N only; Every Fall, Spring & Summer)

Students assigned to participating community pharmacies. Community practice activities full-time for 5 weeks. prereq: Pharm.D. IV, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7421. Elective Practice Experience I. (5 cr.; S-N only; Every Fall, Spring & Summer)

Experience in inpatient or outpatient pharmacy practices where direct patient contact/ care occurs for five weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for five weeks.

prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7422. Elective Practice Experience II. (5 cr.; S-N only; Every Fall, Spring & Summer)

Experience in inpatient or outpatient pharmacy practices where direct patient contact/ care occurs for five weeks, or experience in non-patient care setting. Sites vary from governmental agencies to pharmacy associations to specialized practices for five weeks.

prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity

PHAR 7433. Elective Experience 3. (5 cr.; S-N only; Every Fall, Spring & Summer)

Patient care experience in any setting.

Students responsible for drug-related needs of individual patients. Full-time for five weeks.

prereq: Pharm.D. I-III, MN Board of Pharmacy intern, criminal background check, BLS CPR certification, proof of negative Mantoux test [or explanation of positive test], proof of chicken pox immunity

PHIL 5010. Ancient Philosophers. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)

Major work of selected ancient philosophers (e.g., Plato's Parmenides, Plato's Sophist, Aristotle's Metaphysics). Works discussed vary. prereq: 3001 or instr consent

PHIL 5040. Rationalists. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)

Major work of selected early modern rationalists (e.g., Descartes' Principles of Philosophy, Spinoza's Ethics, Conway's Principles of the Most Ancient and Modern Philosophy, Leibniz's Discourse on Metaphysics). Works discussed may vary from offering to offering.

PHIL 5085. Wittgenstein. (3 cr.; Student Option; Periodic Fall & Spring)

In "Philosophical Investigations" Wittgenstein challenged some of the most long-standing and entrenched intuitions of philosophers -- basic intuitions about mind, rationality, linguistic understanding, and the very nature of philosophical/conceptual inquiry. Many of these intuitions remain entrenched, and Wittgenstein's challenge is as relevant today as it was in 1950. In Phil 4805 we examine the text and the secondary literature, and do so in the light of issues and debates that continue to demand attention.

PHIL 5101. Metaphysics. (3 cr.; Student Option; Fall Even Year)

Broadly speaking, metaphysics is the study of the nature of reality. Metaphysical questions include questions about what kinds of things exist, what is the nature of things, what are persons, what is possible or impossible, what is the nature of time, what is causality, and many other fundamental questions about the world. The aim of this course is to introduce students to some of the central questions of metaphysics to investigate some of their answers. prereq: One course in history of philosophy or instr consent

PHIL 5201. Symbolic Logic I. (4 cr.; Student Option; Every Fall & Spring)

Study of syntax and semantics of sentential and first-order logic. Symbolization of natural-language sentences and arguments. Development of deductive systems for first-order logic. Metatheoretic proofs and methods, including proof by mathematical induction and proof of consistency and completeness. prereq: 1001 or instr consent

PHIL 5202. Symbolic Logic II. (4 cr.; Student Option; Every Spring)
Elements of set theory, including the concepts of enumerability and nonenumerability. Turing machines and recursive functions; the results of Church, Godel, and Tarski and the philosophical significance of those results. prereq: 5201 or instr consent

PHIL 5211. Modal Logic. (4 cr.; Student Option; Spring Odd Year) Axiomatic and semantic treatment of propositional and predicate modal logics; problems of interpreting modal languages. prereq: 5201 or instr consent

PHIL 5221. Philosophy of Logic. (3 cr.; Student Option; Periodic Fall) Attempts to answer, “What is logic?” Scope of logic. Disputes about alternative logics. Theories concerning logical truth (e.g., conventionalism: view that logical truths are contingent). prereq: 5202 or instr consent

PHIL 5222. Philosophy of Mathematics. (3 cr.; Student Option; Periodic Fall & Spring) Major philosophical questions arising in connection with mathematics. What is mathematics about? How do we know the mathematics we do? What is the relation between mathematics and the natural sciences? Selected readings of leading contributors such as Frege, Dedekind, Russell, Hilbert, Brouwer, Godel, Quine. prereq: College level logic or mathematics course or instr consent

PHIL 5320. Intensive Study of a Historical Moral Theory. (3 cr.; Student Option; Periodic Fall & Spring) Intensive consideration of an author or theory in the history of moral or political philosophy. prereq: 1003 or instr consent

PHIL 5326. Lives Worth Living: Questions of Self, Vocation, and Community. (4 cr.; Student Option; Every Summer) Immersion experience. Students live together as a residential community of learners. Works of philosophy, history, and literature form backdrop for exploring such questions as “How is identity constructed?” “What is vocation?”, and “What experiences of community are desirable in a life?” Each student creates a life-hypothesis for a life worth living. prereq: instr consent

PHIL 5350. Catching Lives Worth Living: Participation in the Growth of a Living-Learning Community. (1-3 cr. max 6 cr.; Student Option; Every Summer) Involvement in a democratic living-learning community built by students/instructors. Students participate in community activities and daily instructor meetings. Four seven-day offerings each summer. prereq: Application, instr consent

PHIL 5415. Philosophy of Law. (3 cr.; Student Option; Periodic Spring) Analytical accounts of law and legal obligation. prereq: 1003 or 1004 or 3302 or social science major or instr consent

PHIL 5510. Philosophy of the Individual Arts. (3 cr.; Student Option; Periodic Fall & Spring) Aesthetic problems that arise in studying or practicing an art. prereq: 3502

PHIL 5601. History of the Philosophy of Science. (3 cr.; Student Option; Periodic Fall & Spring) History of logical empiricism, from its European origins in first half of 20th century to its emergence as nearly universal account of science in post-war Anglo-American philosophy. prereq: instr consent

PHIL 5602. Scientific Representation and Explanation. (3 cr.; Student Option; Periodic Fall) Contemporary issues concerning representation and explanation of scientific facts. prereq: instr consent

PHIL 5603. Scientific Inquiry. (3 cr.; Student Option; Periodic Spring) Philosophical theories of methods for evaluating scientific hypotheses. Role of experimentation in science. How hypotheses are accepted within scientific community.

PHIL 5605. Space and Time. (3 cr.; Student Option; Periodic Fall) Philosophical problems concerning nature/structure of space, time, and space-time. prereq: Courses in [philosophy or physics] or instr consent

PHIL 5606. Philosophy of Quantum Mechanics. (3 cr.; Student Option; ) Problems of interpretation in ordinary (nonrelativistic) quantum mechanics. Two-slit experiment, Schrodinger cat paradox (measurement problem), Einstein-Podolsky-Rosen paradox. Leading approaches to interpretation (Copenhagen, hidden variables, universal wave function) and their connections with philosophical issues.

PHIL 5760. Selected Topics in Philosophy. (3 cr. max 9 cr.; Student Option; Periodic Fall & Spring) Philosophical problems of contemporary interest. Topics specified in Class Schedule. prereq: 3xxx-5xxx course in phil or instr consent

PHIL 5993. Directed Studies. (1-3 cr. max 6 cr.; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. prereq: instr consent, dept consent, college consent

PHIL 6010. Workshop in History of Philosophy. (1 cr. max 4 cr.; Student Option; Every Fall & Spring) Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx hist of phil course, instr consent

PHIL 6080. Seminar: History of Ancient and Medieval Philosophy. (3 cr. max 6 cr.; Student Option; Every Fall & Spring) Topics vary by offering. prereq: instr consent

PHIL 6081. Seminar: History of Philosophy--Ancient Philosophers. (3 cr.; Student Option; ) Major developments in ancient Greek philosophic thought; methods and role of history of philosophy in discipline of philosophy.

PHIL 8085. Seminar: History of Philosophy--Modern Philosophers. (3 cr.; Student Option; Periodic Fall) Major developments in modern philosophic thought; methods and role of history of philosophy in discipline of philosophy. prereq: instr consent

PHIL 8090. Seminar: History of Modern Philosophy. (3 cr. max 6 cr.; Student Option; Every Fall & Spring) Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx [epistemology or metaphysics] course, instr consent

PHIL 8100. Workshop in Epistemology and Metaphysics. (1 cr. max 4 cr.; Student Option; Every Fall & Spring) Topics vary by offering. prereq: 4101 or instr consent

PHIL 8130. Seminar: Epistemology. (3 cr. max 6 cr.; Student Option; Every Fall & Spring) Problems in the theory of knowledge. Topics specified in [Class Schedule]. prereq: 4105 or instr consent

PHIL 8131. Epistemology Survey. (3 cr.; Student Option; ) Survey, against background of traditional issues, of contemporary developments in theory of knowledge.

PHIL 8133. Feminist Theories of Knowledge. (3 cr.; Student Option; ) Interdisciplinary seminar; feminist approaches to knowledge and criticism of paradigms of knowledge operative in the disciplines. Feminists’ use of concepts of subjectivity, objectivity, and intersubjectivity; feminist empiricism, standpoint theory, and contextualism, and postmodern and postcolonial theorizing.

PHIL 8180. Seminar: Philosophy of Language. (3 cr. max 6 cr.; Student Option; Every Fall) Topics vary by offering. prereq: 4231 or instr consent

PHIL 8182. Formal Semantics of Natural Language. (3 cr.; A-F or Audit; Periodic Fall) Truth-conditional model-theoretic semantics applied to treatment of opacity, intensionality, quantification, and related phenomena in natural language. prereq: Phil 5201 or instr consent

PHIL 8200. Workshop in Logic and Philosophy of Mathematics. (1 cr. max 4 cr.; Student Option; Periodic Fall & Spring) Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx logic or 4xxx phil of math, instr consent

PHIL 8210. Seminar: Logical Theory. (3 cr. max 6 cr.; Student Option; Every Fall & Spring) Topics vary by offering. prereq: [5201, 5205] or instr consent
PHIL 8220. Seminar: Philosophy of Mathematics. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Topics such as significance of limitative metatheorems (Goedel, et al), assessment of major foundational programs (set theoretic, modern Hilbertian, constructivist), modal/structuralist alternatives to standard platonism. prereq: 5202 or [4xxx or 5xxx] math course or instr consent

PHIL 8300. Workshop in Moral and Political Philosophy. (1 cr. [max 4 cr.]; Student Option; Every Fall & Spring)
Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx moral phil or 4xxx pol phil instr consent

PHIL 8310. Seminar: Moral Philosophy. (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Concepts/problems relating to ethical discourse. prereq: 4310 or 4320 or 4330 or instr consent

PHIL 8320. Seminar on Medical Ethics. (3 cr. [max 6 cr.]; Student Option; Periodic Spring)
Patients’ rights/duties, informed consent, confidentiality, ethical issues in medical research, initiation/termination of medical treatment, euthanasia, abortion, maternal/fetal conflicts, allocation of medical resources. prereq: [4xxx or 5xxx] ethics course or instr consent

PHIL 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

PHIL 8410. Seminar: Philosophy of Law. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Primarily for law students and advanced political science, history, or sociology majors or minors. prereq: 5415 or instr consent

PHIL 8420. Seminar: Political Philosophy. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Topics vary by offering. prereq: 4321 or 4414 or instr consent

PHIL 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

PHIL 8500. Workshop in Aesthetics. (1 cr. [max 4 cr.]; Student Option; Every Fall & Spring)
Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx aesthetics course, instr consent

PHIL 8510. Seminar: Aesthetics Studies. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Topics vary by offering.

PHIL 8550. Seminar: Philosophy of Religion. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Topics vary by offering. prereq: 4521 or instr consent

PHIL 8600. Workshop in the Philosophy of Science. (1 cr. [max 4 cr.]; Student Option; Every Fall & Spring)
Topics vary by offering. prereq: concurrent registration is required (or allowed) in 4xxx phil sci course, instr consent

PHIL 8602. Scientific Representation and Explanation. (3 cr.; Student Option; Periodic Fall & Spring)
Contemporary issues concerning representation and explanation of scientific facts.

PHIL 8606. Seminar: Philosophy of Medicine and the Biomedical Sciences. (3 cr.; Student Option; Every Fall & Spring)
Aims and goals of medicine; concepts of health, illness, and disease; nature of reasoning in clinical medicine; theoretical evolution in medicine; and role of values in practice of medicine and healthcare.

PHIL 8610. Seminar: History of Modern Physical Sciences. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Topics specified in [Class Schedule]. prereq: instr consent

PHIL 8620. Seminar: Philosophy of the Biological Sciences. (3 cr. [max 6 cr.]; Student Option; Every Fall)
Topics vary by offering.

PHIL 8640. Seminar: Philosophy of the Cognitive Sciences. (3 cr. [max 6 cr.]; Student Option; Spring Odd Year)
Philosophical framework for analyzing cognitive sciences. Recent developments in metaphysics/epistemology. Nature of scientific theories, methodologies of cognitive sciences, relations among cognitive sciences. Relation of cognitive science to epistemology and to various philosophical problems. Topics vary by offering. prereq: instr consent

PHIL 8660. Seminar: Social and Cultural Studies of Science. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)
Review of recent work; analysis of theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

PHIL 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

PHIL 8670. Seminar: Philosophy of Science. (3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
Topics vary by offering. prereq: instr consent

PHIL 8710. Seminar: Feminist Philosophy. (3 cr. [max 6 cr.]; Student Option; Periodic Fall)
Topics vary by offering. prereq: 4622 or 5622 or WoSt 4122 or WoSt 5122 or instr consent

PHIL 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PHIL 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

PHIL 8993. Directed Study. (1-3 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer)
tbd prereq: instr consent

PHIL 8994. Directed Research. (1-3 cr. [max 6 cr.]; Student Option; Every Fall & Spring)
tbd prereq: instr consent

Physical Med & Rehabilitation (PMED)

PMED 6000. Special Topics for the Transitional DPT: Musculoskeletal. (2-8 cr.; A-F or Audit; Periodic Fall)
Selected pathology, assessment, and rehabilitation of musculoskeletal conditions. Industrial consultation, post fracture management, imaging, surgical options for selected conditions of spine/extremities. Required musculoskeletal case study from clinical internships. prereq: Enrolled in Physical Therapy MS program

PMED 7410. Rehabilitation Medicine for Adults. (4 cr.; H-N only; Every Fall, Spring & Summer)
The student learns to evaluate a patient with chronic illness and/or a disability and then helps plan a rehabilitation team’s problem-oriented approach to total patient management. Medical student responsibility includes inpatient work-ups and management as well as the opportunity to participate in a variety of specialty clinics.

PMED 7412. Rehabilitation Medicine for Adults: Orthopedics, Neurology. (4 cr.; H-N only; Every Fall, Spring & Summer)
This course is designed for students who are interested in pursuing residency in Physical Medicine and Rehabilitation, Orthopedics, Neurology. Student-physicians will be responsible for inpatient work-ups and management as well as having the opportunity to participate in a variety of specialty clinics (EMG and Botox, traumatic brain injury, spinal cord injury, amputee, musculoskeletal pain, cardiac rehab) and inpatient consults.

PMED 7415. Physical Medicine and Rehabilitation for the Generalist. (4-6 cr.; H-N or Audit; Every Fall, Spring & Summer)
evaluated by faculty based on participation, clinical skills, attitude. Case presentation, participation in weekly conferences.

**PMED 7416. Pediatric Rehabilitation Medicine.** (2 cr.; H-N only; Every Fall, Spring & Summer) Student works on inpatient service, outpatient clinics working with pediatric patients with traumatic brain injury, cerebral palsy, ventilatory dependent children, spinal cord injury, and developmental disabilities.

**PMED 7417. Research in Physical Medicine and Rehabilitation.** (6 cr.; H-N or Audit; Every Fall) This elective provides an opportunity for the interested student to pursue a clinical or laboratory problem related to physical medicine and rehabilitation.

**PMED 7418. Rehabilitation Medicine: Trauma Rehab, Med-Spine.** (4 cr.; H-N only; Every Fall, Spring & Summer) Adult rehabilitation management emphasizing traumatic brain injury, major multiple trauma, acute and chronic burns, musculoskeletal ultrasound, stroke, ALS, and EMG.

**PMED 7420. Rehabilitation Medicine Research.** (2-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer) PM&R is an underrepresented field in terms of academic contribution to clinical research.

**PMED 7910. Physical Medicine and Rehabilitation Medical Residency.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Physical medicine and rehabilitation medical residency.

**PMED 7930. Physical Medicine and Rehabilitation Medical Fellowship.** (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Physical medicine and rehabilitation medical fellowship.

**PMED 8200. Physical Medicine and Rehabilitation Service.** (1-15 cr.; Student Option; Every Fall, Spring & Summer) N/A prereq: enrolled in PMed residency training program

**PMED 8207. Basic and Applied Psychiatry.** (1 cr.; Student Option; Every Fall, Spring & Summer) N/A prereq: enrolled in PMed residency training program

**PMED 8210. Research in Physical Medicine.** (1-15 cr.; Student Option; Every Fall & Spring) N/A prereq: enrolled in PMed residency training program

**PMED 8212. Electromyography.** (1-15 cr.; Student Option; Every Fall, Spring & Summer) N/A prereq: enrolled in PMed residency training program

**PMED 8214. Readings in Electromyography.** (1-3 cr.; Student Option; Every Fall, Spring & Summer) N/A prereq: enrolled in PMed residency training program

**PMED 8220. Seminar: Physical Medicine and Rehabilitation.** (1-15 cr.; Student Option; Every Fall, Spring & Summer) TBD prereq: enrolled in PMed residency training program

### Physical Therapy (PT)

**PT 6002. Ethics in Public Health: Research and Policy.** (1 cr. [max 2 cr.]; S-N or Audit; Every Fall) Moral/ethical analysis. Issues in physical therapy research/practice. Ethical decisions in a practice and in professional training. WebCT lectures, in-class discussions/instruction, exams.

**PT 6058. Anatomy for Physical Therapy.** (6 cr.; A-F or Audit; Every Summer) Study of gross human anatomy, and surface anatomy, for practice of physical therapy. Cadaver dissection of extremities, head, neck, back, abdomen, thoracic, and pelvic regions. Correlation to clinical conditions. Lecture, laboratory.

**PT 6213. Clerkship I.** (2 cr.; A-F or Audit; Every Fall) Practical aspects of clinical education and professional behavior. Psychological, sociological, and cultural needs of diverse patient populations. Students complete a three hrs/week clinical affiliation at University Good Samaritan Center. Patient/therapist observations, concurrent didactic coursework. Facilitation of group exercise, restorative ambulation, range of motion programs, and resident assessment instrument. prereq: Registered PT student

**PT 6214. Clerkship II.** (2 cr.; A-F or Audit; Every Spring) Documentation of physical therapy exams, progress, discharge services. Regulatory agencies responsible for outcomes/accreditation, third party reimbursement, coding, peer review. Complete three hrs/wk clinical affiliation at Good Samaritan Center under supervision of clinical faculty. Observations/documentation, group exercise, restorative ambulation, range of motion programs, resident assessment instrument. prereq: Registered first year PT student

**PT 6215. Clerkship III.** (1 cr. [max 2 cr.]; A-F or Audit; Every Fall) Roles of physical therapist, in orthopedic outpatient setting, as educator and promoter of health/wellness. Students are assigned to a community outpatient orthopedic clinic. Patient evaluations/treatment. Instructing patients, therapists, student physical therapists, and community members to promote physical therapy, health, and wellness. Students assess, prepare, and provide educational experiences. prereq: Registered PT student

**PT 6216. Clerkship IV.** (1 cr.; A-F or Audit; Periodic Spring) Role of physical therapist, in acute care or rehabilitation setting, as clinical educator of physical therapy students. Students are assigned to a local hospital or rehabilitation facility. Patient evaluations, treatment, discharge planning. Students prepare for full time clinical experiences and for their role as potential clinical instructors. prereq: Registered 2nd yr PT student

**PT 6217. Clerkship V.** (2 cr.; A-F or Audit; Periodic Fall) Second-year clerkship. Role of physical therapist in acute care or rehabilitation setting. Students observe/participate in patient evaluation, treatment/discharge planning, client consultation, and community service evaluation/planning. Sites are selected in conjunction with CUPEs. Students keep journal, shared with site supervisor and academic coordinator. prereq: Registered 2nd-year PT student

**PT 6219. Foundations in Interprofessional Communication and Collaboration.** (1 cr.; S-N only; Every Fall) Foundations of Interprofessional Communication & Collaboration (FIPCC) is the first interprofessional course in Phase I of the 1Health curriculum. More than 1,000 health and health care students from allied health, dentistry, dietetics, health coaching, medicine, nursing, pharmacy, physical therapy, public health, social work, speech-language-hearing sciences, and veterinary medicine will be enrolled in this course. The course will be delivered to interprofessional groups of approximately 30-35 students in each room.

**PT 6220. Clinic Volunteer.** (1 cr. [max 6 cr.]; No Grade Associated; Every Fall, Spring & Summer) Functioning evening clinics supervised by licensed physical therapists. Students perform physical therapy exams, provide treatment various conditions, under supervision of a licensed physical therapy clinical instructor.

**PT 6221. Therapeutic Procedures.** (4 cr.; A-F or Audit; Every Spring & Summer) Theory/application of physical agents and therapeutic techniques. Therapeutic massage, ultraviolet radiation, thermotherapy, hydrotherapy, positive pressure devices, transcutaneous electrical nerve stimulation, neuromuscular electrical stimulation, biofeedback, iontophoresis, high volt pulsed current, prereq: Registered PT student

**PT 6231. Clinical Biomechanics.** (5 cr.; A-F or Audit; Periodic Fall) Principles of biomechanics. Forces/structures internal/external to body responsible for normal human movement. Muscle, joint, and tissue mechanics. Joint-specific normal function, whole body posture, gait mechanics. Focuses on normal mechanics as foundation for abnormal mechanics and pathology. Lecture, laboratory. prereq: Intro calculus, physics, registered PT student

**PT 6250. Acute Care in Physical Therapy.** (2 cr.; A-F only; Every Summer) General care of acute and critically ill patient. Disease/disorders common to acute care environment. Integration of evaluation, treatment, and client management skills. prereq: Registered physical therapy student
PT 6251. Integument. (2 cr.; A-F or Audit; Every Summer)
Response of integument to injury, disease, and aging. Emphasizes wound management, burn care, amputee care, and rehabilitation of persons with acute/chronic integument disorders. Integrating elements of physiology, pathophysiology, and therapeutic procedures to evaluate, treat, and manage clients. prereq: Registered PT student

PT 6252. Pathophysiology. (3 cr.; A-F only; Every Summer)
General and organ system pathology. Complicating pathological factors that affect patients. Implications of pathology on patient's clinical presentation. prereq: Enrolled PT student

PT 6280. Clinical Assessment. (4 cr.; A-F or Audit; Periodic Fall)
Clinical assessment techniques of goniometry, manual muscle testing, range of motion, gait analysis, physical/sensory examination, and anthropometrics. Basic intervention approaches, including stretching techniques and resistive exercise. Weekly integration assignments with first clinical clerkship. Lecture, discussion, lab. prereq: Registered PT student

PT 6281. Scientific Foundations I: Theory of Therapeutic Exercise. (3 cr.; A-F or Audit; Every Fall)
Principles of skeletal muscle physiology as basis for therapeutic exercise. Exercise physiology and related microanatomy of musculoskeletal system as they relate to rehabilitation problems. Tissue response to treatment for loss of mobility. Endurance/ strength training. prereq: Registered PT student

PT 6282. Scientific Foundations II: Neuromotor Control. (3 cr. [max 45 cr.]; A-F or Audit; Every Spring)
Principles of neurophysiology, neurology, motor control, and motor learning as basis for therapeutic intervention in motor dysfunction. Practical application of kinesiologic electromyography and nerve conduction. prereq: Registered PT student

PT 6283. Musculoskeletal I. (7 cr.; A-F or Audit; Every Fall & Spring)
First of two-course sequence. Problem-solving approach to evaluating, treating, and preventing selected musculoskeletal conditions across the life span. Chart review, history taking, strength testing, functional testing, gait and posture examination, special orthopedic tests. Therapeutic exercises, orthopedic ambulation, joint mobilization, splinting, patient education. prereq: enrolled PT student

PT 6284. Musculoskeletal Rehabilitation II. (4 cr.; A-F or Audit; Periodic Fall)
Second of two-course sequence. Problem-solving approach to evaluating, treating, and preventing selected musculoskeletal conditions across life span. Practice evaluations, clinic visits, case examples. Integrates diagnostic procedures, medical/surgical management, and tissue response to injury/intervention for selected orthopedic conditions. Screening for recognition of non-musculoskeletal causes of complaints. prereq: Regis PT student

PT 6287. Neurorehabilitation. (8 cr.; A-F or Audit; Every Spring)
Assessment/rehabilitation of patients with neurological conditions (e.g., cerebral vascular disease traumatic brain injury, multiple sclerosis, Parkinson's disease, amyotrophic lateral sclerosis). Using treatment procedures, orthotics, and equipment to improve function and prevent, stabilize, or decrease impairments. prereq: Regis PT student

PT 6288. Pediatric Rehabilitation. (8 cr.; A-F or Audit; Every Spring)
Pediatric assessment/rehabilitation for neurological, orthopedic, cardiac, prematurity, transplant, and behavioral conditions. Preparation for adult assessment/treatment with neurological, general medical, and vascular disease. Students use etiologic knowledge to assess patients in clinic and establish treatment plans/goals. prereq: Registered PT student

PT 6290. Administration. (4 cr.; A-F or Audit; Periodic Fall)
Learning experiences, special assignments related to physical therapy administration, management, supervision, consultation, private practice, and health care issues. Foundations for regulatory compliance and fiscal responsibility. Interpersonal skills for delivery of direct care service. prereq: Regis PT student

PT 6293. Essentials of Rehabilitation Research. (4 cr.; A-F or Audit; Every Fall)
Predictive research, statistical concepts, scientific literature. Tools to design experiments and analyze data. Risk analysis, multivariate regression analysis. Designs of reliability studies, traditional group designs. Students give preliminary presentation of analysis. prereq: Registered 2nd yr PT student

PT 6295. Clinical Internship I. (10 cr. [max 30 cr.]; S-N or Audit; Every Fall, Spring & Summer)

PT 6296. Clinical Internship II. (10 cr.; S-N only; Every Fall, Spring & Summer)
Second of four courses. Students must demonstrate proficiency in communication, team participation, evaluation and treatment, predicting outcomes, and managing patient diagnoses and problems. Selected specialty area of physical therapy practice.

PT 6297. Clinical Internship III. (10 cr.; S-N only; Every Fall, Spring & Summer)
Third of four courses. Students must demonstrate proficiency in communication, team participation, evaluation and treatment, predicting outcomes, and managing patient diagnoses and problems. Selected specialty area of physical therapy practice. prereq: Registered PT student

PT 6298. Clinical Internship IV. (10 cr.; S-N only; Every Fall, Spring & Summer)
Fourth of four courses. Students must demonstrate proficiency in communication, team participation, evaluation and treatment, predicting outcomes, and managing patient diagnoses and problems. Selected specialty area of physical therapy practice.

PT 6310. Physiology for Physical Rehabilitation. (5 cr. [max 10 cr.]; A-F only; Every Spring)
This course is designed to convey foundational information regarding human basic physiology and more advanced integrative physiology to provide the physical therapist a broad range of knowledge on how the human body works at rest, exercise, and as we age.

PT 6340. Human Growth and Development. (3 cr.; A-F or Audit; Every Fall)
Developmental process throughout life span. Physical, motor, social, and personality development. Theories of development. Factors that influence a child's development. prereq: Registered PT student

PT 6400. Health Activism. (1 cr.; No Grade Associated; Every Fall; Spring & Summer)
Joint Medical School-School of Public Health course. Series of skill-building workshops. Hands-on community project completed by small group of public health and medical students in cooperation with a community organization and a faculty mentor. Projects focus on issues of health disparities, environmental justice, and access to care. prereq: Enrolled DPT student

PT 6813. Cardiopulmonary Physical Therapy. (3 cr.; A-F or Audit; Every Fall, Spring & Summer)
Theory and techniques of cardiopulmonary evaluation and treatment. Principles of exercise response and adaptations to training. prereq: enrolled PT student

PT 7000. Neurological Theory and Neurosciences in Physical Therapy. (1-6 cr.; A-F only; Fall Odd, Spring Even Year)
Recent/current updates in neurological theory/ intervention supported by neuroanatomical science. Students explore evidence supporting clinical decision making process. One-six selected weekends. Prereq Admitted to Transisitional Doctor of Physical Therapy Program.

PT 7001. Topics in Musculoskeletal PT. (1-6 cr.; A-F only; Fall & Spring)

PT 7002. Topics in Cardiopulmonary Physical Therapy. (2 cr.; A-F only; Fall Even Year)
Principles of cardiac/pulmonary systems as applied to physical therapy. Principles
of normal/abnormal responses to exercise, pathophysiology, and training. Theory/techniques of cardiopulmonary assessment, evaluation, rehabilitation, and clinical decision making of patients with cardiopulmonary disorders. Two selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.

PT 7003. Topics in Integumentary Physical Therapy. (2 cr.; A-F only; Spring Odd Year) Response of integument to injury, disease, and aging. Advances in wound management, rehabilitation of persons with acute/chronic integument disorders. Physiology, pathophysiology, and therapeutic procedures to evaluate, treat, and manage clients with disorders of integument. Two selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.

PT 7004. Topics in Biomechanics and Pathokinesiology in Physical Therapy. (3 cr.; A-F only; Fall Odd Year) Principles of human biomechanics applied to physical therapy. Biomechanics/pathokinesiology of selected joint complexes. Three selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.


PT 7006. Anatomy for Physical Therapy. (2 cr.; A-F only; Fall Odd Year) Dissection of bones, muscles, nerves, vessels, connective tissue, and selected internal organs. Joint structures of limbs, spinal column, head, and pelvis. Histology, embryology. Correlation of content to clinical practice. Lecture, human cadaver lab. Two selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.

PT 7007. Administration and Legal Issues. (2 cr.; A-F only; Fall Every Year) Ethical/legal application to potential administrative decision making in contemporary practice of patients' physical therapy, theoretical frameworks, concepts, and case analysis to address challenges in practice. Two selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.

PT 7008. Scientific Basis of PT Practice. (2 cr.; A-F only; Spring Even Year) Role of science/research in physical therapy as it relates to critical thinking and decision making in practice. Statistical terminology, research design, hypothesis testing. Two selected weekends. Prereq: Admitted in transitional doctor of physical therapy program.

PT 7009. Capstone Experience. (3 cr.; A-F only; Every Summer) How case studies are conducted/written. Importance of case studies to a profession. Basics of case report, literature review. Measurement theory, writing techniques.

Student projects are evaluated by instructor or core or adjunct faculty. Prereq: Must be a DPT student

PT 7010. Topics in Geriatric Rehabilitation I. (2 cr.; S-N only; Every Fall) Demographics of aging population, psychosocial issues with aging, clinical research in the area of geriatrics. How to write patient case report. Lecture, discussion, literature review. Prereq: Licensed physical therapist enrolled in geriatric clinical residency

PT 7011. Topics in Geriatric Rehabilitation II. (2 cr.; S-N only; Every Spring) Providing physical therapy to geriatric clients. Physiologic, pathophysiology, and therapeutic procedures to evaluate, treat, and manage clients. How clinical issues vary in geriatric population vs. younger patients. Lecture, discussion, literature review. Prereq: Licensed physical therapist enrolled in geriatric clinical residency

PT 7012. Topics in Geriatric Rehabilitation III. (2 cr.; S-N only; Every Summer) Management/reimbursement issues in geriatric health care system. Body systems/pathological processes common in geriatric client. How physical therapy is reimbursed through Medicare system. Lecture, discussion, literature review. Prereq: Licensed physical therapist enrolled in geriatric clinical residency

PT 8131. Research Elective. (1 cr.; S-N only; Every Fall & Spring) Research elective guided by the research advisor. Prereq: Grad PT major

PT 8132. Research Seminar. (1 cr.; S-N only; Spring Odd Year) This initial course for the research series provides a foundation for future guided projects on components of the research cycle. Students explore why research is important and how it can be translated to improvements in clinical care. Basic research design and reporting venues, literature search strategies and tools, critical review of literature, responsible conduct of research, and reference management are discussed. Pre-req: Grad PT major

PT 8193. Research Problems. (2-6 cr.; Student Option; Every Fall, Spring & Summer) Process of developing/completing a scholarly research project or literature review related to rehabilitation science/Physical Therapy education and practice. Students work directly with faculty participating in research in guided small group experience. Type of research experience is determined by adviser. Prereq: Grad PT major

PHYS 5001. Quantum Mechanics I. (4 cr.; Student Option; Every Fall) Schrodinger equation: bound state and scattering problems in one dimension. Spherically symmetric problems in three dimensions, angular momentum, and the hydrogen atom. Approximation methods for stationary states. Time-dependent perturbation theory. Operators and state vectors; general formalism of quantum theory. Prereq: 4101 or equiv or instr consent

PHYS 5002. Quantum Mechanics II. (4 cr.; Student Option; Every Spring) Symmetry in quantum mechanics, space-time symmetries and the rotation group, Clebsch-Gordan coefficients and the Wigner-Eckart theorem. Scattering theory. Method of second quantization with elementary applications. Relativistic wave equations including Dirac equation. Prereq: 5001 or equiv

PHYS 5011. Classical Physics I. (4 cr.; Student Option; Every Fall) Classical mechanics: Lagrangian/Hamiltonian mechanics, orbital dynamics, rigid body motion, special relativity. Prereq: 4001, 4002 or instr consent

PHYS 5012. Classical Physics II. (4 cr.; Student Option; Every Spring) Classical electromagnetism: electrostatics, magnetostatics, Maxwell's equations, electromagnetic waves, radiation, interaction of charged particles with matter. Prereq: 5001 or instr consent

PHYS 5022. Relativity, Cosmology, and the Universe. (4 cr.; Student Option; Periodic Fall) Large-scale structure and history of universe. Introduction to Newtonian and relativistic world models. Physics of early universe. Cosmological tests. Formation of galaxies. Prereq: 2601 or instr consent

PHYS 5041. Mathematical Methods for Physics. (4 cr.; Student Option; Every Fall) Survey of mathematical techniques needed in analysis of physical problems. Emphasizes analytical methods. Prereq: 2601 or grad student

PHYS 5071. Physics for High School Teachers: Experimental Foundations and Historical Perspectives. (3 cr.; Student Option; Periodic Fall) In-depth examination of a conceptual theme in physics, its experimental foundations and historical perspectives. Kinematics and dynamics from Aristotle through Einstein; nature of charge and light; energy and thermodynamics; electricity, magnetism, and quantized fields; structure of matter. Prereq: Gen physics, instr consent; no cr for physics grad or grad physics minor

PHYS 5072. Best Practices in College Physics Teaching. (1-3 cr.; max 5 cr.; Student Option; Every Fall & Spring) Pedagogies for introductory physics classes. Topics from educational research/practice as applied to classroom.
PHYS 5081. Introduction to Biopolymer Physics. (3 cr.; Student Option; Periodic Fall) Introduction to biological and soft condensed matter physics. Emphasizes physical ideas necessary to understand behavior of macromolecules and other biological materials. prereq: working knowledge of thermodynamics, statistical mechanics


PHYS 5401. Physiological Physics. (4 cr.; Student Option; Fall Even Year) Musculoskeletal system, circulatory system/membrane transport, biological control systems, propagation/action potential in nervous system, immunology, electromagnetism at cellular level. prereq: One semester of introductory calculus-based physics, such as PHYS1301W. Students not sure if they meet prerequisites should consult instructor.

PHYS 5402. Radiological Physics. (4 cr.; Student Option; Spring Even Year) Signal analysis, medical imaging, medical x-rays, mammography, radiation therapy, nuclear medicine, MRI, similar topics. prereq: Two semesters of introductory calculus-based physics, such as PHYS1302W. Students not sure if they meet prerequisites should consult instructor.

PHYS 5621. Introduction to Plasma Physics. (3 cr.; Student Option; Periodic Fall) Basic properties of collisionless, magnetized plasmas, single particle motion, plasmas as fluids, magnetohydrodynamics, waves in plasmas, equilibrium, instabilities, kinetic theory/shocks. prereq: CSE grad student, working knowledge of waves/electromagnetism

PHYS 5701. Solid-State Physics for Engineers and Scientists. (4 cr.; Student Option; Periodic Fall & Spring) Crystal structure and binding; diffraction; phonons; thermal and dielectric properties of insulators; free electron model; band structure; semiconductors. prereq: Grad or advanced undergrad in physics or engineering or the sciences

PHYS 5950. Colloquium Seminar. (1 cr.; S-N or Audit; Every Fall & Spring) Colloquium of School of Physics and Astronomy. prereq: [Grad student or advanced undergrad in physics], dept consent

PHYS 5970. Physics Journal Club. (1-3 cr.; S-N only; Every Fall & Spring) Weekly student-led presentation, discussion, and critical analysis of important papers. prereq: 2601, 2605 or equiv; intended for 2nd-yr grad students in physics

PHYS 5980. Introduction to Research Seminar. (1 cr.; [max 3 cr.]; S-N or Audit; Every Fall & Spring) Introduction to the research activities of the School of Physics and Astronomy. prereq: Grad or upper div phys major

PHYS 5993. Directed Studies. (1-5 cr.; [max 15 cr.]; Student Option; Every Fall, Spring & Summer) Independent, directed study in physics areas arranged by the student and a faculty member. prereq: instr consent, dept consent

PHYS 5994. Directed Research. (1-5 cr.; [max 15 cr.]; Student Option; Every Fall, Spring & Summer) Problems, experimental or theoretical, of special interest to students. Written reports. prereq: Jr, dept consent

PHYS 8001. Advanced Quantum Mechanics. (3 cr.; Student Option; Every Fall) Topics in non-relativistic quantum mechanics; second quantization. Introduction to Diagrammatic and Green's function techniques and to relativistic wave equations. Application of relativistic perturbation theory to particle interactions with electromagnetic field. Invariant interactions of elementary particles. prereq: 5002 or instr consent

PHYS 8011. Quantum Field Theory I. (3 cr.; Student Option; Every Spring) Second quantization of relativistic wave equations: canonical quantization of the free scalar and Dirac fields. Fields in interaction: interaction picture. Quantum electrodynamics: quantization of the electromagnetic field, propagators and Feynman rules, tree-level processes. Higher-order processes and renormalization. prereq: 8001 or instr consent

PHYS 8012. Quantum Field Theory II. (3 cr.; Student Option; Every Fall) Aspects of general theory of quantized fields, including space-time and discrete transformation properties, the CPT theorem, and the spin-statistics connection. Introduction to functional and path-integral methods. Renormalization group and asymptotic freedom. Semi-classical methods and instantons in gauge theories. prereq: 8011 or instr consent

PHYS 8013. Special Topics in Quantum Field Theory. (3 cr.; Student Option; Spring Even Year) Includes non-perturbative methods in quantum field theory, supersymmetry, two-dimensional quantum field theories and their applications, lattice simulations of quantum fields, topological quantum field theories, quantum field theory methods applied to condensed matter physics, and string theory. prereq: 8012 or instr consent

PHYS 8100. Seminar: Problems of Physics Teaching and Higher Education. (1 cr. [max 3 cr.]; Student Option; Every Spring) Lectures and informal discussions of courses and curricula, techniques, and materials important in undergraduate physics instruction; relation to general problems of higher education.

PHYS 8161. Atomic and Molecular Structure. (3 cr.; A-F only; Fall Odd Year) Emphasizes interpretation of quantum numbers and selection rules in terms of symmetry. Experimental data summarized and compared with theoretical predictions. prereq: Level of mathematics associated with BS in physical sciences

PHYS 8200. Seminar: Cosmology and High Energy Astrophysics. (1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Current topics in cosmology and high energy astrophysics. prereq: instr consent

PHYS 8300. Seminar: Biological and Medical Physics. (1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Current research in biological and medical physics prereq: instr consent

PHYS 8301. Symmetry and Its Application to Physical Problems. (3 cr.; Student Option; Periodic Fall) Fundamental invariance principles obeyed by laws of physics. Group theory as tool for using symmetry and invariance to help understand behavior of physical systems. Applications made to atomic, nuclear, condensed-matter, and elementary particle physics. prereq: 5002 or instr consent

PHYS 8311. Biological Physics of Single Molecules. (3 cr.; Student Option; Spring Odd Year) Biological molecules, based on statistical mechanics, kinetics, optics, and other physics ideas. Physics of DNA/proteins, their interactions. Force spectroscopy (optical tweezers, atomic force microscopy). Concepts of optical spectroscopy. Single molecule fluorescence/imaging. prereq: [[5201 or Chen 4707], 5011] or instr consent

PHYS 8312. Biological Physics of Macroscopic Systems. (3 cr.; Student Option; Spring Even Year) Macroscopic systems, based on physics such as fluid dynamics, statistical mechanics, non-linear dynamics, and chaos theory. Super-molecular aggregates. Biological physics of the cell. Biological physics of populations/evolution. prereq: [[5201 or CHEN 4707], 5011] or instr consent

PHYS 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

PHYS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

PHYS 8500. Plan B Project. (4 cr.; Student Option; Every Fall, Spring & Summer) Project topic arranged between student and instructor. Written report required. prereq: instr consent; may be taken once to satisfy Plan B master's project requirement; no cr toward PhD

PHYS 8501. General Relativity and Cosmology I. (3 cr.; Student Option; Periodic Fall & Spring)
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Tensor analysis and differential geometry. Special relativity leading to formulation of principles of general relativity and Einstein’s equations. Tests of general relativity and thorough discussion of various black hole solutions, including Schwarzschild, Reissner-Nordstrom, and Kerr solutions. prereq: 5012 or instr consent

PHYS 8502. General Relativity and Cosmology II. (; 3 cr.; Student Option; Periodic Fall) Gravitational radiation. Applications of general relativity to stellar structure of white dwarfs and neutron stars, action principle, and symmetric spaces. Big-bang cosmology, strongly emphasizing particle physics. prereq: 8501 or instr consent

PHYS 8800. Seminar: Space Physics. (; 1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Current topics in space physics and plasma physics.

PHYS 8601. Plasma Physics I. (; 3 cr.; Student Option; Periodic Fall) Theory of plasma waves and instabilities in plasmas, magnetohydrodynamics, nonlinear waves in plasmas, wave propagation in inhomogeneous plasmas. prereq: 4621, 5012 or instr consent

PHYS 8602. Plasma Physics II. (; 3 cr.; Student Option; Periodic Fall) Theory of plasma waves and instabilities, collisions, radiation, transport, nonlinear wave-particle and wave-wave interactions, instabilities in inhomogeneous plasmas. prereq: 8601 or instr consent

PHYS 8611. Cosmic Rays and Plasma Astrophysics. (; 3 cr.; Student Option; Periodic Fall & Spring) Properties of energetic particles in heliosphere and in astrophysical environments; solar physics, including radiation and magnetic effects; solar wind and magnetospheric physics; physics of radiation belts. prereq: 5012 or instr consent

PHYS 8650. Advanced Topics in Space and Plasma Physics. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topics in plasma waves and instabilities, solar physics, cosmic ray physics, atmospheric physics or planetary physics. prereq: 8602 or 8611 or instr consent

PHYS 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TDB prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

PHYS 8700. Seminar: Condensed Matter Physics. (; 1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Current research. prereq: instr consent

PHYS 8702. Statistical Mechanics and Transport Theory. (; 3 cr.; Student Option; Every Spring) Equilibrium properties of macroscopic classical and quantum systems. Phase transitions and Renormalization Group. Transport theory. Applications to soft condensed matter systems. prereq: 5201 or instr consent

PHYS 8711. Solid-State Physics I. (; 3 cr.; Student Option; Every Fall) Fundamental properties of solids. Electronic structure and transport in metals and semiconductors. Properties of disordered materials. prereq: 4211, 5002 or instr consent

PHYS 8712. Solid-State Physics II. (; 3 cr.; Student Option; Every Spring) Fundamental properties of solids. Electronic structure and transport in metals and semiconductors. Properties of disordered materials. prereq: 8711 or instr consent

PHYS 8750. Advanced Topics in Condensed Matter Physics. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Sample research topics: magnetism, superconductivity, low temperature physics, superfluid helium. prereq: 8712 or instr consent

PHYS 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PHYS 8800. Seminar: Nuclear Physics. (; 1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Current research topics.


PHYS 8802. Nuclear Physics II. (; 3 cr.; Student Option; Periodic Fall) Properties of nuclei based on hadronic and quark-gluon degrees of freedom. Relativistic field theory at finite temperatures and density applied to many-body problems, especially nuclear matter and quark-gluon plasma. Applications to lepton and hadron scattering, nucleus-nucleus collisions, astrophysics and cosmology. prereq: 8801 or instr consent

PHYS 8850. Advanced Topics in Nuclear Physics. (; 3 cr. [max 9 cr.]; Student Option; Fall Odd Year) Research topics. prereq: 8802 or instr consent

PHYS 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

PHYS 8900. Seminar: Elementary Particle Physics. (; 1 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Elementary particle physics, high energy physics, particle astrophysics and cosmology.

PHYS 8901. Elementary Particle Physics I. (; 3 cr.; Student Option; Every Fall) Types of fundamental interactions. Exact and approximate symmetries and conservation laws. Gauge quanta: gluons, photons, W and Z bosons, gravitons. Fundamental fermions: leptons and quarks. Isotopic and flavor SU(3) symmetries of strong interaction. Heavy hadrons. Amplitudes and probabilities. Quantum chromodynamics. prereq: 8001 or instr consent


PHYS 8950. Advanced Topics in Elementary Particle Physics. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall) Research topics. prereq: 8902 or instr consent

PHYS 8994. Research in Physics. (; 1-12 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) Research under faculty direction. prereq: instr consent

Physiology (PHSL)

PHSL 5001. Principles of Physiology for Biomedical Engineering. (; 4 cr.; Student Option; Every Fall) Human physiology with emphasis on quantitative aspects. Organ systems (circulation, respiration, renal, gastrointestinal, endocrine, muscle, central and peripheral nervous systems), cellular transport processes, and scaling in biology. prereq: Biomedical engineering grad, one yr college chem and physics and math through integral calculus

PHSL 5094. Research in Physiology. (; 1-5 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Independent lab research project in physiology, supervised by physiology faculty. prereq: instr consent

PHSL 5095. Problems in Physiology. (; 1-5 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Individualized study in physiology. Students address selected problem through library or
Muscle contraction: force generation by actin/myosin. prereq: 3061 or 3071 or 5061 or BioC 3021 or BioC 4331 or instr consent

PHSL 5510. Advanced Cardiac Physiology and Anatomy. (2-3 cr.; Student Option; Every Spring)
Fundamental concepts. advanced topics related to clinical/biomedical cardiac physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course. prereq: instr consent

PHSL 5511. Advanced Neuromuscular Junction Physiology. (2-3 cr.; max 2 cr.; Student Option; Every Summer)
Fundamental concepts and advanced topics related to clinical/biomedical aspects of neuromuscular junction physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course. prereq: instr consent

PHSL 5525. Anatomy and Physiology of the Pelvis and Urinary System. (1-2 cr.; A-F only; Every Spring)
Two-day intensive course. Pelvis, perineum, and urinary system with cadaveric dissection. Structure/function of pelvic and urinary organs, including common dysfunction and pathophysiology. Laboratory dissections, including kidneys, ureters, urinary bladder, pelvic viscera and pennum (male or female), pelvic floor, vascular and nervous structures. Grand rounds section. prereq: One undergrad anatomy course, one undergrad physiology course, instr consent

PHSL 5540. Advanced Exercise Medicine: Physiology and Bioenergetics. (1-2 cr.; Student Option; Periodic Fall)
Three-day intensive course. Physiology, bioenergetics, nutrition, and sports medicine. Focuses on application of principles to treatment of diseases and functional deficits. Lectures, demonstrations, hands-on experiences in an exercise medicine facility. prereq: [Grad student or practicing health professional], instr consent

PHSL 5570. Cell Physiology. (4 cr.; A-F only; Every Fall)
Control mechanisms in maintaining homeostasis with respect to critical cell functions. Regulation of pH, volume, nutrient transport, intracellular electrolyte composition, membrane potential. Aspects of intercellular communication. prereq: [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology] or instr consent

PHSL 5701. Physiology Laboratory. (1-2 cr.; A-F or Audit; Every Fall & Spring)
Experiments in physiology. Emphasizes quantitative aspects, including analysis of organ systems. prereq: instr consent

PHSL 6051. Systems Physiology. (4 cr.; A-F or Audit; Every Spring & Summer)
General physiology, endocrine, circulatory, respiratory, digestive, energy metabolism, and renal physiology examined at molecular, cellular, and organ level. Emphasizes homeostasis and basic regulatory aspects of physiological processes of organ systems. prereq: [Prev or current] neuroscience course; [biochemistry, human anatomy] recommended

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
PHSL 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PHSL 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Plant Pathology (PLPA)

PLPA 5003. Diseases of Forest and Shade Trees. (3 cr.; Student Option; Every Spring) This course provides an overview of tree diseases in urban and forested areas. It covers diseases that have had a significant impact on society such as Dutch Elm disease; oak wilt, chestnut blight, white pine blister rust, sudden oak death and many others. It also provides an overview of important cankers, leaf diseases, wilts, rusts, root rot and other tree problems. Laboratory sessions enable students to get hands-on experience identifying disease agents, examining symptoms and learning appropriate control procedures. Emphasis will also be placed on ecological processes, biological and cultural control, and host-parasite interactions. This course should be of value to anyone interested in biological sciences, natural resources or ecology. It is a must or individuals that will have a career in natural resources but should also be useful to those interested in maintaining healthy trees at home, in urban areas or woodlands. Alumni of the University working with trees or woody ornamentals indicate this is one of the most important courses you can take as a student.

PLPA 5090. Issues in Plant Pathology. (1-4 cr.; Student Option; Every Fall, Spring & Summer) See Class Schedule or department for current offerings.

PLPA 5100. Topics in Plant Pathology. (1-4 cr.; A-F or Audit; Every Fall & Spring) Topics in Plant Pathology

PLPA 5103. Plant-Microbe Interactions. (3 cr.; Student Option; Every Fall) Genetics, physiology, molecular biology of plant-microbe interactions. Communication between plant/microbes, signal transduction, control of gene expression, symbiosis/parasitism, plant host response mechanisms, plant disease physiology. prereq: Intro course in plant pathology or molecular biology or equiv

PLPA 5202. Field Plant Pathology. (2 cr.; Student Option; Every Summer) Characteristics of a variety of plant diseases. Field trips to observe symptoms and effects of diseases, and to learn about prevention and control of diseases in field, forest, golf course, greenhouse, nursery, orchard, and urban environments.

PLPA 5203. Introduction to Fungal Biology. (3 cr.; Student Option; Spring Odd Year) Fungi are a critical component of the diversity and function of terrestrial ecosystems, affecting decomposition, plant nutrient uptake, and agricultural practices. Key components of fungal biology, including ecology, genetics, life cycles and diversity. Labs provide hands on experience with a diverse range of organisms. prereq: BIOL 1009 or equiv

PLPA 5300. Current Topics in Molecular Plant Pathology. (1 cr. [max 2 cr.]; S-N only; Every Spring) Interactive class. Students read, discuss, and critique publications in molecular plant pathology. Focus on articles, examining from different dimensions (underlying principles, experimental strategies, data analysis, impact on the broader discipline). prereq: instr consent

PLPA 5301. Large Scale Omic Data in Plant Biology. (3 cr.; Student Option; Every Fall) Introduction to large scale data in plant biology. Emphasizes model plants and important agricultural crops focusing on new approaches and technologies in the field. Fundamentals, acquisition, and analysis of high-throughput DNA and RNA sequencing high-throughput plant phenotyping, functional and comparative genomics, epigenomics, proteomics, metabolomics, and microbiomes. prereq: Intro course in genetics or instr consent

PLPA 5444. Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions. (3 cr.; A-F or Audit; Every Fall) Concepts and recent research in the ecology, epidemiology, and evolutionary/coevolutionary biology of plant-microbe interactions spanning the range from parasitic to mutualistic in agricultural and natural habitats. prereq: Intro plant pathology or advanced biology coursework recommended

PLPA 5480. Principles of Plant Pathology. (3 cr.; Student Option; Every Fall) This course is intended for graduate students and undergraduate students in their third or fourth year that are interested in learning about principles of plant pathology, diseases that affect plants, microbiology and microbial and plant interactions. In this course students will learn principles of plant pathology through lectures and demonstrations and exercises in laboratory. Students will gain knowledge of mycology and select diseases caused by fungi within Ascomycota, Basidiomycota and the fungal-like Oomycota. Diseases caused by bacteria, nematodes, viruses, parasitic plants and abiotic damage are also examined. Lectures will include information concerning the history and importance of plant pathology, mycology, bacteriology, nematology, virology, infection process, genetics of host and microorganism interactions, epidemiology of diseases and disease control strategies. In the hands-on laboratory period the student will learn laboratory skills, gain experience using the microscope, work with microorganisms, learn diagnostic skills, and be able to recognize 30 plant diseases. prereq: BIOL 1009 or equiv

PLPA 5560. Plant Disease Resistance and Applications. (3 cr.; A-F or Audit; Every Spring) Fundamentals of disease resistance in plants and the genetics of host-parasite interactions as they relate to the sustainable control of plant diseases. Examples explored at the Mendelian, populational, and molecular level of organization. prereq: 2001, BIOL 4003

PLPA 5999. Special Topics in Plant Pathology. (1 cr.; Student Option; Every Fall, Spring & Summer) Workshops on topics in plant pathology. See Class Schedule or department for current offerings.

PLPA 8005. Supervised Classroom or Extension Teaching Experience. (1-2 cr.; S-N only; Every Fall & Spring) Teaching experience in Plant Pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy. prereq: instr consent

PLPA 8090. Research and Teaching in Plant Pathology. (1-8 cr.; Student Option; Every Fall, Spring & Summer) Special assignment in teaching or lab and field problems in pathological research. If taking for PLPA teaching requirement: 2 credits= 1 full semester of teaching experience; 1 credit= 1/2 semester of teaching experience

PLPA 8103. Plant-Microbe Interactions. (3 cr.; Student Option; Every Fall) Genetics, physiology, and molecular biology of plant-microbe interactions. Communication between plants/microbes. Signal transduction, control of gene expression, symbiosis/parasitism, plant host response mechanisms, plant disease physiology. prereq: Intro course in plant pathology or molecular biology or equiv

PLPA 8104. Plant Virology. (2 cr.; A-F only; Every Spring) Characteristics, biology, epidemiology, and control of plant diseases caused by viruses. prereq: 5480

PLPA 8105. Plant Bacteriology. (2 cr.; Student Option; Every Spring) For graduate students interested in bacteria that cause plant diseases. Disease cycles, epidemiology, pathogenesis, and means of disease control. The lab section will focus on techniques used to identify bacteria, for inoculating plants, and isolating bacteria from plant material. prereq: 5480


PLPA 8200. Seminar. (1 cr.; A-F only; Every Fall & Spring) Critical review and presentation of current problems and progress in plant pathology.

PLPA 8300. Plant Pathology Project. (1-6 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer)
Laboratory or library projects for Plan B master's students in plant pathology.

**PLPA 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

**PLPA 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**PLPA 8500. Perspectives in Plant Pathology.** (2 cr. [max 4 cr.]; S-N or Audit; Every Fall) Integrative overview of the field. For Ph.D. students nearing end of formal classroom experience.

**PLPA 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**PLPA 8777. Thesis Credits: Master's.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

**PLPA 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

### Plant and Microbial Biology (PMB)


**PMB 5111. Microbial Physiology and Diversity.** (3 cr.; Student Option; Every Fall) Structural-functional organization of bacteria/archaea. Energy metabolism utilizing light, inorganic/organic chemicals. Cell morphologies, roles/assembly of surface structures. Growth/survival mechanisms in various extreme environments. Adaptation to changing conditions by development of specialized cells/structures, altering metabolic patterns.

**PMB 5412. Plant Physiology.** (3 cr.; Student Option; Every Fall) Plant Physiology is the study of how plant cells, tissues and whole organisms function. PMB 4412/5412 is a classic Plant Physiology course that covers plant water relations, mineral nutrition, membrane transport, photosynthesis, respiration, vascular function, metabolism, growth and development, and hormone responses. The physics underlying our understanding of these physiological systems will be addressed as much as possible. Classical and modern approaches to studying these physiological systems will be covered. There are no enforced prerequisites for this course. The following preparation is recommended: PMB 2022 General Botany or PMB 3007W Plant Algal and Fungal Diversity; General Chemistry and Introductory Physics.

**PMB 5500. Special Topics in Plant Biology.** (1-3 cr.; Student Option; Every Spring) Topics Shell

**PMB 5516. Plant Cell Biology.** (3 cr.; Student Option; Periodic Fall) Structure, function, and dynamic properties of plant cellular components such as organelles, cytoskeleton, and cell wall. How cellular structures are assembled, how it contributes to cell growth/division. Cell fate development. Responses to hormones and external signals. prereq: [Biol 2022 or Biol 3007 or Biol 3022]. [Biol 3021 or BiolC 3021 or Biol 4003]

**PMB 5601. Topics in Plant Biochemistry.** (3 cr.; A-F or Audit; Every Spring) Biochemical analysis of processes unique to photosynthetic organisms. Photosynthesis and carbon dioxide fixation. Synthesis of carbohydrates, lipids, and derivatives. Aromatic compounds such as lignin, other natural products. Functions of natural products. prereq: [BIOL 1002 or BIOL 1009 or BIOL 3022]. CHEM 2301

**PMB 5860. Special Topics.** (1-3 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer) Topics vary, see Class Schedule.

**PMB 8081. Integrative Plant Biology: Connecting Molecules to Ecosystems.** (3 cr.; A-F only; Every Fall) Fundamental questions in plant/fungal biology. Research approaches. Students read/evaluate primary literature. Critical analysis, written summaries, oral presentations. Research in plant/fungal biology, ranging from molecular to ecosystem levels. prereq: Plant biological sciences grad student or instr consent

**PMB 8082. Current Topics in Plant Biology: Structure-Evolution-Ecology.** (1 cr.; S-N or Audit; Every Spring) Background information and review of selected current literature. For first-year students in plant biological sciences and other biological science graduate programs.

**PMB 8123. Research Ethics in the Plant and Environmental Sciences.** (0.5 cr.; S-N or Audit; Every Spring) History/values relating to research/scholarship. Social responsibility/reporting misconduct. Authorship plagiarism. Peer review. Copyright/intellectual property. Conflicts of interest. Research data management. Fiscal responsibility/management. Environmental health/safety. Research involving humans/animals. Mentorship presentations by faculty and invited speakers. Meets first seven weeks of spring semester. prereq: Grad student in [applied plant sciences or plant pathology or plant biological sciences or soil science]

**PMB 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) FTE: Master's prereq: Master's student, adviser and DGS consent

**PMB 8444. FTE: Doctoral.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

**PMB 8666. Doctoral Pre-Thesis Credits.** (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

**PMB 8777. Thesis Credits: Master's.** (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring) Thesis credits: doctoral. prereq: Passed prelim oral or adviser approval

**PMB 8888. Thesis Credit: Doctoral.** (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) Thesis credit: doctoral. prereq: Passed prelim oral or adviser approval

**PMB 8900. Seminar.** (1-2 cr. [max 4 cr.]; S-N or Audit; Every Fall & Spring) Current scientific research.

**PMB 8901. Preparation of Research Proposals.** (2 cr.; S-N only; Every Fall) Grant writing process. Strategies and ethical standards for research proposal preparation/review. Students prepare an original proposal and critique work of others. prereq: Plant biological sciences PhD student

**PMB 8910. Journal Club.** (1 cr. [max 4 cr.]; S-N or Audit; Periodic Fall, Spring & Summer) Critical evaluation of selected current literature.

**PMB 8993. Directed Studies.** (1-5 cr. [max 15 cr.]; Student Option; Every Fall, Spring & Summer) Directed Studies prereq: PBio grad student, instr consent

**PMB 8994. Research.** (1-5 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Independent research determined by student's interests, in consultation with faculty mentor. prereq: PBio grad student, instr consent

### Political Science (POL)

**POL 5005. Political Engagement: Theories and Practice.** (4 cr.; A-F only; Every Fall) Theories of political and civic engagement; case studies of challenges and opportunities in public service careers; ethics of political engagement.

**POL 5065. Mentorship in Political Engagement.** (3 cr.; A-F only; Every Summer)
POL 5210. Topics in Political Theory. (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topics specified in the Class Schedule.

POL 5280. Topics in Political Theory. (3-4 cr. [max 3 cr.]; Student Option; Periodic Fall & Spring) Topics in historical, analytical, or normative political theory. Topics vary, see Class Schedule. prereq: grad student

POL 5306. Presidential Leadership and American Democracy. (3 cr.; Student Option; Periodic Fall) Examines whether president's political and constitutional powers are sufficient to satisfy citizens' high expectations and whether president should be expected to dominate American politics. prereq: grad student or instr consent

POL 5310. Topics in American Politics. (3 cr.; Student Option; Every Fall & Spring) See Class Schedule for description.

POL 5315. State Governments: Laboratories of Democracy. (WI; 4 cr.; Student Option; Periodic Fall) Political behavior, governmental institutions, and public policies in American states. Comparison among states, between state and national government. Emphasizes Minnesota. prereq: grad student or instr consent

POL 5322. Rethinking the Welfare State. (3-4 cr. [max 3 cr.]; Student Option; Periodic Fall & Spring) Competing arguments about welfare states in advanced industrial countries. Whether welfare states result from sectional interests, class relations, or citizenship rights. Compares American social policy with policies in other western countries. prereq: grad student

POL 5325. Political Actors in the American Policy Process. (3 cr.; Student Option; Every Fall) The role of political actors in the American policy process, focusing on actors within government (Congressional representatives, the President, bureaucrats, federal judges, state and local elected officials) and outside government (the public, interest groups, social movements, and the media). Theories of agenda setting, policymaking, and policy change. Graduate standing.

relations on U.S. economy/politics. prereq: Credit will not be granted if credit has been received for: ; 4833; grad student; 3835 recommended

POL 5885. International Conflict and Security. (; 3 cr. ; Student Option; Periodic Fall)
Alternative theories of sources of militarized international conflict. Theories applied to past conflicts. Theories' relevance to present. prereq: grad student

POL 5970. Individual Reading and Research. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer)
Guided individual reading or study. Prereq instr consent, dept consent, college consent.

POL 8060. Research Proseminar in Political Science. (; 2 cr. [max 8 cr.]; Student Option No Audit; Every Fall & Spring)
Readings, discussion, guest speakers. Topics vary by semester.

POL 8070. Advanced Research and Writing in Political Science. (; 2 cr. [max 4 cr.]; S-N only; Every Fall & Spring)
Commentary/guidance at all stages of dissertation research process, from conceptualization of topic/project to editing of nearly final drafts.

POL 8101. Introduction to Political Science. (; 3 cr. ; A-F or Audit; Every Fall & Spring)
History, scope, and methods of political science as a discipline; current subfields; major research programs (including realism, postmodern, participatory. Domestic and international struggles over meaning of science as a discipline; current subfields; major research programs (including realism, pluralism, institutionalism, rational choice, and critical theory); problems of theory, interpretation, concept-formation, comparison, measurement and experimentation; designs for research. prereq: Grad pol sci major or instr consent

POL 8104. Professional Development I. (2 cr. [max 4 cr.]; S-N only; Every Spring)
The objectives of this course are as follows: (1) to provide students with professional advice that will help them move with dispatch through the graduate program; (2) to learn the formal and informal norms of the discipline; and (3) to help them prepare to do independent research and dissertation research. prereq: 1st year Pol graduate student

POL 8105. Professional Development II. (; 1 cr. [max 2 cr.]; S-N or Audit; Every Spring)
Research ethics. Skills for teaching undergraduate courses in political science. Completion of dissertation prospecti or early chapters. prereq: Pol sci student, ABD, dept consent

POL 8106. Quantitative Political Science I. (3 cr. ; Student Option; Every Fall)
This course provides a thorough grounding in the quantitative analysis of political science data. The emphasis is on how to analyze such data, interpret statistical results, and summarize and report the findings. By the end of the term you will (1) know how to describe variables; (2) test hypotheses; (3) use measures of association to quantify the relationship between two variables while holding a third variable constant; (4) understand bivariate regression and the basics of multiple regression; (5) understand reliability and validity and how to assess these properties empirically; and (6) know how to use the STATA statistical software program. prereq: political science grad major or instr consent

POL 8107. Quantitative Political Science II. (; 3 cr. ; A-F only; Every Spring)
Multiple linear regression model applied to political science data. How to use regression techniques to analyze data, interpret statistical results, and summarize/report the findings. Estimation of model. Underlying assumptions. Inference. Model diagnostics. Extensions of model. prereq: Political science grad major or instr consent

POL 8108. Maximum Likelihood Estimation. (3 cr. ; Student Option; Every Fall)
This course presents an overview of the likelihood theory of statistical inference, and its wide range of uses in applied quantitative political science. When dependent variables take the form of two or unordered categories, event counts, or otherwise violate the traditional assumptions of the linear regression model, models estimated by maximum likelihood provide an essential alternative. Topics covered include binary, multinomial, and ordered logit/probit, Poisson regression, and multilevel models. We will rely heavily on computational methods of analysis using the R statistical computing environment, and instruction on how to use R for applied research will be provided throughout the length of the course.

POL 8120. Core Course in Political Methodology: Modeling Political Processes. (; 3 cr. ; Student Option; Fall Odd, Spring Even Year)
Methods used and potential for creating models of political processes. Designing political institutions, discerning/forecasting election outcomes, producing early warnings of international conflicts, increasing turnout in elections. Using mathematics to study political strategy and collective decision making in committees/legislatures. Using statistics to measure political variables, design experiments with human subjects, and test micro/macro political theories. prereq: Pol sci grad major or instr consent

POL 8122. Positive Theory. (; 3 cr. ; Student Option; Every Fall)
Survey of positive political theory and rational-choice models. Information and transaction costs; institutions; models of elections, voting, coalitions. prereq: Grad pol sci major or instr consent

POL 8124. Game Theory. (; 3 cr. ; Student Option; Every Spring)
Application of noncooperative game theory in political science. Equilibrium concepts, bargaining, repeated games, games of incomplete information, signaling games, reputation, learning in games. prereq: [8122, grad pol sci major] or instr consent

POL 8125. Dynamic Analysis. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Time series method, its application in political science. prereq: Pol sci grad student or instr consent

POL 8126. Qualitative Methods. (; 3 cr. ; Student Option; Fall Even, Spring Odd Year)
Qualitative methods in social science. Hands-on training through fieldwork projects. Interviewing, participant observation, narrative interpretation, ethical issues. Problems of gender/race in fieldwork. prereq: Grad student

POL 8127. Survey Research Methods: Measuring Public Opinion. (; 3 cr. ; Student Option; Fall Even, Spring Odd Year)
Theoretical/empirical issues in survey research methodology aimed at assessing political attitudes/behavior (including questionnaire design, scientific sampling). Skill areas necessary to analyze, design, or conduct surveys to examine political phenomena. prereq: Pol sci grad major

POL 8131. Advanced Methods and Models. (; 3 cr. ; Student Option; Every Fall)
Intersection of statistical methodology and deductive modeling; issues in merging inductive and deductive research. Sample topics: parties and elections, probabilistic voting, strategic modeling of international relations. prereq: Grad pol sci major, 6 cr 81xx seminars or instr consent

POL 8160. Topics in Models and Methods. (; 3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Seminars on selected topics, as specified in Class Schedule.

POL 8201. Understanding Political Theory. (3 cr. ; Student Option; Every Fall & Spring)
Key concepts/major approaches. prereq: Grad student or instr consent

POL 8215. Philosophy of Political Inquiry. (; 3 cr. ; Student Option; Every Fall)
Major schools in philosophy of science as applied to political inquiry: pragmatism, positivism, hermeneutics, critical rationalism, critical theory, realism. Themes of political inquiry: explanation, interpretation, theory, criticism. Political issues raised by philosophy of science: liberalism, democracy, control, multiculturalism. prereq: Grad pol sci major or instr consent

POL 8225. American Political Thought. (; 3 cr. ; Student Option; Every Fall)
Colonial era to present: Puritans, American Revolution, Constitution, rise of individualism, pro- and anti-slavery arguments, civil war and reconstruction, industrialism, westward expansion, Native Americans, immigration, populism, socialism, social Darwinism, growth of corporations and unions; Great Depression; growth of American power at home and abroad. prereq: Grad pol sci major or instr consent

POL 8235. Democratic Theory. (; 3 cr. ; Student Option; Periodic Fall & Spring)
Competing models of democracy: classical, republican, liberal, radical, Marxist, neo-Marxist, pragmatist, populist, pluralist, postmodern, participatory. Domestic and international struggles over meaning of
"democracy"; social science models of and findings on democracy. prereq: Grad pol sci major or instr consent

POL 8251. Ancient and Medieval Political Thought. (3 cr.; Student Option; Every Fall) Politics and ethics in Greece, Rome, Christendom: Thucydides, Socrates, Plato, Aristotle, Cicero, Augustine, Aquinas, Marsilius. prereq: Grad pol sci major or instr consent

POL 8252. Early Modern Political Thought. (3 cr.; Student Option; Every Fall) Theorists and texts from Renaissance to French Revolution. Selectively includes Machiavelli, More, Calvin, Luther, Grotius, Bodin, Hobbes, Winstanley, Harrington, Locke, Montesquieu, Rousseau, Hume, Smith, Burke, and wollstonecraft; key debates over liberty, law, power, and knowledge. prereq: Grad pol sci major or instr consent

POL 8253. Late Modern Political Thought. (3 cr.; Student Option; Every Fall & Spring) Theoretical responses to and rival interpretations of Western economy, society, politics, and democratic culture in the modern age; theories of history; class struggle; the end of metaphysics and the death of God; technology and bureaucracy; psychology of culture, in Hegel, Marx, Tocqueville, Mill, Nietzsche, Weber, Freid. prereq: Grad pol sci major or instr consent

POL 8260. Topics in Political Theory. (3 cr.; max 6 cr.; Student Option; Every Fall & Spring) Readings and research in special topics or problems.

POL 8275. Contemporary Political Thought. (3 cr.; Student Option; Every Fall) From approximately World War II to the present. Survey of range of texts or intensive focus on such authors as Adorno, Arendt, Derrida, Foucault, Habermas, Horkheimer, Rawls, Said. Sample topics: feminism, postmodernism, communitarianism, Frankfurt School, postcolonialism. prereq: Grad pol sci major or instr consent

POL 8301. American Politics. (3 cr.; Student Option; Periodic Fall & Spring) Seminar on main themes of theory and research in American politics, institutions, law, and policy. Major works on individual, mass, elite, and institutional behavior and their relationship to each other. Foundation for advanced seminars in American politics. prereq: Grad pol sci major or instr consent

POL 8302. Public Opinion and Political Behavior. (3 cr.; Student Option; Every Fall) Major theoretical perspectives/research on political participation, voting behavior, public opinion. Voter turnout, importance of party identification, effects of campaigns, long-term change in public opinion, designing/conducting research. prereq: Grad pol sci major or instr consent

POL 8303. Political Parties. (3 cr.; Student Option; Every Fall) Party systems and subsystems; party organizational characteristics, goals, and incentives; distribution of power and authority within the party; chief party functions; party as an organizer of governmental power; determinants of party structure and role. prereq: Grad pol sci major or instr consent

POL 8305. Interest Groups and Social Movements. (3 cr.; Student Option; Every Fall & Spring) Theoretical/empirical work on role of interest groups and social/political movements in American politics and policy-making processes. Theories of interest group and social/political movement formation, maintenance, and decline. How interest groups and social/political movements attempt to influence public policy. Impact/effectiveness groups/movements as agents of democratic representation, particularly for marginalized groups. prereq: Grad pol sci major or instr consent

POL 8307. Proseminar in Political Psychology I. (2 cr.; S-N or Audit; Every Fall) Readings, discussion, and guest speakers. Topics vary by semester. prereq: Grad pol sci major or pol psych minor or instr consent

POL 8308. Proseminar in Political Psychology II. (2 cr.; Student Option; Every Spring) Readings, discussion, and guest speakers. Topics vary by semester.

POL 8311. Political Psychology and Socialization. (3 cr.; A-F or Audit; Every Fall & Spring) Introduction to political psychology. Personality and politics; political cognition, emotion, and political behavior; political expertise; media and politics; aggression, authoritarianism, and political behavior; altruism and politics. prereq: Grad pol sci major or pol psych minor or instr consent

POL 8312. Legislative Process. (3 cr.; Student Option; Every Fall & Spring) Introduction to study of legislative politics; theories of legislative institutions and individual behavior; congressional elections; congressional committees, parties, and leaders. prereq: Grad pol sci major or instr consent

POL 8313. Executive Process. (3 cr.; Student Option; Every Fall) Tension between leadership and democracy in context of American presidency in terms of President's relationship with federal bureaucracy, Congress, and making of diplomatic and military policy. prereq: Grad pol sci major or instr consent

POL 8314. Judicial Process. (3 cr.; Student Option; Every Fall) Judicial systems and roles; selection of judges; organizing and supporting litigation; influences on judicial decisions; impact and enforcement of judicial decisions; courts and other institutions of government. prereq: Grad pol sci major or instr consent

POL 8320. Social Psychology of Prejudice and Intergroup Relations. (3 cr.; A-F or Audit; Every Fall) Approaches, findings, and controversies in research on social psychology of prejudice, racial attitudes, and intergroup relations. Focuses on approaches based in social psychology and on related work from political science and sociology.

POL 8321. Urban Politics. (3 cr.; A-F or Audit; Every Fall) Selection of local leadership; relationship of political system to governmental forms and social institutions; role and impact of political institutions; policymaking at local level; studies in policy problems; the emerging metropolis. prereq: Grad pol sci major or instr consent

POL 8325. State Politics and Intergovernmental Relations. (3 cr.; Student Option; Every Fall) Theoretical approaches to comparative study of state politics; study of political culture and behavior, governmental institutions, and public policy at state level; federalism. prereq: Grad pol sci major or instr consent

POL 8331. Constitutional Law. (3 cr.; Student Option; Every Fall) Overview of substantive and theoretical debates in American constitutional law; role of law and constitutional interpretation in shaping American political institutions and American politics. prereq: Grad pol sci major or instr consent

POL 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

POL 8335. Public Policy. (3 cr.; Student Option; Every Fall) Theoretical approaches: incrementalism, innovation and policy learning, comparative policy outputs, policy process models, interest groups, and selected areas of public policy. prereq: Grad pol sci major or instr consent

POL 8337. Welfare State Theories and American Social Policy. (3 cr.; Student Option; Every Fall) Rival theoretical explanations for cause and nature of welfare state development in context of four American social policies: social security, welfare, education, and healthcare. prereq: Grad pol sci major or instr consent

POL 8360. Topics in American Politics. (3 cr.; max 9 cr.; Student Option; Every Fall & Spring) Readings and research in special topics or problems. prereq: instr consent

POL 8401. International Relations. (3 cr.; Student Option; Every Fall & Spring) Basic theories/approaches to study of international politics. Surveys representative work/central issues of scholarship. prereq: Grad pol sci major or dept consent

POL 8402. International Security. (3 cr.; Student Option; Spring Odd Year) Introduction to contending theories of international conflict/security. prereq: Grad pol sci major or instr consent

POL 8403. International Norms and Institutions. (3 cr.; Student Option; Periodic Fall & Spring) Origins, roles, and effectiveness of international norms and institutions; theoretical explanations...
and debates. Institution of sovereignty; rational choice versus constructivist perspectives; role of international law, international organizations, and non-governmental organizations; and international society and transnational cultural norms. prereq: Grad pol sci major or instr consent

POL 8404. International Hierarchy. (; 3 cr.; Student Option; Periodic Fall) Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of hegemony; cultural productions of difference and inequality. prereq: Grad pol sci major or instr consent

POL 8405. International Political Economy. (; 3 cr.; A-F or Audit; Periodic Fall & Spring) Theoretical and policy issues in international economic relations. Different approaches for understanding outcomes in international economy. Trade, finance, labor markets, creation and maintenance of international regimes, and “globalization” of economic liberalism. prereq: Grad pol sci major or instr consent

POL 8406. Politics of International Finance. (; 3 cr.; Student Option; Periodic Fall & Spring) Relationship between workings of the international political system and that of international markets for currency and capital. prereq: Grad pol sci major or instr consent

POL 8407. Morality in World Politics. (; 3 cr.; Student Option; Periodic Fall & Spring) Approaches to normative theorizing and empirical research on moral norms in world politics. Theoretical topics: realism, communitarianism, consequentialism, constructivism, postmodernism, cultural relativism. Substantive issue areas: famine and foreign aid, just war theory, nuclear weapons, moral implications of technology, case study on war (Gulf War). prereq: Grad pol sci major or instr consent

POL 8408. International Relations of the Environment. (; 3 cr.; Student Option; Periodic Fall) Theory and practice of international environmental politics. Emergence of environment as major issue of international relations. Diversities of agendas and politics. Imperatives, templates, resistance in global efforts to forge an applied politics of environmental sustainability. Selected cases. prereq: Grad pol sci major or instr consent

POL 8411. Political Psychology and Foreign Policy. (; 3 cr.; Student Option; Periodic Fall & Spring) Foreign policy theories about decision makers and audiences. Impact of human nature, formal institutions, cultural and cross-cultural settings, and kinds of issues on foreign policy choice, control, and justification. prereq: Grad pol sci major or instr consent

POL 8412. American Foreign Policy. (; 3 cr.; Student Option; Periodic Fall & Spring) U.S. policy toward foreign states and peoples: heritage, motivations, policy processes, what the public generally knows and wants, specific policies. Rise of internecine issues and decline of enemy-focused internationalism; implications for process and content of U.S. foreign policy. prereq: 8410 or instr consent

POL 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and director of graduate studies consent

POL 8460. Topics in International Relations. (; 3 cr.; [max 6 cr.]; Student Option; Every Fall & Spring) Readings and research in advanced topics or problems. Recent topics: global environmental issues, morality in world politics, and norms and institutions in world politics.

POL 8601. Introduction to Comparative Politics. (; 3 cr.; Student Option; Periodic Fall & Spring) Main theoretical approaches and issues: comparative method, the state and class; political culture; development, democratization, rational choice, social movements. prereq: Grad pol sci major

POL 8602. Families, Children, and the State. (; 3 cr.; A-F or Audit; Periodic Fall) Politics of family, sex, and children. Comparative perspective. Family autonomy vs. state authority. Political struggles over the definition of family, sex, and marriage. Crisis in fatherhood. Children's rights. Globalization of Western ideology of childhood. Political realities of third-world childhood. Theories of political efficacy in family/child advocacy.

POL 8603. European Government and Politics. (; 3 cr.; A-F or Audit; Periodic Fall & Spring) Main theories and approaches used to interpret European politics. Many of these theories have broad relevance for comparative politics, for example, theories about the state, cleavages and coalitional bases, parties and social movements, and constitutional structures and institutions have broad relevance for the field of comparative politics. prereq: Grad pol sci major or instr consent

POL 8605. Government and Politics in Africa. (; 3 cr.; A-F or Audit; Periodic Fall & Spring) Theoretical and methodological approaches to study of African politics, focusing on pre-colonial and colonial legacies for post-colonial reality. Local politics, social construction of identities, political economy of peasantry and working class, political development and decay, social movements, and prospects for democracy. prereq: Grad pol sci major or instr consent

POL 8606. Government and Politics of Russia and the Commonwealth of Independent States. (; 3 cr.; A-F or Audit; Periodic Fall & Spring) Framework for understanding politics of change underway in the former Soviet Union. Roots of current transformation, including causes and legacy of the Russian revolution and creation of the Soviet Union. Issues in current transformation, including nationalism, economic reform, and democratization. Prior knowledge of basic Soviet politics is assumed. prereq: Grad pol sci major or instr consent

POL 8611. Chinese Politics. (; 3 cr.; Student Option; Periodic Fall & Spring) Major issues since 1949: democratization, dissent, violence, gender, capitalist and socialist development strategies, inequality, effect of culture on politics, status of Taiwan. Current scholarly debates on Chinese politics. Professional methods for research on contemporary China. prereq: Grad pol sci major or instr consent

POL 8615. The Political Economy of Contemporary Japan. (; 3 cr.; Student Option; Periodic Fall & Spring) Major political and economic issues confronting the Japanese system; situation of Japanese case within comparative politics literature concerning role of the state in formulating economic and social policy making. Review of literature. Deregulation in key industries, welfare reform, tax reforms. prereq: Grad pol sci major or instr consent

POL 8619. Latin American Politics. (; 3 cr.; Student Option; Periodic Fall & Spring) Major bodies of theory on development, democracy and redemocratization, social movements, civil society, the state, and transnational linkages. prereq: Grad pol sci major or instr consent

POL 8621. Comparative and Case Study Methods. (2 cr.; [max 4 cr.]; Student Option No Audit; Every Fall & Spring) This course will provide students with a basic introduction to methodological debates surrounding comparative and case study methods in political science. Although the course is designed primarily with an eye to the needs of students in comparative politics, this course will also be useful to students in other subfields who wish to learn more about comparative and/or case study methods.

POL 8633. Comparative Sociopolitical Change. (; 3 cr.; Student Option; Periodic Fall & Spring) Critical evaluation of literature and theoretical perspectives; comparative examination of social and political change and interrelationship between both processes; structure/agency nexus. prereq: Grad pol sci major or instr consent

POL 8637. Comparative Political Economy. (; 3 cr.; Student Option; Periodic Fall & Spring) Connections between democracy and markets, emphasizing experiences of countries in North America and Europe. prereq: Grad pol sci major or instr consent

POL 8641. Comparative Mass Political Behavior. (; 3 cr.; A-F or Audit; Fall Even, Spring Odd Year) Examined from a cross-national perspective. Development of political participation, mobilization and its effects, development of political cleavages and political parties as vehicles of conflict, modes of political behavior under varied systems of representation and varied party systems. prereq: Grad pol sci major or instr consent
POL 8643. Comparative Political Institutions. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Structure/operation of various political institutions in different settings. Theoretical approaches, comparative frameworks. Introduction to literature on political institutions. Preparation for comparative research on political institutions. prereq: Pol sci grad student or instr consent

POL 8660. Topics in Comparative Politics. (; 3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Readings in advanced topics or problems. Supervised research/training. Topics specified in Class Schedule.

POL 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral, up to 24 combined cr, permission number required for registration, doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

POL 8777. Thesis Credits: Master's. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

POL 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

POL 8990. Directed Readings and Research in Political Science. (; 1-7 cr.; Student Option; Every Fall, Spring & Summer)
TBD prereq: 16 cr 8xxx pol sci courses, instr consent, dept consent

POL 5520. Portuguese Literary and Cultural Studies. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Origins/development of modern Portuguese nation (late 15th to 20th century) using literature, cultural and literary criticism, history, sociology, and various media (film, art, music, Internet). Main cultural problematics pertaining to Portugal as well as fundamental literary texts.

POL 5530. Brazilian Literary and Cultural Studies. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)
Study of origins and development of modern Brazilian nation (late 16th to 20th century) using literature, cultural and literary criticism, history, sociology) and various media (film, art, music, Internet). Main cultural problematics pertaining to Brazil as well as fundamental literary texts. prereq: Grad student or instr consent

PORT 5530. Brazilian Literary and Cultural Studies. (; 3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)
Lusophone manifestations in Portuguese-speaking world (Portugal, Brazil, Lusophone Africa). Literature, history, film, intellectual thought, critical theory, popular culture. Topics may include writers (e.g. Machado de Assis) groups of writers (e.g. Lusophone women writers), or problematics such as (post-)colonialism or Luso-Brazilian modernities.

PORT 5930. Topics in Brazilian Literature. (; 3 cr. [max 9 cr.]; Student Option; Every Fall) Major issues of Brazilian literature; focuses on important authors, movements, currents, and genres. Problems, socioeconomic questions, and literary techniques related to Brazilian themes. Topics specified in Class Schedule.

PORT 5970. Directed Readings. (1-4 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer)
Lusophone studies (Portuguese-speaking Africa, Brazil, Portugal). Areas not covered in other courses. Students submit reading plans for particular topics, figures, periods, or issues. Prereq MA or PhD candidate, instr consent.

PORT 5990. Directed Readings and Research in Political Science. (; 1-7 cr.; Student Option; Every Fall, Spring & Summer)
TBD prereq: 16 cr 8xxx pol sci courses, instr consent, dept consent

PORT 5990. Directed Readings and Research in Political Science. (; 1-7 cr.; Student Option; Every Fall, Spring & Summer)

PORT 8333. FTE: Master's. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

PORT 8777. Thesis Credits: Master's. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PSTL 5306. College Student Mental Health. (2 cr.; A-F only; Every Spring)
Mental health of college students, way colleges provide support for students with mental health concerns, basic skills all college faculty/staff need to provide support to students experiencing distress, self-care strategies for support givers.

PSTL 5306. College Student Mental Health. (2 cr.; A-F only; Every Spring)

PSE 6011. Electric Machines and Drives. (; 3 cr.; A-F or Audit; Every Fall & Spring)
Power Systems, Pwr Electronics (PSE)

PSE 6011. Electric Machines and Drives. (; 3 cr.; A-F or Audit; Every Fall & Spring)
Students learn various aspects of electric machines and drives under a steady state operation. Course provides overview of the components and control and a basic fundamental understanding for further learning. This course describes the principles behind how electric machines operate. In a way that they can be controlled in adjustable speed and position applications. In order to do so, power-electronics based converters are described in their functionality as well as the feedback control of speed and position in a system. prereq: Circuit analysis ?? dc and sinusoidal ac in steady state using phasors; basic idea of diode, transistor and thyristor operation; Fourier analysis; Laplace Transform: Bode Plots, gain and phase margin; Electromagnetic field concepts, magnetic-circuit concepts

PSE 6021. Power Systems. (; 3 cr.; A-F or Audit; Every Fall & Spring)
Students will learn various aspects of electric power systems and receive an overview of the various components and control and a basic fundamental understanding for further learning. Course begins with examining various means of generating electricity and then transmitting it over power lines and cables; calculating power flow in an interconnected grid; various components such as transformers, synchronous generators, etc. that make up power systems. The middle-part of the course describes the requirements for voltage stability and keeping the generators operating synchronously under transient fault conditions. The last part of the courses deals with the protection of power systems against transmission line faults using protective relaying, and under transient over-voltages by means of insulation coordination using surge arrestors. prereq: Circuit analysis ?? dc and sinusoidal ac in steady state using phasors; basic idea of diode, transistor and thyristor operation; Fourier analysis; Laplace Transform; Electromagnetic field concepts, magnetic-circuit concepts

PSE 6031. Power Electronics. (; 3 cr.; A-F or Audit; Every Fall & Spring)
Course on power electronics, an enabling technology, with a focus on its various applications, basic converter structures and how these converters are used and controlled in these applications. By exploiting the commonality of various converters, students get a much deeper and broader understanding. The concentration of this course will be on switch-mode power electronics where the transistors such as MOSFETs and IGBTs are used as semiconductor switches - either ON or OFF. The terminal characteristics of these devices will be discussed for designing converters in which they are used in order to calculate conduction and switching losses for thermal management and design trade-offs; however, in analyzing the voltage transfer ratios in various converter topologies and in their feedback control, these semiconductor devices and the associated passive components will be considered ideal. The last part of the course will discuss thyristor-based converters used at very high power levels in electric-utility applications. prereq:
Preventive Science Minor (PREV)


PREV 8002. Prevention Science Research Methodology. (3 cr.; A-F or Audit; Every Fall) This course is intended to provide students with broad exposure to topics in research methodology within the field of prevention science. Prevention science as a discipline focuses on theory, etiology, and prevention of social, physical and mental health problems and the translation of that information to promote health and well-being. This course will emphasize research methodology as it pertains to preventive interventions in youth and family contexts. The course is intended to serve as a survey of a wide range of topics within these areas, with research design, measurement issues, and analytic methods representing the major foci. Topics will be covered with attention to the community contexts within which prevention research often occurs as well as the ethical and human subjects issues that may arise. Students who successfully complete the course are expected to be able to interpret and critically evaluate prevention research methodology as well as identify appropriate methodological strategies to address research questions within prevention science.

PREV 8003. New Topics in Prevention: Implementation and Dissemination. (3 cr.; A-F or Audit; Every Spring) This is an interdisciplinary course focused on the new science of implementation and dissemination of evidence-based/empirically-supported family-focused psychosocial prevention programs. Course content will include an overview of conceptual and theoretical foundations of implementation research, key research questions, methods for evaluating implementation and dissemination efforts, and case examples from the empirical literature. The course will take an ecological perspective to the implementation of family-based prevention programs, addressing questions such as how widespread efforts to install programs in communities can ensure that programs create change in children and families.

Product Design (PDES)

PDES 5193. Directed Study in Product Design. (1-1.5 cr.; [max 8 cr.]; A-F or Audit; Every Fall, Spring & Summer) Independent study in product design under tutorial guidance. prereq: Grad, instr consent

PDES 5701. Creativity, Idea Generation, and Innovation. (3 cr.; A-F only; Every Fall) Introduction to a variety of creativity and idea generation tools with an emphasis on innovative product concept development. Students apply different toolsets to an ongoing project. Starting with a general theme, students explore problems and concepts, practice using a variety of idea generation tools, and learn methods of evaluating/selecting concepts. Customer needs, benchmarking, and intellectual property.

PDES 5702. Concept Sketching and Rendering. (3 cr.; A-F only; Every Fall) Sketching and rendering for communication of conceptual product design. Free-hand 2-point perspective. Weekly drawing assignments/presentations. Students keep a sketchbook to develop ideas/drawings.


PDES 5704. Computer-Aided Design Methods. (3 cr.; A-F only; Every Fall) Overview of how to make well-modeled, properly illuminated, and carefully composed digital models of existing/conceptual objects. prereq: Senior or grad student

PDES 5705. History and Future of Product Design. (3 cr.; A-F only; Every Spring) This class covers critical milestones in the history, evolution, and trajectory of modern product design as well as the human relationships to consumer goods, including production and consumption. In some assignments, students have the opportunity to apply the topics discussed towards imagining the future of the product design industry.

PDES 5706. Designing for Manufacture. (4 cr.; A-F only; Every Fall) Hands-on exposure to a number of common manufacturing methods and the considerations in product design. Students will be able to apply the theory of design for manufacturing (DFM) and design for assembly (DFA) to other methods that may not be taught in this course. prereq: PDes 5704 or CAD experience.

PDES 5711. Toy Product Design. (2 cr.; A-F only; Every Spring) Toy Product Design is an introduction to integrated product design process in which elements of industrial design, engineering, business, and humanities are combined and applied to a semester-long design project. Cross-functional teams of six students work together to design and prototype new toy product concepts with help from industry mentors.

Prosthodontics (PROS)

PROS 7110. Classic Prosthodontic Literature Review. (2 cr.; A-F only; Every Fall & Spring) Selected historical literature. Current research, its implications for present-day restorative dental therapy. prereq: instr consent

PROS 7120. Current Literature Review. (1 cr. [max 6 cr.]; A-F or Audit; Every Fall, Spring & Summer) Historical development of maxillofacial prosthetics, interdisciplinary relationships in treatment of maxillofacial patient.

PROS 7161. Applied Biomaterials. (2 cr.; A-F or Audit; Every Summer) Principles governing manipulation of materials used in restorative dental practice. The physical and mechanical properties and the biocompatibility of dental materials to oral tissues. prereq: instr consent

PROS 7171. Principles of Maxillofacial Care. (2 cr.; A-F only; Every Fall & Summer) Treatment, biomechanics, and technical procedures associated with fabrication, fitting,
and servicing of various types of oral and facial prostheses.

**PROS 7200. Advanced Clinical Prosthodontics I.** (5 cr.; A-F only; Every Fall, Spring & Summer)
Practical clinical experience in examination, diagnosis, treatment planning, and various phases of treatment of patients with complex restorative dental problems. New and unfamiliar concepts and techniques. prereq: instr consent

**PROS 7210. Advanced Clinical Prosthodontics II.** (2 cr.; A-F or Audit; Every Summer)
Residents are exposed to technical aspects of complete denture, removable partial denture, fixed partial denture construction, associated use of implants, considerations related to temporomandibular dysfunction (TMD). prereq: instr consent; offered concurrently with course on dental materials, head/neck anatomy

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**Psychology (PSY)**

**PSY 5011. Applied Behavior Analysis.** (3 cr.; Student Option No Audit; Every Spring)
Fundamental concepts of applied behavior analysis. Practical techniques of behavior modification with humans/animals. Emphasizes functional analyses of behavioral deficits/excesses, development/implementation of programs to bring about meaningful behavior change.

**PSY 5014. Psychology of Human Learning and Memory.** (3 cr.; A-F only; Spring Odd Year)

**PSY 5015. Cognition, Computation, and Brain.** (3 cr.; Student Option; Spring Odd Year)
Human cognitive abilities (perception, memory, attention) from different perspectives (e.g., cognitive psychological approach, cognitive neuroscience approach). prereq: [Honors or grad] or [jr or sr, 3011 or 3031 or 3051 or 3061] or instr consent

**PSY 5016. Behavior Analysis and Autism.** (4 cr.; A-F or Audit; Every Fall)
Off-campus work with autistic children, under professional supervision. Professional ethics, social responsibility, scientific methods, moral philosophy. At least eight hours per week, for 12 weeks, at service-learning site. One on-campus evening meeting per week. prereq: Individual auto transportation, instr consent

**PSY 5018H. Mathematical Models of Human Behavior.** (3 cr.; A-F only; Periodic Fall)
Mathematical models of complex human behavior, including individual/group decision making, information processing, learning, perception, and overt action. Specific computational techniques drawn from decision theory, information theory, probability theory, machine learning, and elements of data analysis. prereq: Math 1271 or instr consent

**PSY 5031W. Perception.** (WI; 3 cr.; Student Option; Fall Odd Year)
Cognitive, computational, and neuroscience perspectives on visual perception. Topics include color vision, pattern vision, image formation in the eye, object recognition, reading, and impaired vision. prereq: 3031 or 3051 or instr consent

**PSY 5036W. Computational Vision.** (WI; 3 cr.; Student Option; Fall Even Year)
Applications of psychology, neuroscience, computer science to design principles underlying visual perception, and cognition, action. Compares biological/physical processing of images with respect to image formation, perceptual organization, object perception, recognition, navigation, motor control. prereq: [3031 or 3051], [Math 1272 or equiv] or instr consent

**PSY 5037. Psychology of Hearing.** (3 cr.; Student Option; Periodic Fall)
Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech. Clinical/other applications. prereq: [MATH 1271, [3031 or 3051] or grad student

**PSY 5038W. Introduction to Neural Networks.** (WI; 3 cr.; Student Option; Fall Odd Year)
Parallel distributed processing models in neural/cognitive science. Linear models, Hebbian rules, self-organization, non-linear networks, optimization, representation of information. Applications to sensory processing, perception, learning, memory. prereq: [(3061 or NSCI 3102), [MATH 1282 or 2243]] or instr consent

**PSY 5054. Psychology of Language.** (3 cr.; Student Option; Every Fall)
Theories/experimental evidence in past/present conceptions of psychology of language. prereq: Grad or [jr or sr, 3011 or 3031 or 3051 or 3061] or instr consent

**PSY 5062. Cognitive Neuropsychology.** (3 cr.; Student Option; Every Fall)
Consequences of different types of brain damage on human perception/cognition. Neural mechanisms of normal perceptual/cognitive functions. Vision/attention disorders, split brain, language deficits, memory disorders, central planning deficits. Emphasizes function/phenomenology, neural correlate of brain anatomy. prereq: Grad or [jr or sr, 3011 or 3031 or 3051 or 3061] or instr consent

**PSY 5063. Introduction to Functional MRI.** (3 cr.; A-F only; Every Fall)
How to understand and perform a brain imaging experiment. Theory and practice of functional MRI experimental design, execution, and data analysis. Students develop experimental materials/analyze their own functional MRI data. Lectures/lab exercises. prereq: Jr or sr or grad or instr consent

**PSY 5064. Brain and Emotion.** (3 cr.; A-F or Audit; Spring Odd Year)
Introduction to affective neuroscience. How brain promotes emotional/motivated behavior in animals/humans. Biological theories of emotion in historical/current theoretical contexts. Fundamental brain motivational systems, including fear, pleasure, attachment, stress, and regulation of motivated behavior. Implications for emotional development, vulnerability to psychiatric disorders. prereq: 3061 or 5061 or instr consent

**PSY 5065. Functional Imaging: Hands-on Training.** (3 cr.; Student Option; Every Spring)
Basic neuroimaging techniques/functional magnetic resonance imaging (fMRI). First half of semester covers basic physical principles. Second half students design/execute fMRI experiment on Siemens 3 Tesla scanner. prereq: [3801 or equiv], [3061 or NSCI 3101], instr consent

**PSY 5066. Neuroscience, Philosophy and Ethics.** (3 cr.; Student Option; Every Spring)
Neuroscience increasingly allows us to explain the human experience in terms of mechanistic, electrochemical processes. The current course explores philosophical issues sparked by these developments in two modules. The first module examines the ways in which human neuroscience may shed new light on age-long philosophical quandaries such as mind-body dualism, free-will, and consciousness. For example, will neuroscience solve the mind-body problem by providing a wholly physical account of human nature? Is the neural view of free-will as a logical consequence of brain states incompatible with free-will? Can all of conscious experience (qualia) be reduced to neurobiology? The second module turns to neuro-ethical questions regarding the potential benefits and harms neuroscience might bring to the moral fabric of society.

**PSY 5101. Personality: Current Theory and Research.** (3 cr.; Student Option; Spring Odd Year)
Current theory and research on personality functioning and personality structure. Descriptive, biological, evolutionary, cognitive, developmental, cultural, and narrative perspectives on personality. prereq: Psy 3001W and either Psy 3101 or Psy 5135 OR Psychology PhD student

**PSY 5135. Psychology of Individual Differences.** (3 cr.; Student Option; Periodic Spring)
Differential methods in study of human behavior. Psychological traits. Influence of age, sex, heredity, and environment in individual/group differences in ability, personality, interests, and social attitudes. prereq: [3001W or equiv] or [5862 or equiv] or instr consent

**PSY 5136. Human Abilities.** (3 cr.; Student Option; Every Spring)
Theory, methods, and applications of research in human abilities. Intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/treatment interactions, and quantitative
PSY 5137. Introduction to Behavioral Genetics. (3 cr.; Student Option; Every Fall) Genetic methods for studying human/animal behavior. Emphasizes nature/origin of individual differences in behavior. Twin and adoption methods. Cytogenetics, molecular genetics, linkage/association studies. prereq: 3001W or equiv or instr consent

PSY 5138. Adult Development and Aging. (3 cr.; Student Option; Spring Even Year) Theories/findings concerning age-related changes in mental health, personality, cognitive functioning, productivity are reviewed/interpreted within context of multiple biological, social, and psychological changes that accompany age. prereq: Junior, Senior or Graduate Student

PSY 5202. Attitudes and Social Behavior. (3 cr.; Student Option; Periodic Spring) Theory/research on social psychology of beliefs/attitudes. Persuasion principles. prereq: 3201 or instr consent

PSY 5204. Psychology of Interpersonal Relationships. (3 cr.; A-F only; Periodic Fall) Introduction to interpersonal relationship theory/research findings. prereq: Honors or grad student or instr consent

PSY 5205. Applied Social Psychology. (3 cr.; Student Option; Spring Odd Year) Applications of social psychology research/theory to domains such as physical/mental health, education, the media, desegregation, the legal system, energy conservation, public policy. prereq: 3201 or grad student or instr consent

PSY 5207. Personality and Social Behavior. (3 cr.; A-F or Audit; Every Fall) Conceptual/methodological strategies for scientific study of individuals and their social worlds. Applications of theory/research to issues of self, identity, and social interaction. prereq: 3101 or 3201 or honors or grad student or instr consent

PSY 5501. Vocational and Occupational Health Psychology. (3 cr.; Student Option; Every Spring) Survey of history, concepts, theories, methods, and findings of vocational/occupational health psychology. Burnout, personality, violence, stressors/stress-relations, counter productive behaviors, coping in workplace. Vocational development/adaptation, career decision-making/counseling, person-environment fit. prereq: 3001W or equiv or instr consent

PSY 5707. Personnel Psychology. (4 cr.; Student Option; Every Fall) Application of psychological research/theory regarding individual differences, psychological measurement, decision making, and learning to personnel selection, performance assessment, and occupational training. Job analysis, recruitment, selection decisions, performance appraisals, and training design, evaluation, and practice. prereq: [3001W or equiv], 3711 or instr consent

PSY 5708. Organizational Psychology. (3 cr.; Student Option; Every Spring) Psychological causes of behavior in work organizations. Consequences for individual fulfillment and organizational effectiveness. Individual differences, social perception, motivation, stress, job design, leadership, job satisfaction, teamwork, organizational culture.

PSY 5862. Psychological Measurement: Theory and Methods. (3 cr.; Student Option; Every Fall) Types of measurements (tests, scales, inventories) and their construction. Theory/measurement of reliability/validity. prereq: 3801H or MATH 1271 or grad student


PSY 5960. Topics in Psychology. (1-4 cr.; 3 cr.; Student Option; Periodic Fall, Spring) Special course or seminar. Topics listed in Class Schedule. prereq: PSY 1001, or instr consent

PSY 5993. Research Laboratory in Psychology. (3 cr.; max 18 cr.) Student Option; Every Fall & Spring) Laboratory instruction and seminars in faculty research areas. prereq: instr consent, dept consent

PSY 8004. Philosophical Psychology. (3 cr.; S-N or Audit; Periodic Spring) Selected philosophical/methodological problems. prereq: Grad student or instr consent

PSY 8010. Advanced Topics in Learning. (3 cr.; max 12 cr.); S-N or Audit; Periodic Spring) Contemporary topics in learning and behavior theory. prereq: 5012 or instr consent

PSY 8026. Neuro-Immune Interactions. (3 cr.; Student Option; Periodic Fall) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. prereq: MicB 4131 or equiv, NSc 5111 or equiv

PSY 8031. Seminar: Visual Perception. (2 cr.; max 3 cr.; Student Option; Every Fall & Spring) Cognitive, psychological, neurophysiological determinants of visual perception. Current research. prereq: 5031 or instr consent

PSY 8036. Topics in Computational Vision. (3 cr.; max 12 cr.; Student Option; Every Spring) Recent research in visual psychophysics, visual neuroscience, and computer vision. prereq: 5031 or 5036 or equiv or instr consent

PSY 8037. Psychophysics and Audition. (3 cr.; Student Option; Periodic Spring) Modern/classical psychophysics. Psychophysical/physiological correlates of audition. Theories of hearing, prereq: instr consent

PSY 8041. Seminar in Perception. (3 cr.; A-F or Audit; Fall Odd Year) Seminar. Advanced topics in auditory and visual perception. Lecture, discussion, and student-led presentations of research papers on core topics of the peripheral visual and auditory systems, cortical representations, behavioral and brain-imaging methods, and computational approaches to understanding/simulating perception. prereq: Psy grad student or instr consent

PSY 8055. Seminar: Cognitive Neuroscience. (3 cr.; Student Option; Spring Odd Year) Recent advances in analysis of neural bases of cognitive functions. prereq: 5015 or instr consent

PSY 8056. Seminar: Psychology of Language. (3 cr.; A-F or Audit; Periodic Fall & Spring) Selected topics in psycholinguistics. prereq: Grad psych major or instr consent

PSY 8061. Neuropsychopharmacology. (3 cr.; A-F or Audit; Fall Even Year) Relationships between biochemical, neurophysiological, psychological, and behavioral effects of drugs. Research in neuropsychopharmacology, behavioral pharmacology, and pharmacology of addiction. prereq: 5xxx coursework in biological psych or neuroscience or pharmacology or instr consent

PSY 8070. Seminar: Psychopharmacology. (1-3 cr.; max 12 cr.); Student Option; Every Fall & Spring) Basic issues, contemporary research. Lectures, student presentations. prereq: instr consent

PSY 8111. Biological, Cognitive, Affective, Social, Developmental and Historical Aspects of Psychopathology. (4 cr.; A-F or Audit; Every Fall) Descriptive psychopathology. Theory/research. Evaluation of current experimentation in
various behavior disorders. prereq: Clinical psych grad student, instr consent

PSY 8201. Social Cognition. (; 3 cr.; A-F or Audit; Periodic Fall) Social psychological theory/research on social inference and reasoning processes. Psychology of prejudice/stereotyping. prereq: Psych PhD candidate

PSY 8202. Close Relationships. (; 3 cr.; Student Option; Periodic Spring) Classic/contemporary theory/research on close relationships. Emphasizes romantic relationships. prereq: 5204 or instr consent

PSY 8203. Impression Management. (; 3 cr.; Student Option; Periodic Fall) Classic and contemporary theory and research concerning interpersonal strategies of impression management and interplay between private and public self. prereq: Grad psych major; 8208 recommended; instr consent

PSY 8204. Social Psychology of Prejudice and Intergroup Relations. (; 3 cr.; A-F or Periodic Fall) Approaches, findings, and controversies in research on social psychology of prejudice, racial attitudes, and intergroup relations. Focuses on approaches based in social psychology and on related work from political science and sociology.

PSY 8205. Principles of Social Psychology. (; 3 cr. [max 15 cr.]; Student Option; Every Fall) Contemporary theoretical positions and related research. prereq: Psy PhD student

PSY 8206. Proseminar in Social Psychology. (; 1 cr. [max 5 cr.]; S-N only; Every Spring) Current research topics in social psychology. prereq: [PSY 8205, Social Psych PhD student] or instr consent

PSY 8208. Social Psychology: The Self. (; 3 cr.; A-F or Audit; Every Spring) Social psychological theory and research concerning the self and social behavior. prereq: Psych background especially in personality and soc psych

PSY 8209. Research Methods in Social Psychology. (; 3 cr.; A-F only; Fall Odd Year) Experimental/quasi-experimental methods for research in social psychology. Statistical, interpretive, operational, and ethical issues. prereq: Psych PhD student

PSY 8210. Law, Race, and Social Psychology. (; 3 cr.; A-F only; Periodic Fall) Interdisciplinary seminar. Scientific foundations for and legal implications of implicit (vs explicit) racial or gender bias in four socio-legal domains: criminal law, affirmative action, employment discrimination, and legislative redistricting. prereq: 2nd or 3rd yr law student or PhD student in social science doctoral program

PSY 8211. Proseminar in Political Psychology I. (; 2 cr.; S-N or Audit; Periodic Fall & Spring) Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8212. Proseminar in Political Psychology II. (; 2 cr.; S-N or Audit; Periodic Fall & Spring) Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8333. FTE: Master’s. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

PSY 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

PSY 8501. Counseling Psychology: History and Theories. (; 3 cr.; Student Option; Every Fall) Introduction to history of counseling psychology and to primary theoretical orientations used by counseling psychologists. For each theory: basic principles, application to counseling practice, and research support. prereq: Counseling psy grad student or instr consent

PSY 8502. Assessment in Counseling Psychology. (; 3 cr.; Student Option; Every Spring) Principles and practice. Emphasizes psychometric assessment. History, foundations in measurement, basic methods, survey of instruments, test interpretation evaluation, ethics. prereq: Counseling psy grad student or instr consent

PSY 8503. Interviewing and Intervention. (; 3 cr.; Student Option; Every Fall) Skills-based course: conceptualization of counseling process, stages of counseling, development of counseling skills, and strategies for behavior change. prereq: Counseling Psy grad student or instr consent

PSY 8510. Counseling Psychology Beginning Practicum: General. (; 1-6 cr.; S-N only; Every Fall) Beginning applied experiences in counseling psychology settings. prereq: Counseling Psy grad student

PSY 8511. Counseling Psychology Beginning Practicum: General. (; 1-6 cr.; max 18 cr.; S-N only; Every Spring) Beginning applied experiences in counseling psychology settings. prereq: Counseling Psy grad student

PSY 8512. Counseling Psychology Beginning Practicum: General. (; 1-6 cr.; max 18 cr.; S-N only; Every Summer) Beginning applied experiences in counseling psychology settings. prereq: Counseling Psy grad student

PSY 8514. University Counseling Practicum I. (; 4-6 cr.; S-N only; Every Fall) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clientele. prereq: Counseling Psy grad student, instr consent

PSY 8515. University Counseling Practicum II. (; 4-6 cr.; S-N only; Every Spring) Integrates science with supervised practice in University Counseling and Consulting

Services (UCCS) involving career, academic, and personal counseling clientele. prereq: Counseling Psy grad student

PSY 8541. Multicultural Psychology. (; 3 cr.; Student Option; Spring Odd Year) Approaches, findings, and controversies in research on psychology of ethnic/racial minorities and other cultural populations. Emphasizes counseling/community applications of theory/research. Lecture, discussion, lab. prereq: instr consent

PSY 8542. Professional Standards and Ethics in Clinical Psychology. (3 cr.; A-F only; Every Fall) Ethical principles/codes of conduct for psychologists. Ethical dilemmas faced by researchers, practitioners, teachers. prereq: Counseling or clinical psych grad student or instr consent

PSY 8544. Vocational and Occupational Health Psychology Research. (; 3 cr.; Student Option; Spring Odd Year) Research problems specific to special populations, vocational research, assessment/testing, findings in these areas useful to counseling psychology practice. prereq: [8501, 8502, 8503] or equiv, counseling psy grad student, instr consent

PSY 8545. Counseling Psychology Process and Outcome Research. (; 3 cr.; Student Option; Spring Even Year) Research methods, empirically-supported interventions, assessing treatment outcomes in practice, research on the counseling process, applying counseling research in counseling practice and in non-counseling contexts in the "real world." Ethics and standards of research, history of counseling process and outcome research. prereq: [8501, 8502, 8503] or equiv, counseling psy grad student, instr consent

PSY 8560. Counseling Psychology Advanced Practicum I: General. (1-3 cr.; S-N only; Every Fall) Applied practice experience in counseling psychology settings and seminars. May include guest speakers, readings, and student presentations. prereq: Counseling psy grad student, instr consent

PSY 8561. Counseling Psychology Advanced Practicum II: General. (1-3 cr.; S-N only; Every Spring) Applied practice experience in counseling psychology settings and seminars that may include guest speakers, readings, and student presentations on topics relevant to clients and settings of practice experiences. prereq: Counseling psy grad student, instr consent

PSY 8562. Counseling Psychology Advanced Practicum III: General. (1-3 cr.; S-N only; Every Summer) Applied practice experience in counseling psychology settings and seminar that may include guest speakers, readings, and students presentations on topics relevant to clients and settings of practice experiences. prereq: Counseling psy grad student, instr consent

PSY 8565. Counseling Psychology Advanced Practicum I: Career Counseling
PSY 8621. Foundations in Therapeutic Intervention Applying Theory to Clinical Practice. (3 cr.; A-F or Audit; Every Fall) Professional methods in clinical psychology. Individual and group treatment techniques. Lectures and demonstrations of contemporary theories of methods of intervention with adults and or children. prereq: Clinical psych grad student

PSY 8622. Theories and Methods of Effective Intervention. (3 cr.; A-F or Audit; Spring Even Year) Methodological issues in treatment research, theories of change/motivation. Empirically supported therapies for anxiety, mood, personality disorders, psychosis, addiction. Simulating therapeutic interactions to prepare students to provide therapy. prereq: 8111, CSPR grad student

PSY 8664. Personality Assessment. (3 cr.; Student Option; Spring Even Year) Concepts/issues concerning individual differences in personality and their assessment; content, reality, and significance of personality traits; classification of personality traits; major approaches to measurement of personality. prereq: Psy grad student or instr consent

PSY 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]


PSY 8881. Seminar: Quantitative and Psychometric Methods. (3 cr.; Max 15 cr.) Student Option; Every Fall) Reviews individual research on current topics in psychological measurement.

PSY 8882. Seminar: Quantitative and Psychometric Methods. (3 cr.; Max 15 cr.) Student Option; Every Spring) Reviews, individual research on current topics in psychological measurement.

PSY 8888. Thesis Credit: Doctoral. (1-24 cr.; Max 100 cr.) No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

PSY 8935. Readings in Behavioral Genetics and Individual Differences Psychology. (1 cr.; Max 10 cr.) S-N or Audit; Every Fall & Spring) Each week participants read and discuss one or two primary research articles. prereq: 5135, 5137 or instr consent

PSY 8937. Seminar in Human Behavioral Genetics. (3 cr.; Max 9 cr.) Student Option; Every Spring) Advanced topics vary with each offering. Sample topics: gene identification in complex human traits, behavioral genetics of alcoholism, twin-family methodology. prereq: 5137 or instr consent

PSY 8960. Graduate Seminar in Psychology. (1-4 cr.; Max 36 cr.) Student Option; Every Fall & Spring) Graduate seminar in subject of current interest in psychology. prereq: Psychology grad student or instr consent

PSY 8993. Directed Studies: Special Areas of Psychology and Related Sciences. (1-6 cr.; Max 48 cr.) Student Option; Every Fall & Spring) Directed studies in special areas of psychology and related sciences. prereq: Max 24 cr per semester; 15 cr total required [Plan A only]
Public Affairs (PA)

PA 5001. Intellectual Foundations of Public Action. (1.5 cr. ; Student Option; Periodic Fall & Spring)
Evolution of intellectual approaches that underlie public planning, management, and policy analysis in a democratic society. How decision making is shaped by knowledge/values. Role of rationality. Conceptual, descriptive/normative, and structure/process approaches.

PA 5002. Introduction to Policy Analysis. (1.5 cr. ; A-F or Audit; Every Fall & Spring)
Process of public policy analysis from problem structuring to communication of findings. Commonly used analytical methods. Alternative models of analytical problem resolution.

PA 5003. Introduction to Financial Analysis and Management. (1.5 cr. ; A-F or Audit; Every Fall, Spring & Summer)

PA 5004. Introduction to Planning. (3 cr. ; A-F or Audit; Every Fall)
History/institutional development of urban planning as profession. Intellectual foundations, planning theory. Roles of urban planners in U.S./international settings. Scope, legitimacy, limitations of planning/planning process. Issues in planning ethics/settings of diverse populations/stakeholders. prereq: Major/minor in urban/regional planning or instr consent

PA 5011. Management of Organizations. (3 cr. ; A-F or Audit; Every Fall & Spring)
Challenges facing higher-level managers in public and nonprofit organizations in mixed economy and democratic republic. Distinctive features of public and nonprofit management, skills necessary for effective management, manager's role as creator of public value. Lectures, case discussions.

PA 5012. The Politics of Public Affairs. (3 cr. ; A-F or Audit; Every Spring)
Stages of policy making from agenda setting to implementation. Role and behavior of political institutions, citizens, social movements, and interest groups. Concepts of political philosophy. Theories of state. Team taught, interdisciplinary course. Small discussion sections.

PA 5013. Law and Urban Land Use. (1.5 cr. ; A-F or Audit; Every Fall)
Role of law in regulating/shaping urban development, land use, environmental quality, local/regional governmental services. Interface between public/private sector. prereq: Major or minor in urban/regional planning or instr consent

PA 5021. Microeconomics for Policy Analysis. (3 cr. ; A-F or Audit; Every Fall)
Introduction to tools useful for public policy. Intermediate microeconomics.

PA 5022. Applications of Economics for Policy Analysis. (1.5-3 cr. ; max 9 cr.) ; A-F or Audit; Every Spring)
Application of economic reasoning to a wide range of contemporary public policy issues. The following topical-focused courses also fulfill the MPP economics requirement: PA 5431: Public Policies on Work and Pay, PA 5503: Economics of Development, PA 5521: Development Planning and Policy Analysis, PA 5722: Economics of Natural Resource and Environmental Policy, and PA 5805: Global Economics. prereq: 5021 or equiv

PA 5031. Statistics for Public Affairs. (4 cr. ; A-F or Audit; Every Fall)

PA 5032. Applied Regression. (2 cr. ; A-F or Audit; Every Spring)
Bivariate/multivariate models of regression analysis, assumptions behind them. Problems using these models when such assumptions are not met. prereq: [5031 or equiv] or instr consent

PA 5033. Multivariate Techniques. (2 cr. ; A-F or Audit; Every Spring)
Use of bivariate and multivariate statistical approaches for analyzing and evaluating public policy issues and the assumptions behind the analytical approaches. Designed to help students read, understand, interpret, use, and evaluate empirical work used in social sciences by policy analysts and policy makers. prereq: [5032 or 5044 or equiv] or instr consent. May fulfill stats requirements in other programs.

PA 5035. Survey Research and Data Collection. (1.5 cr. ; A-F only; Every Spring)
Introduction to survey research methods. Emphasizes applications to policy/applied research. Research design choices (e.g., descriptive, experimental, case studies), sampling, variable specification, measurement. Conducting interviews, self-administered questionnaires. Qualitative techniques.

PA 5041. Qualitative Methods for Policy Analysis. (4 cr. ; A-F only; Every Fall)
Qualitative analysis techniques, examples of application. Meet with researcher. Hands-on experience in designing, gathering, analyzing data.

PA 5042. Urban and Regional Economics. (2 cr. ; A-F only; Every Spring)
Evaluation of city existence/growth using economics. Economic forces in development of cities. Economic analysis of urban areas/land market. Economic analysis of planning issues in land use, transportation, housing, environment. prereq: [Major or minor in urban and regional planning, microeconomics course] or instr consent

PA 5043. Economic and Demographic Data Analysis. (2 cr. ; A-F only; Every Spring)
Economic/demographic data analysis techniques for urban planning. Exposure to most important data sources. Conceptual understanding of range of methods/hands-on experience in applying these methods. prereq: Major or minor in urban/regional planning or instr consent

PA 5044. Applied Regression, Accelerated. (2 cr. ; A-F only; Every Spring)
Bivariate/multivariate models used in regression analysis, including assumptions behind them/problems that arise when assumptions are not met. Course covers similar topics as PA 5032 but uses more mathematical notation/delves deeper into theory/application of methods. prereq: [5031 or equiv] or instr consent

PA 5045. Statistics for Public Affairs, Accelerated. (4 cr. ; A-F or Audit; Every Fall)
Introduces a range of quantitative tools that are commonly used to inform issues in public affairs. The course provides an introduction to descriptive statistics, probability, and statistical inference, with an emphasis on the ways in which quantitative tools are applied to a diverse range of practical policy questions. PA 5045 is an accelerated treatment of applied statistics for public affairs and serves as a more mathematically and conceptually rigorous alternative to PA 5031.

PA 5051. Public Affairs Leadership I. (; 2 cr. ; A-F only; Every Fall)
Leadership theories, tools, and strategies in global context for the mid-career student. prereq: Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr

PA 5052. Public Affairs Leadership II. (; 2 cr. ; A-F only; Every Spring)
Continues 5051. Leadership theories, tools, and strategies in global context for the mid-career student. prereq: Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr

PA 5053. Policy Analysis in Public Affairs. (; 2 cr. ; A-F only; Every Fall)
Process of public policy and program analysis, including problem formulation, program design and implementation. Opportunity to draw upon published research and conduct field-based research to understand implementation conditions. Professional communications, including writing of memos, requests for proposals, and implementation briefs, are stressed. prereq: Major in public affairs (cohort) or public affairs certificate (cohort); 5053-5054 must be taken in same academic yr

PA 5054. Program Design and Implementation Analysis. (; 2 cr. ; A-F only; Every Spring)
PA 5053. Process of public policy and program analysis, including problem formulation, program design and implementation. Opportunity to draw upon published research and conduct field-based research to understand implementation conditions. Professional communications, including writing of memos, requests for proposals, and implementation briefs, are stressed. prereq: Major in public affairs (cohort) or public affairs certificate (cohort); 5053-5054 must be taken in same academic yr.

PA 5055. Qualitative Research Methods and Analysis. (2 cr.; A-F only; Every Fall) Problem-based learning of analytical reasoning through social science research methods. Systematic review and literature review. Qualitative research including interviews, focus groups, and analysis. Research proposal. prereq: Major in public affairs or public affairs certificate; 5055-5056 must be taken in same academic yr.

PA 5056. Quantitative Research Methods and Analysis. (2 cr.; A-F only; Every Spring) Problem-based learning to analytical reasoning through social science research methods. Frequency distributions, descriptive statistics, elementary probability, statistical inference. Hypothesis testing. Cross-tabulation, analysis of variance, correlation. Simple regression analysis. prereq: Major in public affairs or public affairs certificate; 5055-5056 must be taken in same academic yr.

PA 5080. Capstone Preparation Workshop. (1 cr.; S-N only; Every Fall, Spring & Summer) Project management, qualitative research, and critical framework to complete Capstone course. Students write draft of client project group norms and client contract.

PA 5081. Working in Teams: Crossing Disciplines and Learning from Difference. (0.5 cr.; S-N only; Every Fall) Principles/skills necessary to create high-performing multi-disciplinary/multi-cultural teams. prereq: Major in development practice, public affairs, public policy, urban and regional planning, or sci, tech, and environ policy.

PA 5101. Management and Governance of Nonprofit Organizations. (3 cr.; Student Option; Every Fall) Theories, concepts, and real world examples of managerial challenges. Governance systems, strategic management practices, effect of funding environments, management of multiple constituencies. Types of nonprofits using economic/behavioral approaches. prereq: Grad student or instr consent.


PA 5103. Leadership and Change. (3 cr.; Student Option; Every Fall) Models of change/leadership. How leaders can promote personal, organizational, and societal change. Case studies, action research. Framework for leadership and change.

PA 5104. Strategic Human Resource Management. (3 cr.; A-F or Audit; Every Fall) Theory/practice of developing, utilizing, and aligning human resources to improve culture/outcomes of nonprofit/public organizations. HR strategy, individual diversity, leadership, selection, training, compensation, classification, performance appraisal, future HR practices. prereq: Grad student or instr consent.

PA 5105. Integrative Leadership Seminar. (3 cr.; Student Option No Audit; Every Spring) Basic concepts, practices, people, and organizations associated with integrative leadership. Case materials, related readings, presentations, and interactive discussion. prereq: Grad student or instr consent.

PA 5106. Government, Ethics and the Public Will. (1-3 cr.; Student Option No Audit; Every Spring) Links between core ethical values/formation documents that have shaped democracy in United States or student's homeland. Ethics/agency. Ethics in context of leadership development. Compose narrative of ethical practice. prereq: Grad student or instr consent.

PA 5107. Leadership, Reflective Practice, and Critical Theory: A Practicum. (2 cr.; Student Option; Every Fall) For students immersed in a cultural shift, organization, or leadership form who wish to learn how to negotiate international, cross-cultural/political contradictions. Critical approach to understanding adult learning. How to perceive and challenge dominant ideology, unmask power, contest hegemony, overcome alienation, and practice democracy. prereq: Grad student or instr consent.

PA 5108. Board Leadership Development. (1 cr.; S-N only; Every Fall & Spring) Nonprofit board governance. Governance models, roles/responsibilities, ethics/dynamics. Current research/concepts along with current board experiences to illuminate challenges/explore solutions that build board leadership competencies. prereq: Grad student or instr consent.


PA 5113. State and Local Public Finance. (3 cr.; Student Option; Every Spring) Theory/practice of financing. Providing public services at state/local level of government. Emphasizes integrating theory/practice, applying materials to specific policy areas, and documenting wide range of institutional arrangements across/within the 50 states. prereq: Grad or instr consent.

PA 5114. Budget Analysis in Public and Nonprofit Orgs. (1.5 cr. [max 3 cr.]; Student Option; Every Spring) Techniques, terminology, concepts and skills for developing and analyzing operating and capital budgets in public and nonprofit organizations. Budget analysis using case studies, problem sets, and spreadsheets. Time value of money, cost-benefit analysis, break-even analysis, sensitivity analysis, and fiscal analysis. prereq: PA 5003.

PA 5116. Financing Public and Nonprofit Organizations. (1.5 cr.; Student Option; Every Spring) Financial resource management for public and nonprofit organizations. Short-term and long-term debt management, retirement financing, and endowment investing. Conceptual frameworks and analytical techniques applied to real-world problems. Financial management in context of national and regional economies. prereq: PA 5003; credit will not be granted if credit already received for: PA 5111.

PA 5122. Law and Public Affairs. (3 cr.; Student Option; Every Spring) Overview of evolution of American legal system. Role of courts, legislatures, and political actors in changing law. How law is used to change public policy. prereq: Grad or instr consent.


PA 5132. Mediation Training. (3 cr.; Student Option; Periodic Fall & Spring) Creating an arena for mediation. Skills/expectations needed to mediate disputes between individuals, among groups: balanced (peer or colleague), imbalanced (power differentials). Role playing, group debriefing, critique. Cases. prereq: Grad or instr consent.

PA 5135. Managing Conflict: Negotiation. (3 cr.; Student Option; Every Fall) Theories and frameworks used in negotiations. Navigating diverse audiences and an increasingly complex world. Negotiation in various arenas. Opportunities to practice skills and learn from experts. Structured exercises on issues such as compensation, union conflicts.
PA 5136. Group Process Facilitation for Organizational and Public/Community Engagement. (1 cr.; Student Option No Audit; Every Summer)
Group process facilitation components, theories, tools, techniques. Facilitator’s role in group goals and processes. Facilitation in public policy. Cross-cultural challenges. Topics may include meeting management, group decision-making, conflict, participatory leadership, and other tools.

PA 5137. Project Management in the Public Arena. (1.5 cr.; [max 3 cr.]; Student Option No Audit; Every Spring)
Project management and leadership strategies for implementing public policy, including new or revised government programs, public works, and regulations. Use of project management concepts, principles, and tools, including project definition, scoping, planning, scheduling (using the critical path method), budgeting, monitoring, staffing, and managing project teams. Application of “agile” and “extreme” project management in situations of complexity and uncertainty, including those due to the scrutiny and expectations of elected officials, the media, citizens, and other stakeholders.

PA 5144. Social Entrepreneurship. (3 cr.; A-F only; Periodic Fall & Spring)
Introduction to field of social entrepreneurship. Prepares current/future managers/leaders to create, develop, lead socially entrepreneurial organizations/initiatives. prereq: Grad student or instr consent

PA 5145. Civic Participation in Public Affairs. (3 cr.; A-F only; Every Spring)
Critique/learn various approaches to civic participation in defining/addressing public issues. Readings, cases, classroom discussion, facilitating/experiencing engagement techniques. Examine work of practitioner, design engagement process. prereq: Grad student or instr consent

PA 5151. Organizational Perspectives on Global Development & Humanitarian Assistance. (3 cr.; A-F only; Every Fall)
Organizational analysis of international development and humanitarian assistance, including perspectives from sociology, political science, psychology, public administration, and management. Examine efforts of multiple organizational players, including NGOs, governments, bi-lateral and multi-lateral organizations, corporations, foundations, and international organizations. Critical analysis of aid organizations, especially regarding ways in which they reflect and create power and privilege, the manner in which individuals’ needs and desires interact with, support, or challenge the needs of the organization, and how all of this is influenced by forces outside the boundary of the organization. Students practice developing actionable recommendations to improve the effectiveness of international aid organizations in the context of multiple (and often contested) understandings of global development needs and conflicting stakeholder demands. Readings, class discussions, mini-lectures, simulations, case analyses, group projects, oral presentations, memo writing, opinion writing.

PA 5152. Leadership to Address Global Grand Challenges. (1.5 cr.; Student Option No Audit; Every Spring)
Global grand challenges are novel, emergent, complex, and beyond the resources of any single sector to address. Skills-based course that introduces participants to integrative leadership strategies effective in addressing such challenges, with specific focus on leadership practices that foster collective action across diverse groups of people.

PA 5161. Human-Centered Service Redesign. (3 cr.; A-F or Audit; Every Fall)
This course helps to frame the significance of human-centered redesign to improve service provision and outcomes. It explores how public, nonprofit, and philanthropic structures create unique operational realities and cultures that must be navigated to lead change across institutional boundaries. It also systematically investigates contributors to disparities in the human services system? particularly race. The use of frameworks such as human-centered design, human services value curve, and an equity lens will help us on this exploration. Course learning materials take students through a design process to highlight strategies for systems change and improvement grounded in outcomes. Design processes are iterative and involve understanding and engaging the people and context in problem solving. Through project-based learning approach, students will understand the various constraints that need to be navigated in design: feasibility, viability, and desirability. Students gain experience using design to help appreciate these constraints and develop strategies for overcoming them.

PA 5162. Public Service Redesign Workshop. (3 cr.; A-F only; Every Spring)
Public service delivery innovation and redesign in health and human services fields to improve outcomes. Study and application of theories of organizational development, leadership, and system change. Social system dynamics analysis. Engaging diverse stakeholders. Effects and influence of implicit bias on current and redesigned efforts. Models and tools for public service redesign.

PA 5181. Executive Public Safety Leadership I. (2-3 cr.; Student Option No Audit; Every Fall)
Public safety executive leadership, citizen engagement, and organizational change. Understanding the self and community. Leadership foundations and methods. Public trust and legitimacy. Community participation, inclusion and problem solving. This hybrid course meets 1-2 days per month with all other coursework completed online. It is a prerequisite for PA 5182: Public Safety Leadership II. prereq: Public or nonprofit officials with experience in or with public safety agencies, including law enforcement, fire, emergency management/medical services, or military.

PA 5182. Executive Public Safety Leadership II. (2-3 cr.; Student Option No Audit; Every Spring)
Public safety executive leadership, citizen engagement, and organizational change. Applying Executive Leadership in Complex Situations. Collaboration. Leadership, bias, and diversity. Decision-making and public communications during crisis. Employee wellness and human resources leadership. Application of executive leadership in building teams. This hybrid course meets 1-2 days per month with all other coursework completed online. It is the second in a series with Public Safety Leadership I offered fall term. prereq: Public or nonprofit officials with experience in or with public safety agencies, including law enforcement, fire, emergency management/medical services, or military.

PA 5190. Topics in Public and Nonprofit Leadership and Management. (1-3 cr. [max 9 cr.]; Student Option; Every Fall)
Selected topics.

PA 5204. Urban Spatial and Social Dynamics. (3 cr.; Student Option; Every Spring)
Behavioral theories of internal spatial arrangement, functioning, characteristics of cities at macro level/how they produce system of cities. Factors influencing urban spatial structure over time. Urban form, land use/rent. Spatial expression of economic, social, political forces. prereq: urban/regional planning Major/minor in or public affairs PhD or instr consent

PA 5205. Statistics for Planning. (4 cr.; A-F only; Every Fall)
Basic statistical tools for empirical analysis in urban and regional planning, including descriptive statistics, frequency distributions, elementary probability theory, research design and sampling, statistical inference, hypothesis testing, cross-tabulation/chi-square distribution, correlation, and simple/multiple regression analysis.

PA 5209. Urban Planning and Health Equity. (3 cr.; Student Option; Every Spring)
This interdisciplinary course examines the causes and consequences of place-based health disparities in cities, explores how health disparities can be mitigated and exacerbated by urban planning decisions, and introduces best practices in urban planning for achieving community health equity. The course will involve extensive readings, guest lectures, field-based assignments, data-collection activities, and local community involvement. Twin Cities has one of the largest disparities in health outcomes in the nation and local practitioners are pioneering new urban planning solutions to reduce place-based health disparities. The course will utilize this location advantage and use the region as an immersive learning environment. Students are
expected to apply knowledge and skills learned in the class locally in the Twin Cities region. At the end of the course, students will be able to:
Understand the historical foundations, current trends and challenges, and international perspectives in connecting urban planning to health equity issues; investigate how various planning sectors and urban environment dimensions, including land use, transportation, open space, housing, food systems, and community social capital, interact to affect health disparities in cities; critically evaluate how existing planning processes and decisions respond to the needs of vulnerable populations and contribute to health equity; and develop skills to engage communities and identifying community-sensitive solutions for reducing place-based health disparities. Fulfills a requirement for graduate Health Equity Minor (http://www.sph.umn.edu/academics/minor/health-equity/).

PA 5211. Land Use Planning. (3 cr.; A-F only; Every Fall)
Physical/spatial basis for land use planning at community/regional level. Role of public sector in guiding private development. Land use regulations, comprehensive planning, growth management, innovative land use planning/policies. prereq: Major or minor in urban/regional planning or instr consent

PA 5212. Managing Urban Growth and Change. (3 cr.; Student Option; Fall Even Year)
Theory/practice of planning, promoting, and controlling economic growth/change in urban areas. Economic development tools available to state/local policymakers, historic context of their use in the United States. legal, social, and economic implementation constraints. Interactions among economic, social, and demographic trends. prereq: Grad student or instr consent

PA 5213. Introduction to Site Planning. (3 cr.; Student Option; Every Spring)
Analyzing/paring graphic plans for development or redevelopment of property. Site planning issues, process, opportunities, details, and techniques. Hands-on preparation of a site plan. Site visits, lectures, research, presentations, exam, in-class exercises. prereq: Grad student or instr consent

PA 5215. Computer Applications in Land Use Planning. (3 cr.; Student Option; Every Spring)
Geographical information system software, simulation modeling of land use/development, 3D software, the Internet. Project applications in citizen participation/decision-making. Meets weekly in mostly lab setting, prereq: Grad student or instr consent

PA 5216. Digital Graphics for Planning and Public Policy Makers. (1 cr.; A-F only; Every Fall & Spring)
Concepts, tools, and techniques of graphic representation software tools commonly used in urban planning and basic fundamentals of information design for public policy (InDesign, AutoCAD, Illustrator, PhotoShop). Workflow among programs and production of posters.

Course project utilizes individual and group work.

PA 5221. Private Sector Development. (3 cr.; Student Option; Every Spring)
Roles of various participants in land development. Investment objectives, effects of regulation. Overview of development process from private/public perspective.

PA 5231. Transit Planning and Management. (3 cr.; Student Option; Every Fall)

PA 5232. Transportation Policy, Planning, and Deployment. (3 cr.; Student Option; Periodic Fall & Spring)
Development of transportation policy, making of transportation plans, deployment of transportation technologies. Lectures, interactive case studies, role playing.

PA 5233. Sustainable Transportation. (3 cr.; A-F or Audit; Spring Odd Year)
Concepts of sustainability in movement of people/goods in cities. Techniques/best practices/methods for planning/implementing interventions to improve social, economic, environmental sustainability of communities. prereq: Grad or instr consent

PA 5242. Environmental Planning, Policy, and Decision Making. (3 cr.; A-F or Audit; Periodic Spring)
Theory and practice. Ethical, legal, and institutional frameworks relative to a range of environmental issues. Innovative environmental decision making informed by collaboration, conflict resolution, adaptive management, and resilience thinking. prereq: Grad or instr consent

PA 5251. Strategic Planning and Management. (3 cr.; Student Option No Audit; Periodic Spring)
Theory and practice of strategic planning and management for public and nonprofit organizations and networks. Strategic planning process, management systems; stakeholder analyses. Tools and techniques such as purpose expansions, SWOT analyses, oval mapping, portfolio analyses, and logic models.

PA 5253. Designing Planning and Participation Processes. (3 cr.; A-F only; Every Fall)
Theory/practice of design, implementation, evaluation of planning/participation processes. Types of planning. Stakeholders, including underrepresented groups. Costs/benefits of participation. Participant roles. Planning/participation tools/techniques. prereq: Major or minor in urban/regional planning or instr consent

PA 5261. Housing Policy. (3 cr.; A-F or Audit; Every Spring)
Institutional/environmental setting for housing policy in the United States. Competing views of solving housing problems through public intervention in the market. Federal/local public sector responses to housing problems. prereq: Grad or instr consent

PA 5271. Geographic Information Systems: Applications in Planning and Policy Analysis. (3 cr.; Student Option; Every Fall)
Introduction to GIS. Applications in public planning and policy analysis. Operational skills in GIS software. Mapping analysis of U.S. Census material. Local/state government management/planning. Spatial statistical analysis for policy/planning. prereq: Major in urban/regional planning or instr consent

PA 5281. Immigrants, Urban Planning and Policymaking in the U.S.. (3 cr.; A-F or Audit; Every Fall)
Social, political, economic experiences of contemporary U.S. immigrants. Draws from sociology, economics, demography, political science, public affairs. Local government policies/plans. Cities/suburbs as contexts for immigrants. Interactions between immigrant communities/urban planners/policymakers. prereq: Grad student or instr consent

PA 5290. Topics in Planning. (0.5-4 cr.; [max 12 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 5301. Population Methods & Issues for the United States & Global South. (3 cr.; Student Option; Periodic Spring)
Basic demographic measures/methodology. Demographic transition, mortality, fertility, Perspectives on nonmarital fertility, marriage, divorce, cohabitation. Cultural differences in family structure, aging, migration, refugee movements, population policies. Discussion of readings. prereq: Grad student or instr consent

PA 5311. Program Evaluation. (3 cr.; Student Option; Periodic Fall & Spring)
Principal methods, primary applications of evaluation research as applied to policies/programs in health/human services, education, or the environment. Conducting evaluations. Becoming a critical consumer of studies. prereq: Grad student or instr consent

PA 5390. Topics in Advanced Policy Analysis Methods. (1-4 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topics in advanced policy analysis methods.

PA 5401. Poverty, Inequality, and Public Policy. (3 cr.; Student Option; Every Fall)
Nature/extent of poverty/inequality in the United States, causes/consequences, impact of government programs/policies. Extent/causes of poverty/inequality in other developed/developing countries. prereq: Grad or instr consent

PA 5405. Public Policy Implementation. (3 cr.; A-F or Audit; Every Fall)
Theory, tools, and practice of the implementation of public policy, particularly in areas involving public, private, and nonprofit organizations. Analytical approach focuses on multiple levels in policy fields to pinpoint and assess implementation challenges and levers for improvement.

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
PA 5412. Aging and Disability Policy. (3 cr.; Student Option; Periodic Fall & Spring) Policy debates concerning populations that are aging or disabled. Students learn/practice analyses in context of important health, social, and economic policy debates. Readings on current theory/evidence. prereq: Grad or instr consent

PA 5413. Early Childhood and Public Policy. (3 cr.; Student Option; Every Fall) State/federal/international policies/legislation touching first 5 years of child's life. Family, community, institutional roles in promoting children's social/cognitive/emotional development. Health, mental health, poverty, special needs, economic/social justice. Part of Early Childhood Pol cert. prereq: Grad or instr consent

PA 5414. Child Human Rights: Work and Education. (3 cr.; Student Option; Periodic Spring) International child labor issues. Options for improving child well-being, including policies/programs that have potential to affect the lives of millions of children. prereq: Grad student or instr consent

PA 5415. Economics of Early Childhood Development. (1.5-3 cr.; A-F only; Periodic Fall) Early childhood development (ECD) is examined from an economic perspective. Course focuses on the role of government in helping to promote ECD for purposes of social welfare and economic growth. Readings include studies of brain development as well as longitudinal studies of ECD. Students will become familiar with the importance of rigorous impact evaluations and the use of cost-benefit analysis as a tool for efficient resource allocation of child policies.

PA 5421. Racial Inequality and Public Policy. (3 cr.; Student Option No Audit; Periodic Fall & Spring) Historical roots of racial inequality in American society. Contemporary economic consequences. Public policy responses to racial inequality. Emphasizes thinking/analysis that is critical of strategies offered for reducing racism and racial economic inequality. prereq: Grad or instr consent

PA 5422. Diversity and Public Policy. (3 cr.; A-F only; Periodic Fall) Economics of diversity. Business/public administration cases for workplace diversity. Value of cultural competency in public/nonprofit organizations. Current policy debates on race, ethnicity, gender, sexual identity, and disability. prereq: Grad student or instr consent

PA 5426. Research and Policy with Marginalized Groups. (3 cr.; Student Option; Every Spring) In context of marginalized communities: Analyze public policy problems using reflexive and/or feminist methodologies, discourse analysis, critical legal theories and legal realism; develop legislative strategy and ethical advocacy plans; design ethical research protocols; problem-solve at intersection of theory and practice.

PA 5431. Public Policies on Work and Pay. (3 cr.; Student Option; Every Spring) Public policies affecting employment, hours of work, and institutions in labor markets. Public programs impacting wages, unemployment, training, collective bargaining, job security, and workplace governance. Policy implications of the changing nature of work. prereq: [IP 5031 or equiv], grad student or instr consent

PA 5441. Education Policy and the State Legislature. (3 cr.; Student Option; Periodic Fall) How Minnesota legislature decides K-12 issues. Implications for higher education. How to increase one's influence in process. Discussions with persons who influence statewide educational policy. Presentations. Field trip to state legislature. prereq: Grad or instr consent

PA 5442. Education Law and Policy. (3 cr.; Student Option No Audit; Periodic Fall) Education law and policy with focus on elementary/secondary. Topics include governance; interplay of federal, state and local law and policy; reform efforts; desegregation; achievement gap; role of teachers unions; and finance. Early childhood education discussed in connection with K-12 issues. prereq: Grad or instr consent

PA 5451. Immigration, Health and Public Policy. (3-4 cr.; A-F only; Every Fall & Spring) How to access demographic, health, and background information on US immigrants. Characteristics and health needs of immigrants. Designing culturally competent health programs. How to advocate for needed policy changes to promote immigrant health and wellbeing. Community visits required. Online course.

PA 5450. Topics in Race, Ethnicity, and Public Policy. (1-3 cr.; max 9 cr.; Student Option; Periodic Fall & Spring) Link between race/ethnicity and public policy. How to identify/measure racial/ethnic disparities and their historical/cultural origins and policy impacts and to craft politically feasible remedies. Topics may include criminal justice, housing, child welfare, and education. prereq: Jr or Sr or grad student or instr consent

PA 5490. Topics in Social Policy. (1-4 cr.; max 12 cr.; Student Option; Periodic Fall & Spring) Selected topics.

PA 5501. Theories and Policies of Development. (3 cr.; Student Option; Every Fall) What makes some countries wealthier than others, one group of people healthier and more educated than another? How does the behavior of rich nations affect poor nations? Origins of development thought, contemporary frameworks and policy debates. Economic, human, and sustainable development. prereq: Grad student or instr consent

PA 5503. Economics of Development. (3 cr.; A-F or Audit; Every Fall) Economic growth, inequality, poverty, rural/urban labor markets, risk/insurance. Investments in human capital, credit markets, gender/household economics, governance/institutional issues. Microfinance, conditional cash transfers, labor/education policies. prereq: PA 5501 or concurrent registration is required (or allowed) in PA 5501

PA 5511. Community Economic Development. (3 cr.; Student Option; Every Fall) Contexts/motivations behind community economic development activities. Alternative strategies for organizing/initiating economic development projects. Tools/techniques for economic development analysis/planning (market analysis, feasibility studies, development plans). Implementation at local level. prereq: Grad or instr consent

PA 5512. Workforce and Economic Development. (3 cr.; A-F or Audit; Spring Even Year) Economic and workforce development examined from a U.S. context, exploring how rural and urban regional economies grow, why industries/employers locate where they do, and how workers decide where to live and work. Government and economic development practices related to businesses and innovation will also be addressed. prereq: Grad or instructor consent

PA 5521. Development Planning and Policy Analysis. (4 cr.; Student Option; Every Spring) Techniques of development planning/policy analysis at national, regional, and project levels. Effects of external shocks and government interventions on national/regional economies. Macroeconomic modeling, input-output analysis, social accounting matrices/multipliers, project evaluation. prereq: 5031 or equiv recommended or instr consent

PA 5522. International Development Policy, Families, and Health. (3 cr.; Student Option; Periodic Spring) Implications of paid/unpaid labor for development policy, using household as prism. Legal/cultural use of property rights. Financial effects of ill health. Caregiving. Work-family conflict, policies that alleviate it. Role of gender. Qualitative/quantitative methods. Readings, lectures, discussions. prereq: Grad student or instr consent

PA 5561. Gender and International Development. (3 cr.; Student Option; Periodic Spring) Women and men are affected differently by development and participate differently in policy formulation and implementation. Gender-sensitive perspective. Historical, political context. Global South. Policy, practice, and experience (theory and measurement; international, national, local stakeholders;
effects of policy and practice on development). prereq: Grad or instr consent

PA 5590. Topics in Economic and Community Development. (1-3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 5601. Global Survey of Gender and Public Policy. (3 cr.; Student Option; Periodic Fall) Introduction to the key concepts and tools necessary for gender policy analysis. Survey of the major findings in the field of gender and public policy in policy areas such as poverty alleviation, health, international security, environment and work-family reconciliation. Scope includes local, national, and global policy arenas as well as exploration of gender and the politics of policy formulation.

PA 5621. Board Service in Women and Public Policy. (1 cr.; S-N only; Periodic Fall) Students serve as full members of a board of directors for a women's movement organization. Organizational leadership. How to be an effective board member. Twin Cities feminist nonprofit organizations. prereq: instr consent

PA 5690. Topics in Women, Gender and Public Policy. (0.5-3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Selected topics. prereq: Grad student or instr consent

PA 5701. Science and State. (3 cr.; Student Option; Periodic Fall & Spring) Relationship between science and contemporary society. Nature of science: Its values, processes, and ways of knowing. How science has influenced U.S. political institutions and political/judicial processes. Issues in current debate over U.S. science policy. prereq: Grad or instr consent

PA 5711. Science, Technology & Environmental Policy. (3 cr.; Student Option; Every Fall) Interplay of science, technology, the environment, and society. Approaches from across the social sciences will cover how science and technology can create new environmental pressures as well as policy challenges in a range of spheres from climate change to systems of intellectual property and international development.

PA 5712. Science to Action: All Paths. (1.5 cr.; Student Option No Audit; Every Spring) Understand practices for translating science to action for the common good, integrating action across multiple sectors: i.e., coordinating action by communities, government, for-profit, non-profit/NGO and academia. Case studies and theories are discussed to address societal grand challenge topic.

PA 5715. Survey of Current Issues in Science, Technology, and Environmental Policy. (1.5 cr.; A-F only; Every Spring) Current topics in science, technology, and environmental policy. prereq: Grad or instr consent

PA 5721. Energy Systems and Policy. (3 cr.; Student Option; Every Fall) Impact of energy production/consumption choices on environmental quality, sustainable development, and other economic/social goals. Emphasizes public policy choices for energy/environment, linkages between them.

PA 5722. Economics of Natural Resource and Environmental Policy. (3 cr.; Student Option; Every Spring) Public policy associated with natural resource use and environmental protection. Develops/apples economic concepts/methodologies/policy mechanisms. Principles of environmental/resource economics. Issues related to renewable/nonrenewable resources and environmental pollution. Focuses on scientific/political aspects of policy. prereq: [Intermediate microeconomics, intermediate policy analysis, grad student] or instr consent

PA 5723. Water Policy. (3 cr.; Student Option; Every Spring) Sociocultural, legal, economic, and environmental forces affecting supply/use of water by individuals, sectors, and governance institutions. Historical trends; water laws in United States and internationally. Institutional structures for managing water at federal, state, and local levels. Current water-related issues/policies. prereq: Grad student or instr consent

PA 5724. Climate Change Policy. (3 cr.; Student Option; Every Fall) Existing and proposed approaches to mitigate and adapt to climate change through policies that cross scales of governance (from local to global) and impact a wide range of sectors. Exploration of climate change policy from a variety of disciplinary approaches and perspectives, emphasizing economic logic, ethical principles, and institutional feasibility. How policy can be shaped in the face of a variety of competing interests to achieve commonly desired outcomes. Students develop a deep knowledge of climate change in particular countries through a team final project. prereq: Intro microecon (such as Econ 1101 or equiv)

PA 5731. Emerging Sciences and Technologies: Law, Ethics and Policy. (3 cr.; A-F only; Periodic Fall) This interdisciplinary course will examine issues at the nexus of law, ethics, public policy, and emerging sciences and technologies (ES&T) including nanotechnology, genetic and biomedical engineering, cognitive science, synthetic biology, and robotics. Topics we will explore include the role of science and technology as both a tool for and the subject of law and policy; the legal, ethical, economic, and policy implications of ES&T research and development; environmental and human health risk analysis and regulation (e.g., EPA, FDA, OSHA, and state and local regulatory mechanisms); intellectual property issues; liability issues; and global impacts. Topics will be approached from the perspective of different stakeholders (e.g., federal agencies, industry, academic researchers, the environment, international organizations, and the public) and in the context of different application areas (e.g., drugs, devices, food, agriculture, energy, environmental remediation) using a variety of interdisciplinary approaches. Students with a broad range of interests are encouraged to enroll.

PA 5741. Risk, Resilience and Decision Making. (1.5 cr.; max 3 cr.; Student Option No Audit; Every Spring) Interplay between risk analysis, decision making, and policy in the context of new and emerging technologies, environmental and human well-being, risk and resilience. Assessment methods; risk management processes, issues and methods; role/treatment of uncertainty; factors in decision making; risk-based rule making; public values; risk communication and perception. Scientific, technical, social, political, and ethical issues. prereq: Grad student or instr consent

PA 5742. Interdisciplinary Environmental Study: Practice and Design. (1.5 cr.; Student Option No Audit; Every Fall) Practice & design of interdisciplinary study to support environmental policy-making. Research design (models, experiments, quasi-experiments, case studies & meta-analysis) from a range of disciplines. Their integration in an overarching framework to address pressing STEP issues (e.g., climate change, food security, energy, future cities).

PA 5743. Acara Impact Venture Launchpad - Moving Your Idea to Impact. (1.5 cr.; A-F only; Every Spring) Introduction to design thinking, problem definition, communication, change management and leadership, non-profit and business models, and social entrepreneurship frameworks for purpose of developing idea to address environment or social problem. Presentation at end of class to panel of experts. Projects may be used in Acara Challenge competition. To register, students will submit project proposal.

PA 5751. Urban Infrastructure Systems for Sustainable and Healthy Cities. (3 cr.; A-F or Audit; Every Summer) Study social actors, engineered infrastructures/natural systems as they, together, shape health/sustainability outcomes for cities. Understand role of infrastructure design, planning, policy in sustainable cities. Learn sustainability systems concepts, local-to-global linkages, inter-disciplinary, inter-cultural skills. prereq: Grad student or instr consent

PA 5752. Material-Energy Flows & Sustainable Development. (3 cr.; A-F only; Every Fall) How do material and energy flows shape the development of a sustainable society? Part I introduces concepts of human wellbeing, sustainable development, the role of natural resources and key physical infrastructure in advancing Sustainable Development Goals (SDGs). Part II describes ways to measure progress toward SDGs, particularly those related to material and energy flows. Part III highlights pathways to work toward SDGs, emphasizing principles and concepts from environmental economics.
PA 5790. Topics in Science, Technology, and Environmental Policy. (1.5-3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 5801. Global Public Policy. (3 cr.; Student Option; Every Spring) Creation of rules, norms, institutions to regulate global activities. Policy making. How global policy making regulates interstate, national, transnational activities. Creation/enforcement of global rules. Applications to international security, political economy. prereq: Grad or instr consent

PA 5802. Global Economic Policy. (; 3 cr.; Student Option; Every Fall) Economic logic of globalization, national policy objectives, international finance/financial institutions, international trade and agreements including regional pacts and the WTO, global environmental and resource governance, immigration and emigration, and development challenges. prereq: Major in [public affairs or public policy] or instr consent

PA 5805. Global Economics. (3 cr.; A-F only; Every Fall) Global trade, exchange rates, finance, international business, and migration in context of theories and evidence that inform the policies pursued at national level. Operation of main international organizations dealing with these issues will also be examined. prereq: [5021 or equivalent] or instr consent

PA 5813. US Foreign Policy: The Institutional Basis. (3 cr.; Student Option No Audit; Every Fall) The institutions that shape, influence and manage U.S. foreign policy including their origins and culture. Structure and function of key foreign policy institutions. Academic and policy critiques of the evolving institutional realities, including the State Department decision-making process; how institutions relate to one another, the changing role of institutions such as the Department of Defense, intelligence agencies, and the Department of Homeland Security in foreign policy. Assessment of the role played by Congress, the media, and the public, including non-governmental organizations and lobbying groups, as they seek to influence Executive Branch foreign policy institutions. Meetings virtually or in person with current or former Washington policy-makers who provide insights on real time issues and institutional realities.

PA 5814. Bilateral and Multilateral Diplomacy. (3 cr.; Student Option No Audit; Every Spring) Theory, practice and profession of bilateral & multilateral diplomacy. History of diplomacy; norms, practices and international legal bases; impact of technology, cultural changes on diplomacy. Readings, discussions and simulations teach how major powers/smaller states, working alone or in blocs, use diplomacy to achieve national and regional goals.

PA 5821. Humanitarianism. (3 cr.; Student Option; Periodic Fall & Spring) Foundations, logic, dynamics, dilemmas, and consequences of humanitarianism, a form of governance that operates in the name of--and for--the international community. prereq: Grad student or instr consent


PA 5823. Managing Humanitarian and Refugee Crises: Challenges for Policymakers & Practitioners. (1 cr. [max 3 cr.]; Student Option No Audit; Periodic Fall & Spring) Examines response of governments, international organizations, NGOs, and others to global humanitarian and human rights challenges posed by civil conflict and other complex emergencies in places such as Syria, the Middle East region, South Sudan, Somalia, Burma, and elsewhere. Course will also consider and assess UN and other institutions established to address these issues (like UNOCHA and UNHCR). In addition, course will examine US policy toward humanitarian issues and refugees (including US refugee admissions).

PA 5824. International Humanitarian Crisis Simulation. (1 cr.; S-N or Audit; Every Fall) Students learn/practice humanitarian crisis response skills reflecting international standards through a multi-day, humanitarian dynamic crisis simulation. Includes training in international crisis response standards (SPHERE) and population assessment, WASH (water, sanitation and hygiene) for refugee camps, nutrition, interactive shelter design/planning, the international legal basis for humanitarian response, safety and security issues, psychosocial trauma awareness, and field hospital scenarios. Composed of class meetings and an on-site sector skill training and field crisis simulation.

PA 5825. Crisis Management in Foreign Affairs. (1.5 cr.; Student Option; Every Spring) Crisis decision making in foreign policy. Examination of the organization and structure of crisis decision-making within U.S. national security apparatus. Analysis of in-depth four foreign policy crises (Cuban Missile Crisis, Vietnam ? Tet, Iraq, and a current crisis). Crisis simulation with students in the role of national security leaders.

PA 5841. Women, Violence, and Armed Conflict. (3 cr.; A-F only; Periodic Fall & Spring) Role of women in recent armed conflicts; how women are affected by wartime as combatants, civilians, victims, and perpetrators of war violence. Conflicts in Sierra Leone, Liberia and El Salvador, where women participated in fighting forces in large numbers, as well as women's roles in the Abu Ghraib scandal, female suicide bombers, wartime sexual violence. Policy solutions offered by policymakers and NGOs to deal with problems of gender-based violence. prereq: Grad student or instr consent

PA 5851. Middle East Politics. (3 cr.; A-F only; Periodic Spring) Middle East Politics examines the domestic, regional, and transnational politics of the Middle East and North Africa. It explores key policy-relevant issues in MENA such as external intervention/occupation, human rights, social movements, political economy, religion and politics, democratization and elections, civil society, and gender. prereq: Grad or instr consent

PA 5880. Exploring Global Cities. (1.5 cr.; S-N or Audit; Every Spring) Study abroad offered in cities across globe. Opportunities to study policy/planning issues in varied contexts from comparative/inter-cultural perspective. Study/work with practitioners/peers in field. Tanzania odd years/Austria even years. Additional countries may be added in future.

PA 5885. Human Rights Policy: Issues and Actors. (3 cr.; Student Option; Every Fall) Politics of human rights issue emergence--relevant international, regional, and domestic norms; correlates of state repression; measurement of human rights abuse and remedies; human rights promotion by states, political parties, international organizations, NGOs, social movements, faith-based organizations, and providers of international development assistance.

PA 5886. Master of Human Rights Cohort Seminar I. (1 cr.; S-N only; Every Fall) The Master of Human Rights Cohort Seminar is a required course for all first-year MHR students. The course is intended to create a cohort group and ensure that all MHR students have an opportunity to work together to explore current issues related to human rights practice, focusing on emerging events or crises, and debates over policy, practice, or theory and for direct contact with and networking particularly with counterparts in the Global South. This course is in a series with, and taken before, PA 5887. prereq: First-year MHR

PA 5887. Master of Human Rights Cohort Seminar II. (1 cr.; S-N only; Every Spring) The Master of Human Rights Cohort Seminar is a required course for all first-year MHR students. The course is intended to create a cohort group and ensure that all MHR students have an opportunity to work together to explore current issues related to human rights practice, focusing on emerging events or crises, and debates over policy, practice, or theory and for direct contact with and networking particularly with counterparts in the Global South. This course is in a series with, and taken after, PA 5886.

PA 5890. Topics in Foreign Policy and International Affairs. (1.5 cr.; max 15 cr.; Student Option; Periodic Fall & Spring) Selected topics.
PA 5910. Developing Your Public Service Career. (1 cr.; S-N or Audit; Every Fall) Students investigate/analyze interests, skills, and abilities and combine them in a career plan. Develop tools to demonstrate abilities, document experiences/knowledge, and explore public service career options. Prereq: [Major in public affairs or public policy or urban/ regional planning] or [science, technology/ environmental policy] or [development practice] or instr consent

PA 5920. Skills Workshop. (0.5-4 cr. [max 48 cr.]; Student Option; Every Fall & Spring) Topics on public policy or planning skills. Topics specified in Class Schedule.

PA 5924. Intercultural Competence. (3 cr.; A-F only; Every Spring) Interacting with working effectively with diverse populations. Researching ancestry. Analyzing cross-cultural communication issues in organizations. Prejudice, discrimination, group belonging. Analyze intercultural competence of global leader. Prereq: Grad student or instr consent

PA 5925. Creating a Professional Online Portfolio. (1 cr.; S-N only; Every Spring) Build electronic portfolio reflecting knowledge/skills learned in coursework, internships, volunteer efforts, leadership roles, research activities. Promote professional selves using social networking platform. Prereq: [MPA, MPP, MS-STEP, MURP] or instr consent

PA 5926. Presentation Skills: How to Inspire Your Audience and Change the World. (1 cr.; max 2 cr.; Student Option No Audit; Every Fall) Learn techniques for making effective, persuasive presentations to different kinds of audiences. Practice is essential to improve speaking skills and reduce anxiety. Students practice by recording brief weekly presentations and making class presentations in a supportive environment. Techniques for using PowerPoint to create effective slides are practiced. Course components include presentation assignments; peer reviews; readings/videos and reflections; and class participation. May be repeated once.

PA 5927. Effective Grantwriting for Nonprofit Organizations. (1.5 cr.; A-F only; Every Fall & Spring) Grantwriting skills, processes, problems and resources for nonprofit organizations. Researching and seeking grants. Communication with potential funders and generating financial support. Collaborating effectively with the organization and clients to create substantive, fundable proposals.

PA 5929. Data Visualization: Telling Stories with Numbers. (1.5 cr.; Student Option; Every Fall & Spring) Tools for communicating quantitative information in an intelligent, effective and persuasive way. Topics covered include 1) determining which types of statistical measures are most effective for each type of data and message; 2) determining which types of design to use for communicating quantitative information; and 3) designing graphs and tables that are intelligent and compelling for communicating quantitative information.

PA 5951. Humphrey Fellows Global Commons Seminar. (1 cr. [max 6 cr.]; S-N only; Every Fall) This seminar will introduce Humphrey International Fellows to the public policy, law, and human rights landscape of Minnesota and provide opportunities for professional growth and development in accordance with the goals of the Hubert H. Humphrey International Fellows Program. Through a series of lectures, presentations, trainings and site visits, fellows will be exposed to professional development opportunities, skill building, cultural education, leadership training and networking opportunities. Fellows will also have the opportunity to hear from experts in their fields of expertise, and learn best practices and strategies in public policy, law, and human rights advocacy.

PA 5962. State Governing and Legislating: Working the Process. (3 cr.; A-F only; Every Spring) The Minnesota Capitol and rules and reality of state governance and legislating. Classroom discussions, high-profile guest speakers (including legislators, lobbyists and potentially the governor), and an extensive State Capitol practicum to explore state politics and policies.

PA 5971. Survey of Election Administration. (3 cr.; Student Option No Audit; Every Fall & Spring) Survey of building blocks of election administration, from voter registration to recounts.

PA 5972. Elections and the Law. (3 cr.; Student Option No Audit; Every Fall) Theories and basic structure of the American legal system. Experience with basic tools and skills for using the law to understand and analyze issues facing election administrators across the nation. Use of election-related and non-election-related materials to prepare election administrators for interacting with counsel, legislators and the courts in carrying out their responsibilities.

PA 5973. Strategic Management of Election Administration. (2 cr.; Student Option No Audit; Every Fall) Strategic management for election administrators in the political environment. Election official tools and challenges. The role of the lawmaking process in budgeting and organizational planning.

PA 5974. Election Administration Capstone Project. (2 cr.; Student Option No Audit; Every Fall & Spring) Application of interdisciplinary methods, approaches, and perspectives from core courses. Written report of an election administration issue or problem in jurisdiction of student's choice. Research best practices and possible solutions. Final paper or presentation with findings.

PA 5975. Election Design. (2 cr.; Student Option No Audit; Every Spring) Election administration design principles, including ballot and polling place design and poll worker training materials. Application of principles of field.

PA 5976. Voter Participation. (1 cr.; Student Option No Audit; Every Fall & Summer) Voter participation issues and challenges including historical survey of voter participation in US and methods to increase voter turnout.

PA 5980. Topics in American Election Administration. (0.5-3 cr. [max 9 cr.]; Student Option; Periodic Summer) Selected topics in American election administration. Prereq: Grad student or instr consent; basic US history course recommended

PA 5981. American Institutions in Historical Perspective. (1.5 cr.; Student Option; Periodic Spring) History of churches, fraternal organizations, charities, and institutions more directly related to government. Prereq: Grad student or instr consent; basic US history course recommended

PA 5982. Data Analysis for Election Administration. (2 cr.; Student Option No Audit; Every Spring) Evidence-based election administration. Collection and analysis of quantitative data to solve problems and identify opportunities for improvement. Emphasis on pre-election forecasting for planning purposes and post-election auditing of election results.

PA 5983. Cybersecurity and Elections. (1 cr.; Student Option No Audit; Every Fall) This course will examine the history of cyberattacks on the United States and the American election system, with special attention to the 2016 election cycle. Students will explore the types of cybersecurity threats that exist and strategies to protect against them; understand the roles different levels of government can play in the process, and hear from key officials about the issues raised by the official response to election security threats at the federal, state and local levels as well as in related private sector communities.

PA 5990. Topics: Public Affairs - General Topics. (0-3 cr. [max 18 cr.]; Student Option; Periodic Fall & Spring) General topics in public policy.

PA 5993. Directed Study in Public Affairs. (1-3 cr.; Student Option; Periodic Fall, Spring & Summer) Self-directed study, with faculty advice.

PA 8003. Integrative Doctoral Seminar in Public Affairs I. (3 cr. [max 6 cr.]; A-F only; Every Fall) Lays foundation for doctoral-level study of public affairs through introduction of key concepts, literature, research questions of public affairs. Critically examines paradigms/methodologies through readings, discussions, writing assignments, research presentations. Facilitates development of dissertation research ideas. Prereq: Public Affairs doctoral student
PA 8004. Integrative Doctoral Seminar in Public Affairs II. (3 cr.; A-F only; Every Spring)
Continues PA 8003. Lays foundation for doctoral-level study of public affairs through introduction of key concepts, literature, research questions of public affairs. Critically examines paradigms/methodologies through readings, discussions, writing assignments, research presentations. Facilitates development of dissertation research ideas. prereq: Public Affairs doctoral student

PA 8005. Doctoral Research Seminar in Public Affairs. (3 cr.; A-F only; Every Spring)
Conduct of research, including ethics. Students develop and refine their research ideas. Facilitates development of dissertation research prospectus. prereq: Public Affairs doctoral student

PA 8006. Current Research in Public Affairs: Topics, Approaches, and Cultures. (1.5 cr. [max 3 cr.]; S-N only; Every Fall & Spring)
Students participate in research seminars exploring current topics, approaches, and cultures in public affairs. Students responsible for discussion, presentation, and evaluation of research, including peer review of papers and presentations. Discussion of research ethics and skills, including literature reviews, research design, data visualization, public engagement, presentation, and project management.

PA 8081. Case Study Seminar. (3 cr.; max 6 cr.; A-F only; Every Fall & Spring)
Project for external client on issue agreed upon by student, client, and instructor. Students apply interdisciplinary methods, approaches, and perspectives from core courses. Written report with analysis and policy recommendations. Oral presentation. Topics vary by term. prereq: completion of core courses or instr consent

PA 8082. Professional Paper-Writing Seminar. (3 cr.; A-F or Audit; Every Fall & Spring)
Facilitates completion of research paper on current issues in public policy, management, and science, technology and environment. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses. Written report includes analysis of issue, policy recommendations. All topics accepted. Plan A students welcome. prereq: completion of core courses, or instr consent

PA 8106. Research Seminar in Management, Leadership & Governance. (3 cr.; A-F only; Fall Even Year)
This seminar provides an introduction to the research and theory of management, leadership, and governance within the public, nonprofit organizations, and cross-sector networks involved in public affairs. The course is team-taught by faculty in the Humphrey School's Leadership & Management area, and focuses on the following research literature: democracy and governance (public participation, civic engagement, and public values); organizational theory and behavior; leadership and management practices

PA 8204. Creating Good Work: Economic and Workforce Development. (4 cr.; A-F or Audit; Every Spring)
Job-oriented economic development. Theories on how/why jobs are created. Tools used by communities and economic developers (e.g., tax abatement, infrastructure, job training, entrepreneurship). Strategy, politics, effectiveness.

PA 8206. Planning Theory. (3 cr.; A-F only; Every Spring)
An overview of the major theories that have shaped the field of urban and regional planning, including the analysis of theories related to the process and substance of urban planning. prereq: Public Affairs Ph.D. student, urban planning subplan

PA 8290. Advanced Topics in Planning. (1-3 cr.; max 6 cr.; Student Option; Periodic Fall & Spring)
Selected topics.

PA 8302. Applied Policy Analysis. (4 cr.; Student Option No Audit; Periodic Fall & Spring)
Policy analysis/other applied social sciences as tools for measuring/detecting discrimination in market/nonmarket contexts. Application of modern tools of labor econometrics/race relations research to specific problems of market/nonmarket discrimination.

PA 8312. Analysis of Discrimination. (4 cr.; Student Option; Periodic Fall & Spring)
Policy analysis/other applied social sciences as tools for measuring/detecting discrimination in market/nonmarket contexts. Application of modern tools of labor econometrics/race relations research to specific problems of market/nonmarket discrimination.

PA 8331. Economic Demography. (3 cr.; A-F or Audit; Every Spring)
Classical theory, advanced econometric methods, recent empirical work, and available datasets for research in economic demography. Topics include the economics of mortality, fertility, migration, marriage, women's labor supply, intra-family bargaining, and age structure. Students develop critical analysis and academic discourse skills through in-depth discussions and replications of papers, presentations, referee-style writing assignments, and a term paper. prereq: Grad-level economic theory (PA 5021 or equiv) and econometrics (PA 5033 or equiv) and instructor permission

PA 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

PA 8386. Research Methods in Public Policy. (2 cr.; Student Option; Every Fall)
Social science research methods to analyze and develop public policies. Nature of the research process in analyzing public policies. Qualities of policy analysis and other types of research. Major data sources available to examine public policy issues in the U.S. and abroad. Statistical approaches to examining
PA 8390. Advanced Topics in Advanced Policy Analysis Methods. (3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) FTE: Doctoral prereq: Doctoral student, adviser and DGS consent

PA 8461. Global and U.S. Perspectives on Health and Mortality. (3 cr.; Student Option No Audit; Every Fall) The health of populations in developing and developed countries is very different. Within countries, great health disparities exist between more advantaged and more disadvantaged populations. When crafting policies that aim to improve population health, it is crucial to know how to measure health and how to think about the health needs of the specific population in question. This course will provide an overview to the factors driving health, mortality, and aging across different populations. In addition, students will learn the best sources of data and measures to use to describe the health status of a population. They will also be able to assess policy options that address the health of their population.

PA 8490. Advanced Topics in Social Policy. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8590. Advanced Topics in Economic and Community Development. (1-3 cr.; [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr.

PA 8686. Feminist Organizations. (3 cr.; A-F or Audit; Periodic Spring) Uses social movement literature and histories of U.S. second-wave feminism to study feminist organizations. Recurring issues and conflicts within organizations and movements examined through comparative studies of feminism in Latin America, Eastern Europe, Britain, and Italy. Methods and sources for studying feminism.

PA 8687. Women and Electoral Politics. (3 cr.; A-F or Audit; ) Political science and women's studies literature on American women and electoral politics.

PA 8690. Advanced Topics in Women, Gender and Public Policy. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8706. Interdisciplinary Research Seminar on Science, Technology, and Environmental Policy. (3 cr.; A-F only; Every Fall) Foundational understanding of conducting research on social and policy processes concerning science, technology, and the environment. Key concepts, literature, and new and emerging research directions will be explored with the objective of developing individual research programs. prereq: Public Affairs Ph.D. student with STEP subplan

PA 8707. Interdisciplinary Sustainability Systems Research Seminar. (3 cr.; Student Option No Audit; Every Spring) Sustainability from systems perspective. Explores what environmental sustainability, health, and well being mean for people and the planet; how these attributes are measured and prioritized by different stakeholders, and how different social-ecological and infrastructural systems transition toward improved health and sustainability outcomes.

PA 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PA 8790. Advanced Topics in Science, Technology, and Environmental Policy. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8811. Strategic Issues in International Economic Policy. (3 cr.; Student Option; Periodic Fall & Spring) Compares/contrasts experiences of industrial/developing countries in trade, investment, exchange rates, and immigration.

PA 8821. National Security Policy. (3 cr.; Student Option; Every Fall) Politics and economics of national security policy. Defense policy, military strategy, and weapons procurement. While emphasis is on the United States, other countries also discussed.

PA 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral thesis credit. prereq: [Max 18 cr per semester or summer], 24 cr required

PA 8890. Advanced Topics in Foreign Policy and International Affairs. (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring) Selected topics.

PA 8921. Master's: Professional Paper (Individual Option). (1-3 cr.; Student Option; Every Fall, Spring & Summer) Students work under guidance of paper adviser and committee members to complete their Professional Paper (individual option). prereq: instr consent

PA 8922. Master's: Paper: Plan B. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Masters of science in science, technology, and environmental policy majors work under guidance of paper adviser to complete their Plan B. prereq: instr consent

PA 8931. PhD Public Affairs Professional Skills I. (1 cr.; S-N or Audit; Every Summer) First of three professional skills workshops to prepare Public Affairs PhD students to be engaged scholars and public policy practitioners. Develop skills and tactics for leadership in public affairs scholarship.

PA 8932. PhD Public Affairs Professional Skills II. (1 cr.; S-N or Audit; Every Summer) Second of three professional skills workshops to prepare Public Affairs PhD students to be engaged scholars and public policy practitioners. Communicate complex policy problems and solutions with a wide variety of audiences.

PA 8933. PhD Public Affairs Professional Skills III. (1 cr.; S-N or Audit; Every Summer) Third of three professional skills workshops to prepare Public Affairs PhD students to be engaged scholars and public policy practitioners. Utilize communication platforms to engage diverse audiences. Build a digital portfolio to share research and accelerate teaching impact.

PA 8991. Independent Study. (1-0.5-3 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Independent study. Limit of 6 credits applied toward a Humphrey School of Public Affairs degree or post-baccalaureate certificate program.

Public Health (PUBH)

PUBH 5099. Topics: Epidemiology and Community Health. (1-4 cr. [max 8 cr.]; Student Option; Periodic Fall, Spring & Summer) New courses or topics of interest in epidemiology, community health promotion, public health nutrition or maternal and child health. prereq: specified by course section.

PUBH 5231. Emergency Preparedness: A Public Health Perspective. (2 cr.; A-F only; Every Spring) Public health emergency preparedness, response, recovery. Introduction to field's core competencies. Various components of course, including online modules, intended to stimulate interactions among learners. Purpose, history, organization, functions, tools, activities used in field. prereq: Upper-level undergraduate students and grad/professional students in academic health sciences and fields related to public health emergency preparedness, response, and recovery. Credit will be not granted if student has completed the PUBH 5230 topic course with same title.

PUBH 6000. Topics: Community Health Promotion. (0.5-4 cr.; Student Option; Every Fall) New course offerings or topics of interest in Community Health Promotion.

PUBH 6003. Fundamentals of Alcohol and Drug Abuse for Teacher Education. (1 cr.; Student Option; Every Fall, Spring & Summer) Scientific/socio-cultural aspects of alcohol/drug problems. Emphasizes role of education
in health conservation and drug abuse prevention. prereq: Master of education student or inst or consent

**PUBH 6010. Public Health Approaches to HIV/AIDS.** (3 cr. ; Student Option; Every Fall) Survey of public health approaches to AIDS epidemic. Epidemiological/clinical features of HIV infection. Impact of AIDS on certain communities/populations. Behavior change principles as they apply to AIDS interventions. prereq: Grad student or professional school student or inst or consent

**PUBH 6015. HIV/AIDS: Epidemiology and Public Health Interventions.** (2 cr. ; Student Option; Every Fall) Current/controversial issues related to HIV/AIDS. Primary, secondary, and tertiary prevention. HIV/AIDS in resource-limited countries (including sub-Saharan Africa and Southeast Asia) and in marginalized populations. Evaluation of government policy for control of HIV/AIDS. prereq: [[6320 or 6341 or equiv], [Epi or CHE or MCH or PubH Nut] MPH student or Epi PhD student] or inst or consent

**PUBH 6020. Fundamentals of Social and Behavioral Science.** (2 cr. [max 3 cr.]; A-F only; Every Fall, Spring & Summer) Four major approaches to public health problems: psychosocial, economic, community, policy, Theory, implementation. Small groups practice skills.

**PUBH 6025. Designing e-Interventions for Public Health.** (2 cr. ; Student Option; Spring Even Year) Provide an overview of how technology may be used as a recruitment, assessment, and intervention tool in public health research and practice.


**PUBH 6035. Applied Research Methods.** (3 cr. ; Student Option; Every Fall) This course teaches basic research skills needed to plan, conduct, and analyze data from a quantitative research project. Skills include developing research questions; performing literature searches; developing questionnaires; implementing a study; coding, entering and analyzing data using STATA software; and writing reports.

**PUBH 6040. Dying and Death in Contemporary Society: Implications for Intervention.** (2 cr. ; Student Option; Every Spring) Concepts, attitudes, ethics, and lifestyle management related to dying, death, grief, and bereavement. Emphasizes intervention and educational aspects for community health and helping professionals and for educators.

**PUBH 6045. Skills for Policy Development.** (1 cr. ; Student Option; Every Spring) Skills relevant to policy development and implementation for public health-related issues.

**PUBH 6049. Legislative Advocacy Skills for Public Health.** (3 cr. ; A-F only; Every Spring) State legislature as arena for public health practice. Skills necessary to operate in that arena. Analyzing emergence, development, and resolution of legislative issues of public health importance.

**PUBH 6050. Community Health Theory and Practice I.** (3 cr. ; Student Option; Every Fall) Socioenvironmental factors influencing health-related behavior. Role of groups, institutions, social structures in encouraging healthy, unhealthy behavior. Role of interventions affecting social environment. Barriers to interventions. Individual behavior change theories.

**PUBH 6051. Community Health Theory and Practice II.** (3 cr. ; A-F only; Every Spring) Skill development for developing community health interventions, budgets, implementation plans, and grant proposals. Credit will not be granted if credit has been received for PUBH 6673.

**PUBH 6055. Social Inequalities in Health.** (2 cr. ; Student Option; Every Fall) Extent and causes of social inequalities in health. Degree to which understanding of these inequalities is hampered by methodological limitations in health research. Focuses on individual, community, and policy approaches to reducing social inequalities in health.

**PUBH 6060. Motivational Interviewing: Strategies to Effect Behavior Change.** (1 cr. ; Student Option; Every Summer) Introduction of the theoretical basis of motivational interviewing (MI) style. Using MI style in diverse contexts (clinical, community program, research) and relative to diverse behavioral issues (addictions, healthy lifestyle behaviors, chronic disease adherence).

**PUBH 6066. Building Communities, Increasing Health: Preparing for Community Health Work.** (2 cr. ; Student Option; Every Fall) Taught with Powderhorn-Phillips Cultural Wellness Center. Introduction to community building/organizing. Using culture as a resource for health, reducing barriers, identifying community assets, planning organizing strategy, understanding the impact of history. Emphasizes self-reflection and skill-building for authentic, grassroots community work.

**PUBH 6074. Mass Communication and Public Health.** (3 cr. ; Student Option; Every Spring) This course provides an overview of theory and research that lies at the intersection of mass communication and public health. We examine the potential for media exposure to influence public health outcomes, both as a product of people’s everyday interactions with media and the strategic use of media messages to accomplish public health goals. To this end, we will explore large-scale public health campaigns in the context of tobacco, obesity, and cancer screening. We also will explore news media coverage of controversial health issues, such as the human papillomavirus (HPV) vaccine, and health information in entertainment media, such as smoking in movies. This course seeks to understand whether media messages have had intended and/or unintended effects on public attitudes and behavior. Although our focus is on mass media, interpersonal, medical, and digital media sources will be considered as well.

**PUBH 6078. Public Health Policy as a Prevention Strategy.** (2 cr. ; Student Option; Every Fall) Philosophical, ethical, economic, political, efficacy rationale for policy approach to prevention. Historical/current application of prevention policy to public health problems. prereq: 2nd yr MPH or public health MS student or [Epi, Biostats, Env Hlth, HSRRP Concurrent registration is required (or allowed) in A PhD student] or inst or consent

**PUBH 6081. Sex, Sexuality, and Sexual Health.** (2 cr. ; Student Option; Every Fall) This course is a graduate-level class for students preparing for careers in public health research and practice where sex, sexuality, and sexual health are key components. It is a highly applied, highly interactive course focused on developing skills needed in sex research and sexual health practice. The teaching pedagogical approach is a “flipped classroom” where students are expected to learn the content from the assigned audiotaped lectures, movies and readings, and to come to class ready to participate in exercises, discuss case studies, complete assignments and immerse themselves in public health practice and research focused on sex, sexuality, and sexual health. The purpose of this graduate level course is to prepare health professionals for a professional career addressing community and population sexual health concerns by deepening their knowledge of and exposure to research practice in the field, increasing comfort familiarity and ability to speak on sexual health topics, and by practicing their skills. The assignments focus on hot topics in sex and sexual health, and are designed to increase knowledge of the field of sexual health, while developing skills in conceptualization, measurement, intervention design, and evaluation. Please note this course addresses the greatest challenges in sexual health facing our world, including such hot topics as the Zika virus and HIV prevention, clergy sexual abuse, campus sexual climate, sexual harassment, LGBT health disparities, contraception, abortion, women’s rights, teen sex, and unplanned pregnancy.

**PUBH 6085. Alcohol and Tobacco: Ongoing Threats to Global Health.** (2 cr. ; Student Option; Every Spring) Strategies to prevent and control tobacco and alcohol problems. Policy and community and individual strategies to reduce burden
of tobacco and alcohol problems locally, nationally, and globally. Similarities and differences in public health approaches to tobacco and alcohol prevention and control.

**PUBH 6094. Obesity and Eating Disorder Interventions.** (2 cr.; Student Option; Every Spring) Examine obesity epidemic, eating disorders, prevention and treatment approaches at multiple levels (individual, social, environmental, policy), links between obesity and eating disorders.

**PUBH 6100. Topics: Environmental Health.** (1-4 cr. [max 20 cr.]; Student Option No Audit; Every Fall, Spring & Summer) New course offering/topics in environmental health.

**PUBH 6101. Environmental Health.** (2 cr.; A-F only; Every Fall & Spring) Principles of environmental health relating to macro-/micro-environments and to products consumed or used by people. prereq: Public health [MPH or MHA or certificate] student or instr consent

**PUBH 6102. Issues in Environmental Health.** (2 cr.; A-F only; Every Fall, Spring & Summer). Current issues, principles, and methods of environmental/occupational health practice. prereq: Public health [MPH or MHA or certificate] student or health journalism MA major or nursing MS student or instr consent

**PUBH 6106. Making Sense of Health Studies.** (2 cr.; Student Option No Audit; Every Fall & Spring) How to critically evaluate health news/health research reports on which they are based to make good, well informed decisions about health/well-being.

**PUBH 6107. Excel? and Access? skills in public health settings.** (0 cr.; Student Option; Every Spring) Hands-on course on computer skills to learn a wide range of methods to manipulate public health data. Students will be given ?raw? datasets and practice computer methods to clean, filter, recode, combine, tabulate and report data within the Excel and Access environments. The course is ideal for students who may not pursue more advanced quantitative training but still want to feel comfortable using these widely available programs to produce quality datasets for further analysis, and to generate summary results or reports in their work as public health practitioners. No prerequisites

**PUBH 6108. Foundations of Global Health.** (0-2 cr.; A-F only; Every Fall) This course provides an introduction to key principles and topics in global health including macro-environments and burden of disease, identification of key health problems around the world and the main determinants, health systems and international public health organizations. In addition, we will discuss cross-cutting and timely issues in health promotion, disease control programs, and operational research in international settings.

Class exercises and discussions will focus on challenging global health problems, and strategies to address them. This course is required for those students enrolled in the School of Public Health Global Health Certificate program, and is also open to other qualified students (see Course Prerequisites). Examples of diseases and illustrations of global health problems in this class will include both infectious and non-infectious diseases and should be of interest to students in various programs.

**PUBH 6111. Preventing Pollution: Innovative Approaches to Environmental Management.** (3 cr.; Student Option; Periodic Fall & Spring) Interdisciplinary approach to pollution problems, including sustainability, pollution prevention, risk assessment, regulatory reform, and strategic environmental management. prereq: Public health student or grad student or instr consent

**PUBH 6112. Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals.** (2 cr.; Student Option; Every Fall) Introduction to risk in context of regulatory decision making. prereq: PUBH 6102 and PUBH 6109 or Intro course in toxicology/exposure analysis (e.g., PUBH 6104 Environmental Health Hazards: Introduction to Toxicology, PUBH 6103 Exposure to Environmental Hazards) or equivalent or instructor permission.

**PUBH 6113. Public Policy and Risk: Strategies for Effective Decisions and Discourse.** (3 cr.; Student Option; Periodic Fall & Spring) Introduction to policy making in public health, environment characterized by substantial risk/uncertainty. Basic mathematics of decision making under risk/uncertainty. Cognitive psychology of how people react to risk. Methods of risk communication. prereq: Public health student or grad student or instr consent

**PUBH 6115. Worker Protection Law.** (1 cr.; Student Option; Every Spring) Role of government in protecting rights of citizens. Labor movement history as starting point for discussion of systems for protecting workers in unsafe workplaces and compensating them for injuries. Laws against class-based discrimination.

**PUBH 6116. Environmental Law.** (1 cr.; Student Option; Every Spring) Questions when pollution protection law conflicts with policy encouraging the use of natural resources. Conflicts when government restricts use of property without compensating its owner. Increasing authority of government to audit businesses.

**PUBH 6120. Injury Prevention in the Workplace, Community, and Home.** (2 cr.; Student Option; Every Spring) Injury epidemiology: analyses of major injury problems affecting the public in the workplace, community, and home using epidemiologic model and conceptual framework; emphasis on strategies/program development for prevention and control.

**PUBH 6121. Topics: Injury Prevention in the Workplace, Community, and Home.** (1-2 cr.; Student Option; Every Fall, Spring & Summer) Selected projects in injury prevention.

**PUBH 6122. Seminar: Safety in the Workplace.** (1 cr.; Student Option; Every Spring) Realm of and potential risk factors for occupational safety problems. Strategies for prevention/control.

**PUBH 6123. Violence Prevention and Control: Theory, Research, and Application.** (2 cr.; Student Option; Every Spring) Analysis/critique of major theories and of epidemiological research pertinent to violence, including characteristics of violence and relevant risk factors, reporting/treatment protocols, and current/potential intervention efforts and prevention initiatives. Emphasizes interdisciplinary contributions to violence prevention/control.

**PUBH 6130. Occupational Medicine: Principles and Practice.** (2 cr.; S-N only; Every Spring) Pathogenesis of diseases caused by occupational hazards. Evaluating work-related illnesses. Overall regulatory framework governing occupational health/safety and prerequisite: Environmental health major; toxicology course recommended or instr consent


**PUBH 6132. Air, Water, and Health.** (2 cr.; A-F only; Every Spring) Issues related to providing adequate levels of clean air/water. Local water quantity/quality, air quality in developed/developing world, global air/water quality, policies meant to protect these resources.

**PUBH 6133. Global Health Seminar.** (1 cr.; S-N only; Every Spring) Aspects of global health from public health perspective. Faculty/students from different backgrounds/programs lead/discuss presentations on global health topics. prereq: Public health student or instr consent

**PUBH 6134. Sustainable Development and Global Public Health.** (2 cr.; Student Option; Every Spring) Effects of globalization on social/sustainable development. Population, war, economics, urbanization, environment, water/sanitation, communicable/non-communicable conditions. New infectious/chronic diseases, food security/environmental health. prereq: Credit will not be granted if received for 6100 or 6365

**PUBH 6140. Occupational and Environmental Epidemiology.** (2 cr.; Student Option; Every Spring) Principles/concepts in identifying health effects in workplace. Strategies for identifying excess risk, evaluating strengths/weaknesses
of research techniques, assessing bias/confounding. prereq: Coursework in epidemiology, biostatistics

**PUBH 6150. Interdisciplinary Evaluation of Occupational Health and Safety Field Problems.** (3 cr.; Student Option; Every Spring)
Guided evaluation of potential health/safety problems at work site, recommendations and design criteria for correction/evaluation of occupational health/safety programs. prereq: 6170 or instr consent

**PUBH 6151. Occupational and Environmental Health Nursing Seminar.** (1 cr.; max 6 cr.; S-N only; Every Fall & Spring)
Synthesize information from coursework/professional experience to enhance critical thinking/application to field of occupational/environmental health nursing. prereq: Enrolled in OEHN program, MS, MPH, PhD degrees

**PUBH 6154. Climate Change and Global Health.** (3 cr.; Student Option; Every Spring)
Interconnected relationships between global climate change/human health. Develop computer models to predict climate change from natural/anthropogenic forces, predict human health outcomes as result of changing climate. prereq: Students must have elementary computer skills.

**PUBH 6159. Principles of Toxicology I.** (2 cr.; A-F only; Every Fall)
This is the first of two courses that covers fundamental principles of exposure, uptake and metabolism. This course focuses on identifying the mechanisms and effects of chemical, biological, and physical agents on human health. Discussions will focus on the action of environmental agents and how they interact with humans to cause disease. Emphasis is on understanding the principles of toxicology as they apply to understanding toxicant-human interactions.

**PUBH 6160. Systems Toxicology.** (3 cr.; Student Option; Every Spring)
Application of information regarding basic pharmacokinetic principles/metabolic systems to elucidate mechanisms of toxicity induced by xenobiotic compounds. prereq: [Coursework in biochemistry, molecular biology, organic chemistry] or instr consent

**PUBH 6161. Regulatory Toxicology.** (2 cr.; Student Option; Every Spring)
In-depth introduction to laws (and associated regulations) of U.S. federal regulatory agencies, such as CPSC, EPA, FDA, OSHA, and DOT, that require/use toxicological data/information in their mission of protecting human/environmental health. prereq: Background in toxicology or pharmacology or related field is recommended

**PUBH 6162. Biomarkers.** (2 cr.; A-F only; Every Spring)
Introduce current status of molecular biomarker research, including biomarkers of chemical exposures, genetic toxicity markers, genomics-based biomarkers of susceptibility, organ/systems biomarkers. Progression of biomarker development/application from laboratory environment to clinical or population-based settings/development of public health policies/interventions. prereq: Introductory courses in toxicology and exposure analysis recommended

**PUBH 6164. Toxicological Analysis.** (2 cr.; A-F only; Every Fall)
Methods in molecular toxicology. Research facilities at University. Field trips to local organizations employing modern toxicological methods. prereq: Enrollment in toxicology concentration of Environmental Health PhD program, instr consent

**PUBH 6167. Grant Writing for Toxicological Sciences.** (2 cr.; A-F only; Every Summer)
Principles of writing an NIH-style grant proposal. prereq: Toxicological analysis, toxicology, experience in toxicological research, instr consent

**PUBH 6170. Introduction to Occupational Health and Safety.** (3 cr.; Student Option; Every Fall & Summer)
Concepts/issues in occupational health/safety. Application of public health principles/decision-making process in preventing injury/disease, promoting health of adults, protecting worker populations from environmental hazards. Observational visit to manufacturing facility. prereq: Environmental health major or instr consent

**PUBH 6172. Industrial Hygiene Applications.** (2 cr.; Student Option; Spring Odd Year)
Recognition, evaluation, and control of occupational health/safety hazards. Practice application to specific industrial hygiene problems related to gases/vapors, aerosols, and physical agents.

**PUBH 6173. Exposure to Physical Agents.** (2 cr.; Student Option; Spring Even Year)

**PUBH 6174. Control of Workplace Exposure.** (3 cr.; Student Option; Spring Odd Year)
Hierarchy of options for controlling human exposures to airborne contaminants, both gaseous/aerosol. Science/practice of process control/exhaust ventilation in workplaces/other indoor air spaces/air cleaning. Control of emissions to ambient environment.

**PUBH 6175. Environmental Measurements Laboratory.** (2 cr.; A-F only; Spring Even Year)
Measuring exposures to potentially hazardous agents in air or water. Sampling the agent. Preparing sample for analysis. Conducting analysis. Interpreting results. prereq: EH or instr consent

**PUBH 6176. Hazardous Materials and Waste Management.** (2 cr.; Student Option; Fall Even Year)
Generation, control, and disposal of hazardous materials/wastes. Recognizing, evaluating, controlling, and preventing hazards from chemicals that threaten occupational/environmental health. Lectures, case studies, workshops, field trips. prereq: [6170, courses in [chemistry, organic chemistry] or equiv] or instr consent

**PUBH 6177. Nanotechnology Health and Safety.** (0-3 cr.; Student Option; Every Fall)
As defined by ASTM, nanotechnology is the emerging field of "technologies that measure, manipulate, or incorporate materials and/or features with at least one dimension between approximately 1 and 100 nm". Toxicology studies have indicated that exposures to nanomaterials present unique health risks not encountered with their parent materials. After completing this course, students will understand how the fundamental concepts and methods of occupational hygiene are applied specifically to nanomaterials. Students will learn to use aerosol science, toxicology, product lifecycle assessment, exposure assessment, and occupational hygiene data interpretation methods comprehensively to evaluate workers’ disease risks from nanomaterial exposures and to guide intervention efforts. Emphasis will be placed on control measures appropriate for nanomaterials, and control banding approaches when data are lacking. Participants will study the handling of waste products and potential impacts of released nanoparticles on the public and the ambient environment. The course is aimed at graduate and upper-level undergraduate students in the health and basic sciences, engineering, public health, and industrial hygiene.

**PUBH 6181. Surveillance of Foodborne Diseases and Food Safety Hazards.** (2 cr.; Student Option; Every Fall)

**PUBH 6182. Emerging Infectious Disease: Current Issues, Policies, and Controversies.** (3 cr.; Student Option; Every Spring)

**PUBH 6183. Theory and Practice in Foodborne Disease Outbreak Detection, Investigation and Control.** (1 cr.; S-N only; Every Spring)
This course focuses on the practical basis for developing and implementing methods for foodborne disease outbreak detection, investigation and control; using recent outbreaks to highlight underlying principles. The course will review biological characteristics of major foodborne disease pathogens, clinical features of the illnesses they cause and epidemiologic presentations of foodborne outbreaks. The implications of these characteristics will be discussed in a problem solving, seminar format that examines theory and practice in the context of recent outbreaks.
Strategies to promote timely decision-making will be emphasized.

PUBH 6190. Environmental Chemistry. (.3 cr.; Student Option; Every Fall) Overview air, water, and soil chemistry. Pertinent environmental problems. Human/ecological multimedia exposures to chemicals in the environment. prereq: One course each in [gen chem, org chem] or instr consent

PUBH 6191. Air Pollution. (.3 cr.; A-F or Audit; Every Spring) Overview of many facets of air pollution. Primary/secondary sources. Transport mechanisms, including meteorological effects, atmospheric transformations of pollutants, and deposition processes involved in removal of pollutants. Human/ecosystem health effects, nuisance effects. Regulations/standards in place and under review that affect air pollution management. prereq: [General, organic chemistry] or instr consent

PUBH 6192. Measurement and Properties of Air Contaminants. (.2 cr.; A-F or Audit; Every Fall) Gaseous/particulate air contaminants, their occurrence in workplaces. Factors governing generation/dispersal. Criteria, rationales, and standards for measurement in workplace. Industrial hygiene measurement. Aerosol-related ill health. prereq: Good grasp of [elementary physics, chemistry, mathematics including calculus]

PUBH 6193. Advanced Topics in Human Exposure Science. (.2 cr.; A-F only; Every Fall) Designing exposure studies for epidemiologic investigations and health risk assessments. Techniques to measure/estimate human exposures to hazardous agents in non-occupational and occupational environments. prereq: 6192 or instr consent

PUBH 6200. Topics: Foundations of Interprofessional Communication and Collaboration. (.0-5.4 cr. [max 80 cr.]; S-N only; Periodic Fall) First of three phases of the Center for Interprofessional Education’s 1 HEALTH curriculum. Online hybrid course requiring students to attend small group face-to-face sessions. prereq: [MAA or MPH or MS] student

PUBH 6210. Public Health Medicine Seminar. (.1 cr.; S-N or Audit; Every Fall & Spring) Links between medical practice and public health practice. Emphasizes interdisciplinary public health interventions. Two relatively common medical problems serve to focus discussion about intersection of medicine and public health. prereq: [Public health medicine program MPH major or [MD degree or equiv], instr consent]

PUBH 6231. Global Health Capstone. (.1 cr.; Student Option; Periodic Fall & Spring) This course is designed to facilitate learners’ synthesis of the skills, knowledge, and attitudes learned throughout the Global Health Certificate courses and practiced during field experience. Each student will be

guided through the creation of a portfolio of carefully selected assignments, reflections, and experiences completed during the Certificate program, along with a resume and a final reflection. Each student will then present a portfolio at the end of the course.

PUBH 6241. American Indian Public Health and Wellness, Health Policy, Law, Health Services Administration. (2 cr.; A-F only; Every Fall) This course provides a general basis for understanding American Indian public health and wellness. Central to this area of study, is an appreciation to understand the unique governmental relationship based on how the federal government relates to tribal nations as distinct sovereign political entities, not as a racial classification. The trust responsibility is a government to government relationship as established in the U.S. Constitution. In this course students will learn about the legal responsibility of the United States to the 573 federally recognized tribes, to provide health services to American Indians. Students will examine the public health issues facing American Indian communities; review historical implications, analyze legislation, apply specific financing requirements, and gain an understanding of the unique American Indian public health system and the complex set of services, activities, collaborations and stakeholders that varies by tribe and region. It is designed to help students understand how to work respectfully and effectively with tribes and American Indian communities, to understand the basis of health services and implications of specific tribal (local and federal) law to help improve the devastating health issues currently experienced by American Indians.

PUBH 6250. Foundations of Public Health. (.2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) In this course we will examine values, contexts, principles, and frameworks of public health. We will provide an introduction to public health, consider the history of public health, social/political determinants, impact of health disparities on race, class and gender, moral and legal foundations, public health structures, historical trauma and cultural competence, health and human rights, advocacy and health equity, communication and financing, and the future of public health in the 21st century. Grounded in theory and concepts, we will incorporate core competencies and skills for public health professionals and will focus on developing problem solving and decision-making skills through critical analysis, reflection, case studies, readings, and paper assignments.

PUBH 6271. Management and Organization Within the Ambulatory Care Facility. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program of on-campus (two-weeks) and off-campus study, seminar and monthly local classes with preceptors on management principles, organizational behavior, executive roles, problem solving, health care delivery, human resources, information systems, financial management, support, and patient care services/governance. prereq: Certificate of Management Studies in Health Services Administration ISP-I student or instr consent

PUBH 6272. Management and Organization in Hospital and Health Care Systems. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program of on-campus (two-weeks) and off-campus study, seminar and monthly local classes with preceptors on management principles, organizational behavior, executive roles, problem solving, health care delivery, human resources, information systems, financial management, support, and patient care services/governance. prereq: Certificate of Management Studies in Health Services Administration ISP-I student or instr consent

PUBH 6273. Patient Care Management and Organization Within the Hospital and Health Care Organization. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program including on-campus (two weeks) and off-campus study, seminar and monthly local classes with preceptors on management principles, organizational behavior, executive roles, problem solving, health care delivery, human resources, information systems, financial management, resource allocation, productivity/efficiency, and governance. prereq: Certificate of Management Studies in Health Services Administration ISP-I student or instr consent

PUBH 6274. Administrative and Professional Relationships Within the Ambulatory Care Facility. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program. On-campus (two weeks), off-campus study. Seminar. Monthly local classes with preceptors on ethics, change theory, managed care, strategic planning, law capital finance, integrated services, joint ventures, financial planning, community health systems. prereq: Certificate of Management Studies in Health Services Administration ISP-II student or instr consent

PUBH 6275. Administrative and Professional Relationships Within the Health Care Facility. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program. On-campus (two weeks), off-campus study. Seminar. Monthly local classes with preceptors on ethics, change theory, managed care, strategic planning, medical staff, law, capital finance, integrated services, joint ventures, financial planning, community health systems. prereq: Certificate of Management Studies in Health Services Administration ISP-II student or instr consent

PUBH 6276. Administrative and Professional Relationships in Patient Care Administration. (.4 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer) Ten-month program. On-campus (two weeks), off-campus. Seminar. Monthly local classes with preceptors on ethics, change theory, managed care, strategic planning, law, capital finance, integrated services, joint ventures, financial planning, community health system.
Design/implementation of clinical research protocols. IRB, FDA, and other regulations. Practical tools for survey management. prereq: [Bachelors degree or degree from health professional program or grad student in [dentistry or medicine or nursing or pharmacy or public health or veterinary medicine]], instr consent

PUBH 6320. Fundamentals of Epidemiology. (3 cr.; A-F only; Every Fall, Spring & Summer)

This course provides an understanding of basic methods and tools used by epidemiologists to study the health of populations.

PUBH 6325. Data Processing with PC-SAS. (1 cr.; Student Option; Every Spring)

Introduction to methods for transferring/processing existing data sources. Emphasizes hands-on approach to pre-statistical data processing and analysis with PC-SAS statistical software with a Microsoft Windows operating system.

PUBH 6333. Principles of Human Behavior I. (2 cr.; A-F or Audit; Fall Even Year)

Theoretical perspective on etiology/modification of health behavior in individuals/communities. prereq: Epi PhD student or instr consent

PUBH 6334. Human Behavior II. (2 cr.; A-F or Audit; Spring Even Year)

Critical evaluation of major behavioral public health intervention research. Experience in research designs/methods in health behavior intervention. prereq: [6333]. Epidemiology grad student in behavioral track) or instr consent

PUBH 6336. Advanced Seminar in Infectious Disease Epidemiology. (1 cr. [max 2 cr.]; S-N or Audit; Every Fall)

Real-world applications of infectious-disease epidemiologic principles to contemporary/controversial issues. Development of prevention/control strategies. prereq: 6341, 6385

PUBH 6341. Epidemiologic Methods I. (3 cr.; A-F only; Every Fall)

Introduction to epidemiologic concepts and methods: (1) Study design (randomized trials and observational studies); (2) Measures of exposure-disease association; (3) Casual inference and bias; (4) Confounding and effect modification.

PUBH 6342. Epidemiologic Methods II. (3 cr.; Student Option; Every Spring)

Methods and techniques for designing, implementing, analyzing, and interpretng observational epidemiologic studies, including cohort, case-control, and cross-sectional studies.

PUBH 6343. Epidemiologic Methods III. (4 cr.; Student Option; Every Fall)

Analysis/interpretation of data from various epidemiological study designs. SAS used to demonstrate epidemiological/statistical concepts in data analysis. prereq: [6342, 6451] with a grade of at least B- or instr consent

PUBH 6344. Completing the Cumulating Experience: Secondary Data Analysis. (2 cr.; Student Option; Every Spring)

Opportunity to start and finish MPH project. Secondary data analysis of cross-sectional, case-control, or cohort studies. Develop study question. Describe methods of study. Writing and interpreting results of analyzed data.

PUBH 6348. Writing Research Grants. (2 cr.; A-F or Audit; Every Fall)

Focuses on NIH research grants. Mechanisms of grant writing: specific aims, hypotheses, innovation, background, approaches, evaluation analyses, principles of informed consent, budget development, and grant-review process.

PUBH 6350. Epidemiologic Methods III: Lab. (1 cr.; Student Option; Every Fall)

Skills-based course in which students get hands-on experience in analysis of a variety of epidemiologic datasets using SAS programming to apply epidemiologic methods presented in PUBH 6343, examine crude data for outliers, data errors and distributional assumptions, debug code when programs do not run correctly, and prepare a scientific presentation with appropriate content for introduction/background, methods, results and discussion.

PUBH 6355. Pathophysiology of Human Disease. (4 cr.; Student Option; Every Fall)

Compendium of human diseases relevant to public health professionals. Focuses on cardiovascular disease, cancer, and infectious disease. Presented from epidemiologic, pathophysiologic perspective. Significance of diseases in terms of prevalence, incidence, morbidity, and mortality. Risk factors, prevention strategies. prereq: Epidemiology major or public health nutrition major or instr consent

PUBH 6363. Design and Analysis of Cluster-Randomized Trials in Epidemiology. (3 cr.; Student Option; Every Spring)

Community, school-based, and work-site trials. Trials involving randomization of other identifiable groups to study conditions. Experimental and quasi-experimental designs and threats to their validity.

PUBH 6365. Global Challenges in Infectious Disease Epidemiology. (2 cr.; Student Option; Every Fall)

This course will focus on the considerable burden due to infectious diseases within middle and low-income countries, as well as the underlying risk factors that lead to their emergence and spread. Students will learn about and review different measures of disease burden and health status. Different diseases of international public health significance will be reviewed, with a focus on epidemiologic research and methods used describe and analyze disease determinants. The course will also expose students to different interventions (prevention and control strategies) that have been used in both an emergency situation and to reduce the burden of more endemic diseases that significantly impact the health of populations. The scientific literature concerning specific diseases of interest will be examined and discussed in order to illustrate these principles. We recognize that it is impossible to cover all subjects in global health. Using a
case-study approach, the course will instead select a variety of infectious diseases of international importance. We will focus instead on approaches to dealing with these different problems, and some of the methodologies used to study them. This course will allow students to gain both skills and a greater understanding of public health research and practice as it applies to international health. prereq: [6320 or 6341, instr consent] master’s or doctoral level student in School of Public Health.

PUBH 6370. Social Epidemiology. (; 2 cr. ; Student Option; Spring Even Year) How a society’s social interactions, past and present, yield differential exposures and differences in health outcomes between persons who make up populations. New disease-specific risk factors. How well-known exposures emerge and are maintained by social system.

PUBH 6375. Screening for Disease: a Double-Edged Sword?. (2 cr. ; Student Option; Every Fall) The earliest concept of screening for disease arose in the early 1900’s with the advent of x-rays, which allowed, literally, for viewing lungs on a “screen”. The rise of screening has also been attributed to public health approaches that were employed to “screen” out pollutants from water or to protect from vector-borne diseases. The earliest application of x-rays was to identify tuberculosis. Use of x-rays for tuberculosis led to realization that the technology allowed for the early diagnosis of latent tuberculosis, thereby offering the opportunity for treatment and control of its spread in the population. Another early application of screening was to determine the mental health suitability of army recruits in World War I. Since the World War II era, screening for disease has become a routine part of medical care. Thirty-six of the 55 U.S. Preventive Services Task Force evidence-based recommendations with an A or B grade are for screening in areas such as cancer, pregnancy, cardiovascular disease, mental health, and obesity, among others. Despite the U.S. Preventive Services Task Force imprimatur on screening recommendations, routine screening is complicated not only by conflicting evidence of its efficacy, leading to disagreement among professional medical societies, but also by increasing recognition of potential physical and psychological harms that may outweigh benefits. In addition, social, economic and political forces shape screening application and policy decisions, such as whether or not to provide insurance coverage for screening tests. For example, the 2009 U.S. Preventive Services Task Force recommendations to change the age at which to begin and frequency of mammography for breast cancer led to a public outcry. Advocacy groups and professional medical societies opposed to the changes lobbied Congress to keep the old recommendations. They claimed the revised recommendations would result in unnecessary deaths. However, it should be noted that reducing mammography frequency and narrowing the age range for women to be screened would also likely reduce reimbursement for clinical screening services. The aim of this course, then, is to provide a comprehensive overview of screening methods and evaluation, and to examine the efficacy, benefits versus harms, population uptake, screening promotion, and controversies surrounding specific screening tests for various health conditions. These include, but are not limited to, cancer, cardiovascular disease, infectious disease, mental health and newborn metabolic and genetic defects. Such controversies can range from overdiagnosis and unnecessary treatment, informed decision-making, screening policies, and ethical issues. The course is designed to appeal to students in Public Health, Nursing, Pharmacy, Medicine, genetic counseling and public policy.

PUBH 6380. Ecology of Infectious Diseases. (; 3 cr. ; A-F or Audit; Every Fall) Ways in which host, agent, and environmental interactions influence transmission of infectious agents. Environmental dissemination, eradication/control, evolution of virulence, analytical/molecular tools.

PUBH 6381. Genetics in Public Health in the Age of Precision Medicine. (; 2 cr. ; Student Option; Every Fall) Mechanisms of molecular genetics. Issues related to medical/public health genetics, including basis of human diversity, Human Genome Project, novel genetic mechanisms underlying diseases, ethical/legal issues. prereq: Grad student or professional school student or instr consent

PUBH 6385. Epidemiology and Control of Infectious Diseases. (; 2 cr. ; Student Option; Every Spring) Principles and methods. Strategies for disease control and prevention, including immunization. Relevance of modes of transmission of specific agents for disease spread and prevention. Public health consequences of infectious diseases at local, national, and international levels.


PUBH 6388. Foundations of Global Health. (; 2 cr. ; Student Option; Every Fall) This course provides an introduction to key principles and topics in global health including measures of global burden of disease, identification of key health problems around the world and the main determinants, health systems and international public health organizations. In addition, we will discuss cross-cutting and timely issues in health promotion, disease control programs, and operational research in international settings. Class exercises and discussions will focus on challenging global health problems, and strategies to address them. This course is required for those students enrolled in the School of Public Health Global Health Certificate program, and is also open to other qualified students (see Course Prerequisites). Examples of diseases and illustrations of global health problems in this class will include both infectious and non-infectious diseases and should be of interest to students in various programs.

PUBH 6389. Nutritional Epidemiology. (; 2 cr. ; Student Option; Every Fall) Nutrition/disease relationships through application of epidemiologic methods. Characterization of various exposures to food/nutrient intakes, biological basis for nutrition/disease relationships. Studies of specific chronic diseases and nutritional intake. Design/interpretation of studies using nutritional measures. prereq: [6320 or 6330 or 6341], [Epidemiology MPH or Public Health Nutrition MPH or Epidemiology PhD student] or instr consent

PUBH 6390. Topics: Epidemiology. (; 0.5-4 cr. ; max 80 cr. ; Student Option; Periodic Fall, Spring & Summer) New course offerings or topics of interest in epidemiology.

PUBH 6400. Topics: Biostatistics. (; 0.5-4 cr. ; max 80 cr. ; Student Option No Audit; Periodic Fall, Spring & Summer) New course offerings or topics of interest in biostatistics.

PUBH 6414. Biostatistical Literacy. (; 3 cr. ; A-F only; Every Fall, Spring & Summer) Develop ability to read/interpret statistical results in primary literature. Minimal calculation. No formal training in any statistical programming software. Biostatistical Literacy will cover the fundamental concepts of study design, descriptive statistics, hypothesis testing, confidence intervals, odds ratios, relative risks, adjusted models in multiple linear, logistic and Poisson regression, and survival analysis. The focus will be when to use a given method and how to interpret the results, not the actual computation or computer programming to obtain results from raw data. prereq: MPH or certificate student or environmental health or instr consent


PUBH 6420. Introduction to SAS Programming. (; 1 cr. ; Student Option; Periodic Fall & Summer) Use of SAS for analysis of biomedical data. Data manipulation/description. Basic
statistical analyses (t-tests, chi-square, simple regression).

PUBH 6431. Topics in Hierarchical Bayesian Analysis. (1 cr.; Student Option No Audit; Every Summer) Hierarchical Bayesian methods combine information from various sources and are increasingly used in biomedical and public health settings to accommodate complex data and produce readily interpretable output. This course will introduce students to Bayesian methods, emphasizing the basic methodological framework, real-world applications, and practical computing.

PUBH 6432. Biostatistical Methods in Translational and Clinical Research. (1 cr.; Student Option No Audit; Periodic Summer) This short course on translational and clinical research will focus on the topics of diagnostic medicine and designing clinical research methods, application of regression models and early phase clinical trials. prerequisite: Students will benefit from having taken one or two semester courses in biostatistics or applied statistics covering up to and including multiple regression and introductory logistic regression.

PUBH 6450. Biostatistics I. (4 cr.; A-F only; Every Fall & Spring) Descriptive statistics. Gaussian probability models, point/interval estimation for means/proportions. Hypothesis testing, including t, chi-square, and nonparametric tests. Simple regression/correlation. ANOVA. Health science applications using output from statistical packages. prerequisite: [College-level algebra, health sciences grad student] or instr consent

PUBH 6451. Biostatistics II. (4 cr.; Student Option; Every Fall & Spring) Two-way ANOVA, interactions, repeated measures, general linear models. Logistic regression for cohort and case-control studies. Loglinear models, contingency tables, Poisson regression, survival data, Kaplan-Meier methods, proportional hazards models. prerequisite: [PUBH 6450 with grade of at least B, health sciences grad student] or instr consent

PUBH 6460. Essential Skills for Biostatistical Practices. (1 cr.; S-N only; Every Fall) The Essential Skills for Biostatistical Practice seminar will teach career development skills and job-relevant? computing and communications skills. Students will learn about MS-level job opportunities from biostatistics professionals from a wide range of occupational settings locally, nationally or internationally. Students will also learn practical skills needed both for their (optional) field experience and for the capstone experience course, including principles of reproducible research, how to integrate statistical output in reports, searching the literature, and research ethics. The format and course topics will vary from week to week, as described below. Some lectures will be shared with an existing seminar course for PhD students. PUBH 4803 Research Skills in Biostatistics. Attendance will be mandatory, and there will be weekly homework assignments to reinforce skills presented in class.

PUBH 6470. SAS Procedures and Data Analysis. (3 cr.; Student Option; Every Fall) SAS procedures, how they are used in various health-related datasets to answer specific problems regarding estimation, testing, or prediction. prerequisite: [PUBH 6450, 6451] or [PUBH 7405, 7406] or [Stat 5101, Stat 5102]

PUBH 6525. Introduction to Population Health: A Health System. (1 cr.; A-F only; Every Fall) Population health is the field of practice and research concerned with the health of groups of individuals and the equitable distribution of health within these groups. Populations may be defined by geographic area, by social and economic characteristics such as gender, socioeconomic status, and race/ethnicity, by disease states such as persons with mental illness or diabetes, or by enrollment in a health care plan or utilization of a specific health care organization. Population health takes an upstream approach, focusing on the social determinants of health and fundamental issues of health equity. While improving population health requires the involvement of multiple sectors such as public health agencies, health departments, education, housing, faith-based organizations and criminal justice, here we focus on how population health can be addressed from within the health system. Through partnerships with other sectors. Using case studies, we will explore how population health innovations are applied by health systems.

PUBH 6527. Healthcare Leadership and Effecting Change. (2 cr.; A-F only, Every Spring) How to become effective change leader in organizations. prerequisite: MHA student

PUBH 6535. Managerial Accounting for Health Services. (3 cr.; A-F or Audit; Every Fall, Spring & Summer) Differential, absorption, activity-based costing. Budgeting, variance analysis. Financial accounting, including transaction data and accrual accounting. Developing financial statements. Ration analysis. prerequisite: [AHC student or instr consent; experience with spreadsheets such as Excel or Lotus recommended

PUBH 6540. Health care Organizational Behavior. (2 cr.; A-F or Audit; Every Fall) Human behavior in organizations. Motivation, leadership, influence of organizational structure, informal group behavior, interpersonal relations, supervision. Emphasizes preventing/solving problems among individuals/groups in organizations. prerequisite: Health care admin student or instr consent

PUBH 6541. Statistics for Health Management Decision Making. (3 cr.; Student Option; Every Fall) Variation. Frequency distribution, measurement, probability, graphing. Significance tests, estimation, trends; data handling. Modeling, odds ratios. Prevalence, incidence and vital statistics. Research applications. Statistical approach to rational administrative decision making. Inductive teaching, lectures, computer/lab exercises. prerequisite: Health care admin student or instr consent

PUBH 6542. Management of Health Care Organizations. (3 cr.; A-F or Audit; Every Fall & Spring) Role of hospital in health services delivery. Relationships with other systems and the community. Emphasizes governance, medical staff, and role of administrator. Lectures, on-site visits to health services organizations. prerequisite: Health care admin student

PUBH 6544. Principles of Problem Solving in Health Services Organizations. (4 cr.; A-F or Audit; Every Spring) Problem-solving theory/technique. Solving a management problem within a health services organization. Presenting a report. Lectures, seminars, demonstrations. prerequisite: PUBH 6541, completed 30 hours of MHA coursework, Health care administration student

PUBH 6545. Advanced Problem Solving in Health Services Organizations. (4 cr.; A-F or Audit; Every Spring) Defining, analyzing, and solving significant senior management-level operational or health public policy problems. prerequisite: PUBH 6544 or concurrent registration is required (or allowed) in PUBH 6544, Healthcare Administration student

PUBH 6547. Health Care Human Resources Management. (2 cr.; A-F or Audit; Every Fall & Spring) Concepts in human resources management as applied to health services organizations. Relationship between human resources management and general management. Work and human resources. Compensation/benefits, personnel planning, recruitment/selection, training/development. Employee appraisal/discipline. Union-management relations. prerequisite: Health care admin student or public health admin student or instr consent

PUBH 6548. Medical Group Management. (2 cr.; A-F or Audit; Every Spring) Overview of physicians group management in integrated delivery systems. Physician/administrative roles, operational/strategic issues, alternative organizational models, risk-contracting, provider payment methods, managing change, effective communication. prerequisite: Health care admin student or instr consent

PUBH 6551. Contemporary Problems in Health Care. (1-2 cr.; Student Option; Every Fall & Spring) Current concepts, problems, principles, and future developments of health and health care, selected by students. Developing models based on current literature and research. Verbal/written presentations from policy/issue perspectives. prerequisite: Grad student

PUBH 6553. Health Care Management Ethics. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) Ethical issues faced by health care managers as leaders of an organization, members of a profession, and coordinators of clinical
Group research thesis with verbal/written presentations. prereq: Health care admin student or instr consent

PUBH 6562. Information Technology in Health Care. (2 cr.; Student Option; Every Fall) Managing information as a strategic resource within health care organizations. Designing information technology systems to capture, combine, and transform information to measure processes/outcomes of care, support collaborative clinical decision making, support management decisions, empower patients, and improve health care operations.

PUBH 6563. Integrated Delivery Systems. (2 cr.; A-F only; Every Fall & Spring) Integrated models of health care delivery. Emphasizes organizational design, governance, operations, strategy, resource deployment, and the role of the "embedded medical practice." prereq: Hlth care admin student or instr consent

PUBH 6564. Private Purchasers of Health Care: Roles of Employers and Health Plans in U.S. Health Care System. (2 cr.; A-F or Audit; Every Fall) Development and organization of HMOs and PPOs: risk sharing, provider contracts, utilization management, quality improvement, marketing, and new product development; employer relations; Medicare and Medicaid contracting; budget processing; financial performance; pricing; government regulations. prereq: MHA or MBA or HSRP or PHA student or instr consent

PUBH 6565. Innovation of Healthcare Services. (2 cr.; A-F only; Every Fall) Designing/creating new care delivery services/experiences. Exploiting opportunities for innovation. Overcoming obstacles. Capturing value. prereq: MHA student only

PUBH 6566. Interprofessional Teamwork in Health Care. (2 cr.; Student Option; Every Fall & Summer) Leading/participating in interdisciplinary teams. Team communication, problem solving, conflict management, organizational support. prereq: [Health care admin or MHA or PUBH admin/policy student, familiarly with computerized spreadsheets] or instr consent

PUBH 6569. Healthcare Policy. (1 cr. [max 2 cr.]; A-F only; Every Fall) Public policy environment surrounding health care and public health systems. Political context of health policy. Approaches to policy formation/analysis. Tools/strategies for influencing health policy outcomes. prereq: Public health [MPH or MHA or certificate] student or instr consent

PUBH 6570. Healthcare Administration. (1-4 cr. [max 8 cr.]; Student Option; Periodic Fall, Spring & Summer) Selected readings in healthcare administration. Discussion based on readings. prereq: dept consent

PUBH 6571. Leading Performance Improvement in Health Care. (2 cr.; A-F only; Every Spring) Introduction to concepts of performance improvement in health care institutions. prereq: MHA or MPH or certificate student or instr consent

PUBH 6572. Management for Clinical Research. (2 cr.; Student Option; Every Fall) Management for clinical research. prereq: Pursuing clinical research recommended

PUBH 6573. The Nature of Clinical Care. (2 cr.; A-F only; Every Spring) Discussing clinical matters with colleagues. Students participate as peers in managing health care performance in hospitals, medical groups, and other health care delivery and public health institutions. prereq: School of Public Health student


PUBH 6577. Advanced Problem Solving in Health Services Administration. (2 cr.; A-F only; Every Spring) Capstone course. Students integrate/synthesize knowledge, attitudes, and skills acquired in curriculum and apply them to resolve management problem. prereq: MHA student

PUBH 6578. Negotiation Strategies. (2 cr.; A-F only; Every Spring) The central issues of this course deal with understanding the behavior of individuals, groups and organizations on the context of competitive situations. prereq: MHA student or instructor permission

PUBH 6589. Medical Technology Evaluation and Market Research. (2 cr.; Student Option; Every Spring) Analytical tools for formulating evaluations of innovations in medical technologies. Disseminating results to get a new product to market.

PUBH 6596. Legal Considerations in Health Services Organizations. (2 cr.; A-F or Audit; Every Fall, Spring & Summer) Laws affecting administration of hospitals and other healthcare organizations. Administrative law, corporate/business law, labor law, civil liability, tax-related issues. Legal issues relevant to administration, decision making, and planning. prereq: Health care admin student

PUBH 6600. Topics: Maternal and Child Health. (0.5-4 cr. [max 20 cr.]; Student Option; Periodic Fall, Spring & Summer) New courses or topics of interest.
countries. Social, economic, environmental, behavioral, and political factors affecting health behaviors, reproductive health, chronic and acute diseases, premature mortality and longevity. prereq: Grad level student

PUBH 6605. Reproductive and Perinatal Health. (2 cr.; Student Option; Spring Even Year)
Epidemiology, programs, services, and policies. Social, emotional, psychological, environmental, economic, and political factors that affect reproductive health, pregnancy, and childbirth. prereq: Public health student or grad student or instr consent

PUBH 6606. Children's Health: Issues, Programs, and Policies. (2 cr.; Student Option; Periodic Spring & Summer)
Overview of public health issues related to children in the United States. Focus on identifying and planning public health strategies, policies, and programs to improve health of infants and children.

PUBH 6607. Adolescent Health: Issues, Programs, and Policies. (2 cr.; Student Option; Spring Even Year)
Major public health issues of adolescents in the United States. Emphasizes prevention and health promotion strategies and effectiveness of programs and policies.

PUBH 6613. Children and Youth with Special Health Care Needs. (2 cr.; Student Option; Fall Even Year)
Principles, programs, policies, and practices for identifying/meeting needs of children/youth with special health care needs in the United States. Epidemiology, historic/current legislation, organization/delivery. Readings, online discussions, written assignments. prereq: Graduate-level student in [AHC programs or education or social work or psychology]

PUBH 6617. Practical Methods for Secondary Data Analysis. (3 cr.; Student Option; Every Fall)
Introduction to methods for finding, transferring, and processing existing data sources. Focuses on practical approaches to pre-statistical data processing and analysis with STATA using a PC with an MS Windows operating system. Complex survey samples, other survey biases. prereq: Graduate level student or instr consent

PUBH 6627. Sexuality Education: Criteria, Curricula, and Controversy. (1 cr.; Student Option; Every Fall & Spring)

PUBH 6630. Foundations of Maternal and Child Health Leadership. (3 cr.; Student Option; Every Fall)
Historical/current principles, programs, policies, and practices related to women, children, adolescents, and families. Articulating a personal leadership style/plan for development of leadership competencies. Leadership principles, skills, and models applied to improving health of MCH populations. prereq: Public Health MCH major or instr consent

PUBH 6634. Children and Families: Public Health Policy and Advocacy. (2 cr.; Student Option; Every Spring)
The course will focus on how public policies at the federal, state and local level influence children's health. Students will develop practical skills to understand, analyze, communicate, and advocate on children's policy issues. The course will include presentations and discussions with Minnesota's current leaders in children's health policy including legislators, advocates, and state commissioners. Instructor information: Lauren Gilchrist is the Senior Policy Advisor to Governor Mark Dayton. In this role, she works with commissioners, legislators, local government and stakeholders to advance health and human services policy issues for the state of Minnesota. She previously served as an advisor to the late Senator Ted Kennedy and Senator Al Franken.

PUBH 6636. Qualitative Research Methods in Public Health Practice. (2 cr.; Student Option; Every Fall)
Qualitative inquiry, selected data collection, management, analysis methods for qualitative research in public health. Current approaches to assess strength of evidence of qualitative studies in public health. Provision of practical skills that can be applied in public health settings.

PUBH 6638. Excel and Access in Public Health Settings. (1 cr.; Student Option; Every Spring)
This is a hands-on course on computer skills to learn a wide range of methods to manipulate public health data. Students will be given raw databases and practice computer methods to clean, filter, recode, combine, tabulate and report data within the Excel and Access environments. The course is ideal for students who may not pursue more advanced quantitative training but still want to feel comfortable using these widely available programs to produce quality datasets for further analysis, and to generate summary results or reports in their work as public health practitioners.

PUBH 6655. Principles and Programs in Maternal and Child Health. (2 cr.; A-F only; Every Summer)
Public health perspective for assessing/meeting health needs of women, children, adolescents, and families. Historical/current principles, programs, policies, and practices related to these populations. prereq: Maternal/child health MPH major enrolled in online program or instr consent

PUBH 6673. Grant Writing for Public Health. (1 cr.; Student Option; Every Spring)
Hands-on workshop. Identifying successful elements of a grant application. Grant review process. Critiquing a grant. Writing an application.

PUBH 6675. Women's Health. (2 cr.; Student Option; Fall Odd Year)
Programs, services, and policies that affect women's health in the United States. Methodological issues in research. Emphasizes social, economic, environmental, behavioral, and political factors. Measurement/interpretation of factors, how they translate into interventions, programs, and policies.

PUBH 6702. Integrative Leadership Seminar. (3 cr.; Student Option; Every Spring)
Explore, investigate, discuss, develop basic concepts/practices for people/organizations associated with "integrative leadership", prereq: University of Minnesota doctoral student or master's student, Integrative Leadership minor

PUBH 6703. Health Impact Assessment: A Tool to Promote Health Equity. (1.5 cr.; A-F or Audit; Every Fall)
Health is largely influenced by the upstream social determinants of health, and yet policy decision makers rarely consider health. As a result, our social and physical environments often benefit certain groups over others, leading to health disparities. Health Impact Assessment (HIA) is a tool that uses the best available evidence to uncover the health impacts of policies, plans and projects in order to influence decisions before they are finalized. Strong community engagement grounds the HIA in the health issues and topics important to those who will be impacted by the decision, leading to more equitable, healthier communities. This is a skills focused course that introduces students to the six steps of an HIA, along with relevant data sources and methods. With each step, students will be given the opportunity to practice and apply key concepts. Throughout the semester, students will work in interdisciplinary teams to develop a plan for an HIA, culminating in a group presentation. Students will also critique an HIA of their choice to see how HIAs have been used in the real world. This course will also cover emerging topics and challenges in the HIA field, including data gaps, funding, intersections with government decision making processes, and public engagement in HIAs. Students will have a chance to hear from several practitioners who will share their insights and experiences conducting HIAs in Minnesota.

PUBH 6705. Community Health Assessment. (3 cr.; Student Option; Every Spring)
Two of the three core functions of public health: health assessment, assurance. Lectures, discussion, group activities, oral presentations. prereq: concurrent registration is required (or allowed) in 6320 or concurrent registration is required (or allowed) in 6341, public hhl admin/policy or maternal/child hhl major or instr consent

PUBH 6711. Public Health Law. (2 cr.; Student Option; Every Spring & Summer)
Basic concepts of law, legislative process, and legal bases for existence/administration of public health programs. Legal aspects of current public health issues/controversies, regulatory role of government in health services system. prereq: Grad student or professional school student or instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
PUBH 6713. Global Health in a Local Context. (3 cr.; Student Option; Every Fall) Global Health in a Local Context: An experiential course on the social determinants, health equity, and leading change in Minnesota immerses students in the study of health equity, the social determinants of health, the principles and practice of global health in a local setting, and community-based healthcare. The discipline of social medicine provides a theoretical and practical framework to explore these topics. This course draws on the social sciences and social epidemiology to forge understandings of the social determinants of health; integrates the voice and decision-making power of individuals, families, and communities; is multidisciplinary and multisectoral in its responses; ensures an equity agenda; and is guided by deep, multi-faceted encounters with local contexts.

PUBH 6717. Decision Analysis for Health Care. (© 2 cr.; Student Option; Every Fall) Introduction to methods/range of applications of decision analysis and cost-effectiveness analysis in health care technology assessment, medical decision making, and health resource allocation.

PUBH 6721. Leading Collaborations. (© 1 cr.; Student Option; Every Spring) How mental health care providers located in individual organizations coordinate their activities so that care of clients is integrated. Coordination of labs and county health departments. Organizations such as rural health networks and community health information networks to achieve community-based goals. prereq: 6752 or instr consent

PUBH 6723. Lean Management in Health Care. (© 1 cr.; Student Option; Every Spring) Organizing to maximize customer value while minimizing waste. Lean management applied in Phillips Neighborhood Clinic. Observing waste. Developing basic value flow diagrams. Using problem-solving techniques to improve quality continuously. prereq: instr consent

PUBH 6724. The Health Care System and Public Health. (© 3 cr.; Student Option; Periodic Fall & Spring) Overview of health care delivery, finance systems within public health context. Components of health care system: financing, role of employers/public programs, health care delivery system, managed care. Collaborative interventions between managed care, public health, prereq: Public health or grad student or instr consent

PUBH 6726. Medical Device Industry; Business and Public Policy. (© 3 cr.; Student Option; Every Spring) Business, public policy, regulatory, technology management issues concerning medical device/biotechnology industries. Nature/effects of private-public sector interactions. Involvement by leaders in Minnesota organizations, prereq: MPH or MHA or grad student or instr consent

PUBH 6727. Health Leadership and Effecting Change. (© 2 cr.; Student Option; Every Fall, Spring & Summer) Analysis of leadership models and competencies, particularly as applied to organizational change. Applications to individual self-development and to health care organizations, prereq: Public hth MPH or MHA or certificate student or [health services research, policy/admin] MS student or instr consent

PUBH 6729. Public Health Leadership. (© 1 cr.; Student Option No Audit; Every Fall) Designed for MPH students interested in enhancing ability to improve public’s health by inspiring/mobilizing others. Core concepts of leadership theory/key competencies of effective public health leaders. prereq: School of Public Health grad student or instr consent

PUBH 6730. International Comparative Health Systems. (2 cr.; Student Option; Spring Odd Year) History and development of health systems from a socio-political perspective. Overview of relative importance and meaning of health outcomes data. Role of WHO. Students use OECD health database.

PUBH 6732. Topics and Methods in Global Health Assessment. (© 2 cr.; Student Option; Spring Odd Year) Evaluation of health populations relative to specific topics important to global health, including methodology appropriate to particular issue. Focuses on developing countries. prereq: [6705, concurrent registration is required (or allowed) in PUBH 6705 or concurrent registration is required (or allowed) in PUBH 6731 or concurrent registration is required (or allowed) in PUBH 6341] or concurrent registration is required (or allowed) in course in epidemiology, [public health MPH or environmental health [MS or PhD] or health services research/policy/administration [MS or PhD] or epidemiology PhD or clinical research MS] or instr consent

PUBH 6734. International Project Planning and Management. (© 2 cr.; Student Option No Audit; Every Spring) Practical skills for work as international project manager. Key international public health issues. Students practice management and work with local nonprofit that works internationally or domestically with refugee and immigrant populations in Minnesota. prereq: PHAP grad student or instr consent

PUBH 6735. Principles of Health Policy. (© 3 cr. [max 6 cr.]; A-F only; Every Fall) The purpose of this course is to introduce students to the policy environment that influences and shapes public health and the provision of health care services, to enhance understanding of the historical and political context of health policy, to develop strategies for analysis of health policy issues, and to communicate effectively in the policy environment. Credit will not be granted if credit has been received for PUBH 6835.

PUBH 6741. Ethics in Public Health: Professional Practice and Policy. (© 1 cr.; A-F only; Every Fall, Spring & Summer) Introduction to ethical issues in public health practice/policy. Ethical analysis, recognizing/analyzing moral issues. prereq: Public health [MPH or MHA or certificate] student or environmental health [MS or PhD] major or instr consent

PUBH 6742. Ethics in Public Health: Research and Policy. (© 1 cr.; A-F only; Every Fall, Spring & Summer) Introduction to ethical issues in public health research/policy. Ethical analysis. Recognizing/analyzing moral issues. prereq: Public health [MPH or certificate] student or [clinical research MS or Environmental health [MS or PhD] or epidemiology PhD or [health services research, policy/admin [MS or PhD]]] major or instr consent

PUBH 6744. State Health Policy and Politics. (© 2 cr.; Student Option; Every Spring) Half semester. Federal health reform debate and debate over reinstating the MN General Assistance Medical Care program. Intergovernmental relationship between the federal and state governments in health policy and finance; role of state and local policy makers and policy advocates. Political context for state health policy development.

PUBH 6751. Principles of Management in Health Services Organizations. (© 2 cr.; A-F only; Every Fall, Spring & Summer) Understanding of and improvement in the competencies of managers in organizations, particularly as applied to health services and public health organizations, prereq: [Public hth MPH or MHA or certificate] student or [environmental health MS or PhD] student or dentistry MS student or instr consent

PUBH 6755. Planning and Budgeting for Public Health. (© 2 cr.; Student Option No Audit; Every Fall & Summer) Principles of budgeting, planning, forecasting, and analyzing in nonprofit/government organizations applied to health care administration and public health, prereq: Academic Hlth Ctr grad student or instr consent

PUBH 6758. Managing Public Health Systems. (© 2 cr.; A-F only; Every Fall, Spring & Summer) Problem solving, process management, quality improvement, collaboration/partnership management. Organizing public health core functions and essential services, prereq: [6751 or concurrent registration is required (or allowed) in 6751], [public health MPH or certificate] student or environmental health [MS or PhD] major or HSRPA [MS or PhD] major

PUBH 6762. Health Finance Applications. (© 2 cr.; Student Option; Every Spring) Top management perspective of healthcare financial management responsibility in context of strategic issues. Emphasizes balancing theory and applications. Capstone course. prereq: [6558, [grad or professional school] student] or instr consent

PUBH 6765. Continuous Quality Improvement: Methods and Techniques. (3 cr.; Student Option; Every Fall) Theory/practical applications of concepts, tools, techniques of continuous quality improvement (QI) in public health/health care.
PUBH 6772. Health Disparities Capstone Seminar. (1 cr. [max 2 cr.]; Student Option No Audit; Every Spring)
Readings and discussion-based seminar. Readings emphasize practice and policy solutions to health disparities. prereq: [CSPH 5115, 2d yr MPH student completing SPH health disparities interdisciplinary concentration] or instr consent

PUBH 6780. Topics: Public Health Administration and Policy. (1-3 cr. [max 60 cr.]; A-F only; Periodic Fall & Spring)
New courses or topics of interest in public health administration/policy.

PUBH 6800. Topics: Health Services Research and Policy. (0.5-4 cr. [max 80 cr.]; Student Option; Periodic Fall, Spring & Summer)
New courses or topics of interest in health services research and policy.

PUBH 6801. Health and Human Rights. (3 cr.; Student Option; Every Fall)
Relationship of health and human rights in public health context. Philosophical frameworks/groundings. Nexus between health and human rights. Historical/contemporary topics. prereq: Grad student or professional student or instr consent

PUBH 6802. Managing Electronic Health Information. (3 cr.; Student Option; Every Fall & Spring)

PUBH 6803. Conducting a Systematic Literature Review. (3 cr.; Student Option No Audit; Every Spring)
Developing skills built on evidence-based practice. Draws on staff of Minnesota Evidence-based Practice Center. prereq: Basic knowledge of epidemiology

PUBH 6804. Community Mental Health. (2 cr.; Student Option; Fall Even Year)
Social-psychological processes that shape experience of mental health/illness. Consequences of disorders for individuals, families, and communities. Epidemiology research, theories of mental health/illness. Effect of policies related to organizing/financing services.

PUBH 6805. Introduction to Project Management for Health Professionals. (2 cr. [max 4 cr.]; A-F only; Every Summer)
Core concepts/skills for managing projects effectively, making sure they are completed on time, within budget, meeting performance objectives. prereq: Matriculation in master's program in School of Public Health, or instr consent

PUBH 6806. Principles of Public Health Research. (2 cr.; Student Option; Every Fall)
Evaluation of public health research literature and planning for independent research projects. Formulation of research question, research design, sampling techniques, use of research concepts, and data analysis. Data collection techniques, including questionnaires, interviews, and data analysis, prerequisite: PubH 6645, 6801, 6806 or instr consent

PUBH 6808. Professional and Research Practice in Health Services Research, Policy and Administration. (1 cr.; S-N only; Every Summer)
Institutional rules related to funder requirement compliance (CMS, NSF, etc.), regulatory compliance (HIPAA, FISMA), risk management related to data management. Integrating/normalizing data from disparate data sources, managing very large scale projects, organizing data warehouses, supporting collaboration with stakeholders. Professional practice and research issues. prerequisite: MS in HSRP & MPH in PHI, PubH 6450, 6451, 6806, or instr consent

PUBH 6809. Advanced Methods in Health Decision Science. (3 cr.; Student Option No Audit; Every Spring)
Methods applicable to issues of medical decision making. Analyses of environmental/safety decisions. How to apply methods at cutting-edge of clinical decision science. prerequisite: [6717 or intro course in decision analysis], some facility with mathematical notation/reasoning

PUBH 6810. Survey Research Methods. (3 cr.; Student Option No Audit; Every Spring)
Theory/application of survey research in data collection. Sampling, item development, instrument design/administration to conduct survey or be aware of issues related to design/implementation. Identification of sources of error in survey research.

PUBH 6811. Health Disparities Research: Measures, Methods, and Data. (2 cr.; Student Option No Audit; Fall Even Year)
Methods for conducting health disparities research using publicly available data sources. Interrelated issues such as conceptualization of disparities, measurement, analytic choices, and available data sources. prerequisite: [Grad or professional] student, introductory research methods course] or instr consent

PUBH 6812. Applied Projects in Health Intelligence and Analytics. (2 cr.; S-N only; Every Summer)
How to translate academic skills, research methods, data management, substantive areas to real world Health Intelligence & Analytics tasks. Complete two five-week long analytic projects provided by sponsor. Experience conducting literature reviews, organizing/describing data, estimating models, writing executive report on findings, presenting findings to sponsor. The project for this course serves as meeting the Plan B master's project requirement.

PUBH 6813. Managing Electronic Health Information. (2 cr.; Student Option No Audit; Every Spring)
Managing health information is a central function of health care organizations. Information is used for managing population health, profiling providers, and measuring quality. This course describes relational data theory, normalization, and Structured Query Language (SQL) will be used to create and query databases. Students will be introduced to the basic programming skills necessary to manage data in research projects. Programming aspects of the course will use SQL procedure in the SAS language. prerequisite: Admission to a University of Minnesota Masters program or Permission of instructor.

PUBH 6814. Data and Information for Population Health Management. (2 cr.; Student Option No Audit; Every Spring)
Information is used for managing population health surveillance, profiling providers, measuring quality, measuring resource use, and managing population health. This course describes the organizational context of health information and how to use health data to manage population health. Sources and types of health information, organizational processes affecting information quality, consistency, completeness, and accuracy, methods for organizing information, use of information for decision making, and how data can be used to provide usable information, will be discussed. prerequisite: Completion or concurrent enrollment in PubH 6813, Managing Electronic Health Information. 2 cr contains the skills necessary for completing the assigned paper/project in this course, PubH 6814, OR instructor permission.

PUBH 6815. Community-based Participatory Research. (2 cr.; Student Option No Audit; Every Fall)
This introductory course is intended for junior faculty, post-docs, graduate students and community practitioners interested in adding CBPR to their repertoire of effective approaches to understanding and addressing social and health disparities. Topics will explore the purpose and applications of CBPR; partnership formation and maintenance; issues of power, trust, race, class, and social justice; conflict resolution; ethical issues; CBPR's relationship to cultural knowledge systems, and funding CBPR projects. This is NOT a methodology course. CBPR is an approach to conducting research that is amenable to a variety of research designs and methodologies and will NOT cover topics such as survey design, quantitative methods, qualitative methods, focus groups, community needs assessment procedures, etc.

PUBH 6832. Economics of the Health Care System. (3 cr.; Student Option; Every Fall)
Development of traditional issues in health economics. Production of health, demand for health capital and health care, insurance theory and markets, managed care, pricing, physician's services, production and costs in health care institutions, role of government, cost effectiveness analysis, reform. prerequisite: [Grad or professional school] student, knowledge of [microeconomic analytical tools, analytical statistics] or instr consent
PUBH 6835. Principles of Health Policy. (2 cr.; Student Option; Every Spring) Social, political, and economic context within which U.S. health-care system developed. Influence of these contextual elements on public policies guiding/regulating organization/delivery of health services. Prereq: [Pub Hlth [MPH or certificate] or pub affairs MPA or healthcare admin MHA or [health serv research, policy/admin [MS or Phd]]] student or instr consent

PUBH 6845. Using Demographic Data for Policy Analysis. (3 cr.; A-F only; Every Spring) How to pose researchable policy questions, locate existing data, turn data into a usable format, understand data documentation, analyze data, communicate findings according to standards of the professional policy community. Quantitative issues, prereq: [Grad level research methods course, basic statistics course] or instr consent


PUBH 6855. Medical Sociology. (3 cr.; Student Option; Every Spring) Introduction to common theoretical/empirical approaches used by sociologists to study health/illness. How content reflects social inequalities in health/illness. Social processes that shape experience of health/illness. Prereq: [(Grad or professional school) student, previous experience with statistical software] or instr consent

PUBH 6861. Health Insurance. (2 cr.; A-F or Audit; Every Spring) Financing personal health care: theory of insurance, health insurance markets, cost sharing, HMOs, PPOs, public and catastrophic health insurance, and the uninsured. Emphasis on public policy. Prereq: Microecon theory course or instr consent

PUBH 6862. Cost-Effectiveness Analysis in Health Care. (3 cr.; Student Option; Every Spring) Government regulations. New technologies. Diagnosis/treatment protocols. Strengths, limitations, appropriateness of different approaches, prereq: instr consent; introductory econ course recommended

PUBH 6863. Understanding Health Care Quality. (2 cr.; A-F only; Every Fall) Introduction to assessing/assuring quality of care. Emphasizes both process and outcomes approaches, paralleling interest in appropriateness/effectiveness of care. Issues around creating needed behavioral changes.

PUBH 6864. Conducting Health Outcomes Research. (3 cr.; Student Option; Every Spring) Major concepts/principles in conducting health outcomes research that evaluates medical care. Developing study designs matched to research questions. Frequentely used study designs. Evaluating health outcomes. Analytical approaches. Prereq: Introductory course in epidemiology or health services research methods or instr consent

PUBH 6875. Practice of Health Services Research. (2 cr.; Student Option; Every Fall) How practice of health services research is conducted in various organizations. Presentations by guest lecturers from health services research organizations. How the specific organization's research is funded, how it sets an agenda, and how it carries out research. Prereq: Public health MPH or grad student or instr consent

PUBH 6876. Public Health Systems Analysis and Design. (2 cr.; Student Option No Audit; Every Fall) Basic knowledge/skills to design, develop, implement public health information systems. Systems development lifecycle, including problem definition, feasibility analysis, logical modeling, system architecture/implementation. Develop communication, analysis, management skills needed to develop information systems that meet user needs. Prereq: Grad or professional student or instr consent

PUBH 6877. Public Health Systems Analysis and Design - Practicum. (2 cr.; Student Option No Audit; Every Fall) Hands-on group project to practice skills of design, development, and implementation of public health information systems. Project teams employ site visits, interviews, surveys, and other data collection methods to gather system requirement specifications. Experience full system development lifecycle, including problem definition, feasibility analysis, logical modeling, and system architecture implementation. Prereq: Grad or professional student or instr consent, [completion of or concurrent registration is required (or allowed) in 6876]

PUBH 6878. Public Health Systems Analysis and Development Practicum. (2 cr.; S-N only; Every Fall) Individual student or student teams will conduct a full systems analysis for a public health information system for a client.

PUBH 6879. Public Health Systems Analysis and Development Practicum. (2 cr.; S-N only; Every Spring) Individual students or student teams will conduct a full systems analysis for a public health information system for a client.

PUBH 6880. Introduction to Public Health Informatics. (2 cr.; A-F or Audit; Every Spring) Information is key to effective public health administration. Surveillance systems provide information on infectious disease tracking, disease clusters, food-borne outbreaks, and injuries. Environmental monitoring systems provide information on health risks such as toxic chemicals or airborne pollutants. Registries contain information on vital statistics such as birth, death, and immunization. e-Public Health integrates information from electronic health records to use in improving population health. Introduction to Public Health Informatics describes these public health information systems and key issues in managing this information effectively, such as data standards, common functions, decision support, meaningful use, health information exchange, privacy and security. Prereq: School of Public Health student or graduate student

PUBH 6881. Advanced Public Health Informatics Applications. (2 cr.; [max 4 cr.]; A-F or Audit; Every Fall) Public Health Informatics includes a wide variety of applications that are used to assess, assure, and advocate for population health such as immunization registries, vital statistics systems, birth and death registries, food and environmental health surveillance systems, and infectious disease surveillance. Health information exchange (HIE), such as reports from labs or clinics to public health departments, is a key informatics tool used to support surveillance systems. Advanced Public Health Informatics Applications teaches the key concepts and the skills related to HIE and the concepts and skills necessary to implement it in surveillance systems.

PUBH 6890. Topics: Public Health Informatics. (1-4 cr.; [max 80 cr.]; Student Option; Periodic Fall, Spring & Summer) New courses or topics of interest in Public Health Informatics.

PUBH 6900. Topics: Public Health Nutrition. (0.5-4 cr.; [max 80 cr.]; Student Option; Periodic Fall, Spring & Summer) New courses or topics of interest in public health nutrition.

PUBH 6901. Foundations of Public Health Nutrition Leadership. (2 cr.; Student Option; Every Fall) Principles of public health nutrition. Roles/function of public health nutritionists. Programs/delivery mechanisms for promoting nutritional status of populations. Students explore their beliefs/competencies in relation to principles/philosophy of public health nutrition. This course has a strong focus on policy, systems and environmental changes to improve access to health foods for individuals and communities.

PUBH 6904. Nutrition and Aging. (2 cr.; Student Option; Every Summer) Current literature on nutrition needs/factors affecting nutritional status of adults and the elderly. Relevant community resources. Prereq: Grad student or professional school student or instr consent

PUBH 6905. Nutrition for Public Health Promotion and Disease Prevention. (2 cr.; Student Option; Every Fall) Nutrition topics of contemporary interest. Concepts/facts about science of human nutrition discussed in relation to personal/community nutrition problems/concerns. Applied introductory course with labs. Prereq: Grad student or instr consent

PUBH 6906. Global Nutrition. (2 cr.; Student Option; Every Spring)
Overview of child and adolescent obesity from public health perspective.

**PUBH 6950. From Kid to Community: Personal, Social and Environmental Influences on Youth Obesity.** (2 cr.; Student Option; Every Fall)
Overview of public health strategies for the prevention of pediatric obesity. Includes overview of epidemiology of child and adolescent obesity with a focus on socio-ecological risk factors. Discusses implications for developing interventions and programs. prereq: completed one of the following: a) basic intro to nutrition course, b) PUBH 6094, or c) 1 year work experience in the field of obesity and/or public health or instructor consent.

**PUBH 6955. Using Policy to Address Child and Adolescent Obesity Prevention.** (1 cr.; Student Option; Every Spring)
Overview of federal, state, local policy approaches. National initiatives for prevention of child and adolescent obesity. Specific policies will be discussed at local, state, federal levels. Extensive discussion on evidence of impact of policies on child and adolescent weight.

**PUBH 6995. Community Nutrition Practicum.** (8 cr.; A-F only; Every Summer)
Didactic/ experiential learning opportunities in community nutrition program delivery/management. Students complete at least 36 hours each week for eight weeks guided by on-site preceptor and course instructor. prereq: Public health nutrition MPH degree student, instr consent

**PUBH 6996. Clinical Nutrition Practicum.** (9 cr.; A-F only; Every Summer)
Didactic/ experiential learning in clinical nutrition. Application of nutrition care process/ model to medical conditions. Students complete at least 36 hours each week for nine weeks guided by on-site preceptor and course instructor. prereq: Public health nutrition MPH degree student, instr consent

**PUBH 7091. Independent Study: Community Health Promotion.** (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Independent study supervised by community health promotion faculty member. prereq: CHP program, instr consent

**PUBH 7094. Integrative Learning Experience: Community Health Promotion.** (1-6 cr.; S-N only; Every Fall, Spring & Summer)
MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration-specific competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student's educational and professional goals. prereq: Environmental health program, instr consent

**PUBH 7193. Directed Study: Environmental Health.** (1-4 cr. [max 20 cr.]; Student Option No Audit; Every Fall, Spring & Summer)
Directed study in a topic agreed upon by student and faculty member. prereq: instr consent

**PUBH 7194. Integrative Learning Experience: Environmental Health.** (1-5 cr.; max 25 cr.; S-N only; Every Fall, Spring & Summer)
MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student's educational and professional goals. prereq: Environmental health program, instr consent

**PUBH 7195. MS in Environmental Health Sciences Plan B Project.** (1-5 cr.; S-N only; Every Fall, Spring & Summer)
Students must complete a written plan B project where they are required to synthesize and integrate knowledge acquired in coursework and other learning experiences and apply theory and principles in a context that reflects an aspect of professional practice. The culminating experience must be used as a means by which faculty judge whether the student has mastered the body of knowledge and can demonstrate proficiency in the required competencies through written and oral presentation. All master's degree candidates are required to pass a final comprehensive oral examination to be taken after submission of the Plan B project(s).

**PUBH 7196. Applied Practice Experience: Environmental Health.** (1-5 cr.; S-N or Audit; Every Fall, Spring & Summer)
MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of the competencies. prereq: CHP program, instr consent

**PUBH 7200. Topics: Public Health Practice.** (0.5-4 cr. [max 80 cr.]; Student Option No Audit; Every Fall, Spring & Summer)
New course offerings or topics of interest in public health practice.

**PUBH 7210. Topics: Global Food Systems.** (0.5 cr. [max 3 cr.]; S-N only; Every Summer)
Food systems related to specific food products, including inputs, processes, and outputs from production sites to consumers. Context for food safety policy. Concept of food system biosecurity as prerequisites for a safe, abundant, affordable, and diverse food supply. Case studies of food-borne disease outbreaks illustrate critical controls in food production.

**PUBH 7211. Food System Biosecurity: Preparedness and Response.** (1 cr.; Student Option; Periodic Fall)
Public health preparedness and response related to food system biosecurity. Systems approach to biosecurity. Models for systematic evaluation of vulnerabilities (HACCP, ORM) and problem solving (Haddon’s Matrix). Risk communication, preparedness planning, text exercises, contingency planning, prereq: Grad student or professional school student or instr consent

PUBH 7212. Food System Biosecurity: Threats. (1 cr.; Student Option; Periodic Fall)
Public health threats to food system biosecurity. Principles of biosecurity, vulnerabilities of the food system from pre-harvest through post-processing, potential threats by class of agent, strategies to minimize threats and protect public’s health, prereq: Grad student or professional school student or instr consent

PUBH 7213. Applications of Microbiology to Food Systems Monitoring. (1 cr.; Student Option; Periodic Fall)
Microbiological testing to determine prevalence of pathogens in specific foods. Identification of causes of foodborne disease outbreaks. Monitoring critical control points. Traditional/rapid lab methods are used to detect indicator organisms, pathogens, and other contaminants of public health concern, prereq: Grad student or professional school student or instr consent

PUBH 7214. Principles of Risk Communication. (1 cr.; Student Option No Audit; Every Summer)
Key concepts of risk communication theory and their practical application to collection/sharing of information in support of individual and community decision-making about public health issues. Application of risk communication principles to routine, ongoing public health issues and those that arise out of emergency/crisis.

PUBH 7215. Food Safety: Risk Assessment and Risk Management. (1 cr.; Student Option No Audit; Summer Even Year)
Risk assessment methods/strategies for managing risk for specific foods and across the food system. Students work in groups to identify a specific risk management question to be addressed by risk assessment and develop a specific risk management strategy.

PUBH 7216. Food Safety Risk Management. (1 cr.; Student Option No Audit; Summer Even Year)
Strategies for managing risk of food-borne diseases for specific foods and across food system.

PUBH 7217. Advances in Molecular Epidemiological Analysis. (1 cr.; Student Option No Audit; Summer Even Year)
Overview of molecular laboratory techniques used to detect, identify, and characterize infectious disease agents. Application of molecular subtyping techniques to surveillance and outbreak investigations. Implications for public health practice.

PUBH 7218. Culturally Based Community Health Immersion. (0.5 cr.; S-N only; Every Summer)
Students view public health practice in action and reflect on ways that urban environments impact health services for members of underserved/emerging communities. One-day field trip to a culturally specific community health setting in the Twin Cities.

PUBH 7220. Personal Protective Equipment and Respiratory Protection. (1 cr.; Student Option No Audit; Every Summer)

PUBH 7221. Planning for Urgent Threats. (1 cr.; Student Option No Audit; Every Summer)
Role of public health in disaster preparedness, response, and recovery. How public health agencies plan for managing the crisis. Providing surge capacity to maintain public health and health care functions. Assisting a community’s recovery from a disaster.

PUBH 7222. Best Practices in Emergency Response. (1 cr.; S-N only; Periodic Summer)
Best practices in PH preparedness & response are evolving & continually tested with new experiences & expertise. This course for PH professionals and professionals responsible for preparedness planning, response & recovery is designed to provide participants with practical applications & tools to apply learning from real incidents.

PUBH 7223. Concepts of Disaster Behavioral Health. (1 cr.; S-N only; Every Summer)
Impact of disaster on the behavioral health of victims, survivors, and communities. Real scenarios for predictable phases of disaster recovery and concepts of behavioral health services after disaster. Steps for disaster behavioral health response planning/preparation. Presentations, discussion, individual/small group exercises.

PUBH 7224. Business Continuity Planning for Disasters and Emergencies. (1 cr.; Student Option No Audit; Every Summer)
Field-based learning experience. Student help develop business plan for natural or man-made disasters or emergencies, assess current business needs and existing continuity planning, and work in teams to develop, implement, and maintain programs to prevent, mitigate, prepare for, respond to, and recover from disasters/emergencies.

PUBH 7225. Communication and Information Technology Tools for Public Health Emergency Response. (1 cr.; Student Option No Audit; Summer Odd Year)
Uses Incident Command System as framework. Application of information/communication technology to emergency response. Communication exercise design, IT project management, backup communication methods. prereq: [FEMA IS-100a, FEMA IS-546a] with certificate of completion

PUBH 7226. Media Relations Practicum. (1 cr.; Student Option No Audit; Every Summer)

PUBH 7227. Incident Management Systems: The Public Health Role. (1 cr.; S-N only; Periodic Summer)
Managing personnel/resources in an emergency incident. Formalized/common management practices applicable in virtually any setting.

PUBH 7230. Topics in Infectious Disease. (0.5-4 cr. [max 80 cr.]; Student Option No Audit; Every Summer)

PUBH 7231. Surveillance of Foodborne Diseases in Humans. (1 cr.; Student Option No Audit; Every Spring & Summer)

PUBH 7232. Surveillance of Foodborne Diseases in Animals and Plants. (1 cr.; Student Option No Audit; Every Spring & Summer)

PUBH 7233. Food System Defense: Vulnerabilities in the Food System. (1.5 cr.; Student Option No Audit; Periodic Summer)
Holistic view of food system. Tools to assess vulnerability of specific food systems/facilities. Legal, regulatory, supply chain, public health system, and technology strategies. Instructors are from public/private sectors related to food system.

PUBH 7234. Global Food Systems Leadership. (1 cr.; S-N only; Periodic Summer)
Critical competencies for leadership in industry, government, and academia necessary for ensuring an abundant, affordable, and safe global food supply.

PUBH 7235. Surveillance of Zoonotic Pathogens in Animals. (1 cr.; Student Option No Audit; Periodic Summer)
Case-study approach/field trips. Surveillance issues related to zoonotic pathogens in animals.

PUBH 7236. Farm to Table Program: Minnesota. (2 cr.; Student Option No Audit; Every Summer)
Explore the food system from farm to table in Minnesota while considering aspects of food sustainability, environmental health, public health, animal welfare and health, food safety, and food security. Activities & highlights will highlight the farm, processing, retail, government and academic sectors of the food production chain.

PUBH 7237. Using Risk Analysis Tools: Estimating Food Safety on the Farm to Table Continuum. (1 cr.; Student Option No Audit; Periodic Summer) This applications-based course will provide the necessary risk- and science-based tools to evaluate and mitigate the microbial and chemical risks in a food production chain?from the farm until consumption. Participants will be divided in small interdisciplinary groups to mimic a real risk analysis team and develop real-case outbreak scenarios. The attendants will follow the risk analysis process as an integral part of a science-based decision-making (risk prioritization, risk assessment, risk management and risk communication) to estimate and manage the food safety risks. The attendants will apply different qualitative (hazard analysis, decision matrices) and quantitative (risk prioritization, modeling, and web-based software) tools by using a computer. The participants will present the main outcomes from the analyses and will evaluate possible mitigation options to reduce the risk in a cost-effective way.

PUBH 7240. Topics: Health Care Issues in Underserved Populations. (.5-4 cr. [max 20 cr.]; Student Option No Audit; Every Summer) Overview of disparities compared with other U.S. population groups. Health/clinical issues affecting underserved populations. Cultural/historical aspects. Health care systems response.


PUBH 7242. War and Public Health. (1 cr.; Student Option No Audit; Every Summer) Public health problems associated with armed conflict; interdisciplinary perspective with emphasis on analyzing the complexities. Consequences of war, mass displacement, effects on community and family, women's roles and experiences, trauma and healing. Health intervention strategies. Seminar discussion format.

PUBH 7244. Community-based Participatory Research. (1 cr.; Student Option; Periodic Summer) This introductory course is intended for graduate students and community practitioners interested in adding CBPR to their repertoire of effective approaches to understanding and addressing social and health disparities. Topics such as the purpose and applications of CBPR; partnership formation and maintenance; issues of power, trust, race, class, and social justice; ethical issues; CBPR's relationship to cultural knowledge systems will be explored. The course has a required pre-course component (6-8 hours) consisting of readings, lectures and exercises designed to prepare you for in-class discussion and experiential learning.

PUBH 7250. Designing and Conducting Focus Group Interviews. (.1 cr.; Student Option No Audit; Every Spring & Summer) Interactive, intensive overview of focus group procedures for public/non-profit environments. Practical approaches to determining appropriate use of focus groups. Design options, developing questions, recruiting participants, moderating. Analyzing/reporting results.

PUBH 7251. Data Analysis From Focus Groups. (.1 cr.; Student Option No Audit; Every Summer) Alternatives for capturing data in focus groups. Making sense out of data. Alternative analytic strategies. Emphasizes analysis that is systematic/verifiable.

PUBH 7252. Qualitative Research Methods: Discovering the Value of Voice in Words, Stories and Photographs. (1 cr.; Student Option No Audit; Every Summer) Utility of qualitative research methods in public health research and policy initiatives. Key methods, including focus groups, grounded theory, ethnography, phenomenology, and photovoice. Using methods when resources are scarce. Ethical/human subjects considerations. Data analysis/dissemination, software selection. Writing small grant proposals. Mixed methodology approaches.

PUBH 7253. Introduction to GIS. (.1 cr.; S-N only; Every Summer) Concepts/uses of Geographic Information Systems. Data structures, sources of data, tools, vendors/software, health-related applications. Exercises in spatial data display/query, map generation, spatial analysis using ArcGIS software. Students create their own GIS project model. prereq: Experience with spreadsheet programs.


PUBH 7255. Application of EpInfo Software in Epidemiology Investigation and Data Management. (.1 cr.; Student Option No Audit; Every Summer) Introduction to use of EpInfo software for epidemiological investigations. Data management/analysis. Exercises in outbreak investigations and presentation of analysis and results. prereq: Grad-level epidemiology course.

PUBH 7256. Navigating an MPH Project. (0.5 cr.; S-N only; Every Summer) Types of MPH projects. Tools to facilitate completion. Literature review techniques, type of research, Institutional Review Board/Institutional Animal Care/Use Committee approval, analytic tools, writing/presenting/defending projects. prereq: Public health practice MPH student or [other MPH student, instr consent]

PUBH 7257. Qualitative Data Analysis. (1 cr.; Student Option No Audit; Every Summer) Analyze/work with qualitative data from variety of data collection methods/multiple analysis approaches. Discussion of analyzing photograph/video data will provide insights on how best to analyze these types of data.

PUBH 7258. Data Driven and Time-Sensitive Decision Making. (1 cr.; Student Option; Periodic Summer) This course aims to provide knowledge and equip students with techniques to transform data into information that decision makers can use in order to make time critical decisions. It has been well documented that decision-making during a crisis is difficult as information is limited and established procedures may not be followed, thus increasing the amount of stress on individuals required to make those decisions. To improve crisis decision-making data collection, analysis, and synthesis an abundant and wide-variety of data are required in order to make an informed decision. This course will have didactic and application components where students will be able to apply the skills knowledge learned.


PUBH 7261. Ecosystem Health. (1 cr.; Student Option No Audit; Periodic Summer) Impact of global environmental change on human health/welfare. How major changes in the environment such as wild land degradation, increasing contaminant loads, and climate change are altering human, wildlife, and domestic animal fitness/survival. Depletion of wild resources of nutritional, social, or economic importance. Loss of biodiversity. Alterations in disease prevalence, including emerging infectious diseases. Strategies to mediate/prevent changes and their impacts on human well-being.

PUBH 7262. Globalization and Health. (.1 cr.; Student Option No Audit; Periodic Summer) Global health concerns cross the borders of developed and developing nations. Effect of globalization on social and scientific consequences in public health. Interplay between global stressors such as population, war, economics, urbanization, and environment; effects on the health of women/
PUBH 7263. Global One Health Leadership Workshop and Practicum. (2 cr.; Student Option No Audit; Every Summer) Leadership skills for addressing challenges/opportunities at convergence of public health, animal health, environmental/ecosystem health, economic development. Enhance critical leadership competencies in context of complex, multifactorial problems.

PUBH 7291. Independent Study: Public Health Practice. (0.5-2 cr.; S-N only; Every Fall, Spring & Summer) Independent study supervised by a public health practice faculty member. prereq: Public health practice MPH major, instr consent

PUBH 7294. Integrative Learning Experience: Public Health Practice. (0.5-4 cr. [max 12 cr.]; S-N only; Every Fall, Spring & Summer) MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student's educational and professional goals. prereq: Public health practice MPH program, instr consent

PUBH 7296. Applied Practice Experience: Public Health Practice. (1-8 cr.; S-N only; Every Fall, Spring & Summer) MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of the competencies. prereq: public health practice student, instr consent

PUBH 7391. Independent Study: Epidemiology. (1-4 cr.; Student Option; Every Fall, Spring & Summer) Independent study supervised by epidemiology faculty member. prereq: [EPI major or grad student], instr consent

PUBH 7392. Readings in Epidemiology. (1-4 cr.; Student Option; Every Fall, Spring & Summer) Current readings in epidemiology. prereq: Epidemiology major, instr consent

PUBH 7394. Integrative Learning Experience: Epidemiology. (1-6 cr.; S-N only; Every Fall, Spring & Summer) MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student's educational and professional goals. Epidemiology MPH student, instr consent

PUBH 7396. Applied Practice Experience: Epidemiology. (1-5 cr.; S-N only; Every Fall, Spring & Summer) MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of the competencies. prereq: epidemiology student, instr consent

PUBH 7400. Topics: Biostatistics. (0.5-4 cr. [max 20 cr.]; Student Option; Periodic Fall, Spring & Summer) New courses or topics of interest in biostatistics.

PUBH 7401. Fundamentals of Biostatistical Inference. (4 cr.; Student Option; Every Fall) Part of two-course sequence intended for PhD students in School of Public Health who need rigorous approach to probability/statistics/statistical inference with applications to research in public health. prereq: Background in calculus; intended for PhD students in public health and other health sci who need rigorous approach to probability/statistics and statistical inference with applications to research in public health

PUBH 7402. Biostatistics Modeling and Methods. (4 cr.; Student Option; Every Spring) Second of two-course sequence. Rigorous approach to probability/statistics, statistical inference. Applications to research in public health. prereq: 7401; intended for PhD students in health sciences

PUBH 7405. Biostatistics: Regression. (4 cr.; Student Option; Every Fall) T-tests, confidence intervals, power, type I/II errors. Exploratory data analysis. Simple linear regression, regression in matrix notation, multiple regression, diagnostics. Ordinary least squares, violations, generalized least squares, nonlinear least squares regression. Introduction to General linear Model. SAS and S-Plus used. prereq: [Stat 5101 or concurrent registration is required (or allowed) in Stat 5101], biostatistics major or instr consent

PUBH 7406. Advanced Regression and Design. (4 cr.; Student Option; Every Spring) Topics include maximum likelihood estimation, single and multifactor analysis of variance, logistic regression, log-linear models, multinomial logit models, proportional odds models for ordinal data, gamma and inverse-Gaussian models, over-dispersion, analysis of deviance, model selection and criticism, model diagnostics, and an introduction to non-parametric regression methods. R is used. prereq: [Stat 5101 or concurrent registration is required (or allowed) in STAT 5101], biostatistics major or instr consent

PUBH 7407. Analysis of Categorical Data. (3 cr.; Student Option; Every Spring) Contingency tables, odds ratio, relative risk, chi-square tests, log-linear models, logistic regression, conditional logistic regression, Poisson regression, matching, generalized linear models for independent data. SAS/S-Plus used throughout. prereq: 7405, [STAT 5102 or concurrent registration is required (or allowed) in STAT 5102], biostatistics major or instr consent

PUBH 7445. Statistics for Human Genetics and Molecular Biology. (3 cr.; Student Option; Every Spring) Introduction to statistical problems arising in molecular biology. Problems in physical mapping (radiation hybrid mapping, DDP), genetic mapping (pedigree analysis, lod scores, TDT), biopolymer sequence analysis (alignment, motif recognition), and micro array analysis. prereq: [6450, 6451 or equiv] or instr consent; background in molecular biology recommended

PUBH 7450. Survival Analysis. (3 cr.; Student Option; Every Fall)
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

**PUBH 7460. Advanced Statistical Computing.** (3 cr.; Student Option; Every Fall)
Statistical computing using SAS, Splus, and FORTRAN or C. Use of pseudo-random number generators, distribution functions. Matrix manipulations with applications to regression and estimation of variance. Simulation studies, minimization of functions, nonlinear regression, macro programming, numerical methods of integration, prereq: [7405, biostatistics major, (C or FORTRAN)] or instr consent

**PUBH 7461. Exploring and Visualizing Data in R.** (2 cr.; Student Option; Every Fall)
This course is intended for students, both within and outside the School of Public Health, who want to learn how to manipulate data, perform simple statistical analyses, and prepare basic visualizations using the statistical software R. While the tools and techniques taught will be generic, many of the examples will be drawn from biomedicine and public health.

**PUBH 7462. Advanced Programming and Data Analysis in R.** (2 cr.; Student Option; Every Spring)
This course is intended for students who are relatively proficient with R, and are looking to improve their coding and data analysis skills. The emphasis will be on learning tools and techniques which are useful to students who will be doing non-trivial programming and/or data analysis in either a research or production environment.

**PUBH 7465. Biostatistics Consulting.** (3 cr.; Student Option; Periodic Spring)
Professional roles/responsibilities of practicing biostatistician as consultant/collaborator in health science research. Discussion, written assignments, student presentations, meeting notes, interviews, guest, prereq: [(7405, 7406, 7407) or (STAT 8051, STAT 8052), (STAT 5101, STAT 5102) or (STAT 8101, STAT 8102), biostatistics major] or instr consent

**PUBH 7470. Statistics for Translational and Clinical Research.** (3 cr.; Student Option; Every Spring)
Diagnostic medicine, including methods for ROC curve, Bioassays. Early-phase clinical trials, methods including dose escalation, toxicity, and monitoring. Quality of life. prereq: [6450, 6451] or equiv, (graduate student in biostatistics or statistics or clinical research), familiarity with SAS

**PUBH 7475. Statistical Learning and Data Mining.** (3 cr.; Student Option; Periodic Spring)
Various statistical techniques for extracting useful information (i.e., learning) from data. Linear discriminant analysis, tree-structured classifiers, feed-forward neural networks, support vector machines, other nonparametric methods, classifier ensembles, unsupervised learning, prereq: [(6450, 6452) or equiv], programming background in (FORTRAN or C/C++ or JAVA or Splus/R) or instr consent; 2nd yr MS recommended

**PUBH 7485. Methods for Causal Inference.** (3 cr.; Student Option; Every Fall)
Although most of statistical inference focuses on association relationships among variables, in many biomedical and health sciences contexts the focus is on establishing the causal effect of an intervention or treatment. Drawing causal conclusions can be challenging, particularly in the context of observational data, as treatment assignment may be confounded. The first part of this course focuses on methods to establish the causal effect of a point exposure, i.e., situations in which treatment is given at a single point in time. Methods to estimate causal treatment effects will include outcome regression, propensity score methods (i.e., inverse weighting, matching), and doubly robust approaches. The second half of the course focuses on estimating the effect of a series of treatment decisions during the course of a chronic disease such as cancer, substance abuse, mental health disorders, etc. Methods to estimate these time-varying treatments include marginal structural models estimated by inverse probability weighting, structural nested models estimated by G-estimation, and the (parametric) G-computation algorithm. We will then turn our attention to estimating the optimal treatment sequence for a given subject, i.e., how to determine the right treatment, for the right patient, at the right time, using dynamic marginal structural models and methods derived from reinforcement learning (e.g., Q-learning, A-learning) and classification problems (outcome weighted learning, C-learning). PUBH 8485 is appropriate for Ph.D students in Biostatistics and Statistics. The homework and projects will focus more on the theoretical aspects of the methods to prepare students for methodological research in this area. PUBH 7485 is appropriate for Masters students in Biostatistics and PhD students in other fields who wish to learn causal methods to apply them to topics in the health sciences. This course uses the statistical software of R, a freely available statistical software package, to implement many of the methods we discuss. However, most of the methods discussed in this course can be implemented in any statistical software (e.g., SAS, Stata, SPSS, etc.) and students will be free to use any software for homework assignments.

**PUBH 7494. Integrative Learning Experience: Biostatistics.** (1-3 cr.; S-N only; Every Fall, Spring & Summer)
MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student?'s educational and professional goals. prereq: Biostatistics program, instr consent

**PUBH 7496. Applied Practice Experience: Biostatistics.** (1 cr. [max 6 cr.]; S-N only; Every Fall, Spring & Summer)
MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of the competencies. prereq: biostatistics MPH student

**PUBH 7534. Marketing for Health Care Professionals.** (1 cr. [max 2 cr.]; A-F only; Every Summer)
Application of principles of marketing to managing professional practice.

**PUBH 7535. Managerial Accounting for Health Services.** (3 cr.; A-F or Audit; Every Spring)
Differential, absorption, activity-based costing. Budgeting, variance analysis. Financial accounting, including transaction data/accrual accounting. Developing financial statements. Ration analysis. prereq: [AHC student or instr consent], experience with spreadsheets such as Excel or Lotus recommended

**PUBH 7536. Health Finance I.** (3 cr.; Student Option No Audit; Every Summer)
Principles of corporate/not-for-profit finance. Net present value, financial analysis, capital budgeting, financing options/decisions, capital structure, capital asset pricing model, financial planning, working capital management.

**PUBH 7537. Health Finance II.** (3 cr.; A-F only; Every Fall)

**PUBH 7541. Statistics for Health Management Decision Making.** (3 cr.; Student Option No Audit; Every Spring)

**PUBH 7542. Quality Improvement and Patient Safety.** (2 cr.; A-F only; Every Fall)
Almost 20 years ago in the United States the Institute of Medicine published To Err is Human, transparently noting that between 44,000 and 98,000 people in that country die every year as a result of medical errors; further research has shown that patients in all countries are subject to unintended harm as a result of their interaction with our healthcare systems. Not only are these errors devastating to those who have them, they harm providers and cost billions of dollars a year. Additionally, as the healthcare landscape shifts rapidly from one build upon volume to a value-based system, health systems and countries face an ever more urgent need to improve quality
and safety for the populations they serve. This course will review the role of the health system leader in addressing the challenge of improving quality, safety, and value. Modules will specifically address: an overview of quality improvement and patient safety, data and common improvement models, patient safety techniques, the administrator's role in the creation of the culture of safety, future trends in quality, safety, and value. Course Goals: a. Understand the patient, system, and population impacts of the current quality and safety challenges faced by healthcare b. Describe common models used for improvement work c. Understand the role that providers and health system leaders play in quality improvement and patient safety d. Utilize common tools of quality and safety e. Balance system and personal responsibilities in quality improvement and patient safety f. Be familiar with common terminology and techniques such as PDSA, Lean, RCA, and Six Sigma Course is reserved for students enrolled in Executive Masters in Healthcare Administration Program? School of Public Health.


PUBH 7551. Principles of Management in Health Services Organizations. (2 cr.; A-F only; Every Spring) Understanding of improvement in competencies of managers in organizations, particularly as applied to health services/public health organizations.

PUBH 7553. Health Care Management Ethics. (1 cr.; max 2 cr.; A-F only; Every Fall) Ethical issues faced by health care managers as leaders of organization, members of profession, coordinators of clinical processes. Perspectives of managerial, organizational, professional, clinical ethics.


PUBH 7555. Topics in Health Economics. (2 cr.; A-F only; Every Summer) General principles of health economics applied to issues in health. Implications for health policy.


PUBH 7560. Operations Research and Quality in Health Care. (3 cr.; A-F only; Every Spring) Using systems perspective to develop models to analyze/improve health care operations. Identifying data needs/sources to model structures, processes, outcomes of care.

PUBH 7562. Information Technology in Health Care. (2 cr.; A-F only; Every Summer) Managing information as strategic resource within health care organizations. Designing information technology systems to capture, combine, transform information to manage processes/outcomes of care, optimize collaborative clinical decision making, support management decisions.


PUBH 7566. The Henry Capstone: Core Concepts in Managing Health Care Organizations. (S Nutrition; Every Fall) Seminar course supporting students as they complete capstone project.

PUBH 7568. Interdisciplinary Teamwork in Health Care. (2 cr.; A-F only; Every Summer) Develop skills to function in inter-professional teams by using knowledge of various health care professions, principles of teamwork, knowledge of teams as they function in health care. Team formation, leading teams, decision making in teams, managing conflict in teams.


PUBH 7570. Healthcare Administration. (1-4 cr.; max 8 cr.; A-F only; Every Fall & Spring) Selected readings in healthcare administration. Discussion based on readings. prerequisites: dept consent

PUBH 7571. Organizational Integration in Health Care Delivery. (2 cr.; A-F only; Every Fall) Introduction to integrated healthcare and integrated health systems. Design, governance, operations, strategies, and the models for effectively integrating and aligning physicians and other medical professionals in interprofessional teams.


PUBH 7573. Managing the Embedded Medical Practice. (2 cr.; A-F only; Every Fall) Build competencies in areas of design, strategy, operations, finance for embedded medical practice.

PUBH 7576. Legal Considerations in Health Services Organizations. (2 cr.; A-F only; Every Summer) Laws affecting administration of hospitals/other healthcare organizations. Administrative law, corporate/business law, labor law, civil liability, tax-related issues. Legal issues relevant to administration, decision making, planning.

PUBH 7580. Organizational Management in Long Term Care. (1 cr.; max 2 cr.; A-F only; Every Fall) Overview of organizational management and human resource management in long-term care setting from senior manager's perspective. Combines three days of on-campus seminars with independent study.

PUBH 7581. Supports and Services for Long Term Care. (1.5 cr.; max 3 cr.; A-F only; Every Spring) Organization, operations, functions, services, and programs of nursing facilities.

PUBH 7582. Practicum in Long-Term Care Administration. (4 cr.; S-N or Audit; Every Fall, Spring & Summer) Students apply knowledge to practice of long-term care administration, under guidance of a preceptor. prerequisites: [7580, 7581, 7583] or [7587, 7588]

PUBH 7583. Managerial Accounting in Long-Term Care Administration. (4 cr.; A-F or Audit; Every Spring) Advanced managerial accounting. Financial statement analysis, strategic planning, costing, control. Planning for capital needs in long-term care administration. Specific applications made to Minnesota State Medicaid reimbursement, Rule 50 cost reporting, nursing home industry standards, and budgeting process. Five days of on-campus seminars are combined with independent study. prerequisites: Introductory accounting

PUBH 7584. Health Care and Medical Needs. (1 cr.; max 2 cr.; A-F only; Every Fall) Advanced managerial accounting. Financial statement analysis, strategic planning, costing, control. Planning for capital needs in long-term care administration. Specific applications made to Minnesota State Medicaid reimbursement, Rule 50 cost reporting, nursing home industry standards, and budgeting process. Five days of on-campus seminars are combined with independent study. prerequisites: Introductory accounting

PUBH 7585. Community Health Care Leadership Development I. (S-10 cr.; A-F or Audit; Periodic Summer) Nine-month program including on-campus (two weeks) plus off-campus study including seminars and monthly dialogues with mentors. Community development of health. Cultural meaning of community. Analyzing economic/ political foundations of health. prerequisites: Member of a community health care group

PUBH 7586. Community Healthcare Leadership Development II. (S-10 cr.; A-F or Audit; Periodic Summer)
Nine-month program including on-campus (two weeks) plus off-campus study including seminars and monthly dialogues with mentors. Innovative community health development. Leading implementation of change. Networking with national/international health communities. prereq: Member of a community healthcare group

PUBH 7587. Regulatory Management in Long-Term Care. (1 cr. [max 2 cr.]; A-F or Audit; Every Summer) Funding mechanisms, regulatory compliance mechanisms, and legal provisions currently in force for long-term care industry.

PUBH 7588. Information Uses in Long-Term Care. (2 cr. ; A-F or Audit; Every Fall) Accumulation/analysis of data to inform management decision-making in long-term care. One day on-campus seminar, independent study. prereq: Some knowledge of computers

PUBH 7589. Human Resource Management in Long Term Care. (0.5 cr. [max 1 cr.]; A-F only; Every Fall) Covers workplace culture, accountability and fairness, and just and learning culture concepts.

PUBH 7590. Gerontology for Healthcare Managers. (1 cr. [max 2 cr.]; A-F only; Every Spring) Covers physical, biological, social, and psychological aspects of the aging process.

PUBH 7591. Independent Study: Health Care Administration. (1-4 cr. [max 20 cr.]; Student Option) Independent study supervised by a health care administration faculty member. prereq: instr consent

PUBH 7592. Healthcare Law. (0.5 cr. [max 1 cr.]; A-F only; Every Summer) Covers legal and regulatory issues related to the operation of long-term care service delivery organizations.

PUBH 7596. Clerkship in Health Care Administration. (2 cr. ; A-F or Audit; Periodic Spring & Summer) Survey/solution of management problems within a local health services organization. Preparation of formal management report. prereq: 6544, health care admin student

PUBH 7691. Independent Study: Maternal and Child Health. (1-4 cr. [max 20 cr.]; Student Option) Independent study supervised by a maternal and child health faculty member. prereq: Maternal/child health major, instr consent

PUBH 7694. Integrative Learning Experience: Maternal and Child Health. (1-4 cr.; S-N only; Every Fall, Spring & Summer) MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student?s educational and professional goals.

PUBH 7696. Applied Practice Experience: Maternal and Child Health. (; 1-5 cr.; S-N only; Every Fall, Spring & Summer) MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of the competencies. prereq: Maternal and Child Health Student, instr consent

PUBH 7710. Setting Priorities and Framing Public Health Issues. (2 cr. [max 6 cr.]; A-F only; Every Spring) The course is designed to develop the skills required to define researchable policy questions, critically analyze policy issues and problems, articulate relevant policy options and bring research and data to help frame decision-making. Additionally, this course will familiarize students with the governmental public health system in the United States. In the field of health policy, there are always multiple sides to every issue and complex political and socio-economic dynamics that create a certain level of uncertainty about what to do. This complexity makes predicting outcomes and making recommendations for policy solutions difficult. Yet decisions still need to be made and are often made given the best information available at that particular time. Providing recommendations based on an analysis of available evidence is an important part of any decision-making process. Through the use of varied writing and presentation exercises students will learn to identify issues, develop problem statements, define an audience and analyze an issue based on a set of key criteria.

PUBH 7730. Public Health Laws, Rules, and Regulations. (1 cr. [max 3 cr.]; A-F only; Every Spring) This course will address basic concepts of public health law and the legal bases for the existence and administration of public health programs. Balancing the legal aspects of current public health issues, controversies, individual rights, and the regulatory role of government in health service systems will be considered.

PUBH 7740. Leadership and Leading Change. (2 cr. [max 6 cr.]; A-F only; Every Fall) Leadership and Leading Change, is designed for E-PHAP students who aspire to be effective leaders and effective change agents in multi-sectoral contexts. The health care sector organizations discussed will include a variety of public health settings, care delivery organizations and others including government, private and public organizations across multiple sectors. Students explore the core concepts of leadership theory and the principles of change in organizational, community, political, social, and global settings. They use a self-assessment instrument to understand their own strengths and areas for improvement as a leader and use the results of that assessment to develop a personal leadership development plan. The readings are books and articles from the general leadership literature, from the change management literature, and from public health teaching cases. In this hybrid course, the face-to-face portion includes small group discussions, guest speakers, exercises and class discussions that focus on applying concepts from the readings to a variety of settings. Students participate in small discussion groups; each small group will have an opportunity to lead a class discussion on assigned reading materials and their application to leadership in health care settings today. The on-line portion of the course focuses on principles of change and change strategies for public health leaders. Students post reflection notes and engage in discussion with colleagues on course content to critique, comment on relationships between concepts, and to provide personal reflections on the material as the course progresses through the on-line weeks. The in-person portion of the course ends with an assigned paper, the personal leadership development plan. Finally, students choose one of two options for their final course paper: (1) a critique of a change project and leadership from the field, or (2) a personal project plan that demonstrates application of change and leadership strategies.

PUBH 7784. Master's Project Seminar: PHAP and HSRP&A. (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring) Students participate in exercises to improve written/verbal communication, enhance skills related to giving constructive feedback. Ways that public health administration/policy is practiced. How to integrate knowledge into individually designed master's project. prereq: Public health administration/policy major or health services research/policy/administration major

PUBH 7791. Independent Study: Public Health Administration and Policy. (1-6 cr. [max 24 cr.]; Student Option; Every Fall, Spring & Summer) Independent study supervised by a public health administration and policy faculty member. prereq: Public hth admin/policy major, instr consent

PUBH 7794. Integrative Learning Experience: Public Health Administration and Policy. (2-3 cr.; S-N or Audit; Every Fall, Spring & Summer) MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student?s educational and professional goals. prereq: Public health administration/policy program, instr consent

PUBH 7796. Applied Practice Experience: Public Health Administration and Policy. (2 cr.; S-N only; Every Fall, Spring & Summer) MPH students are required to complete a supervised Applied Practice Experience (APEX). Students must address five competencies and must submit two products that demonstrate attainment of
the competencies. prereq: public health administration and policy student, instr consent

**PUBH 7894. MS in Health Services Research, Policy, and Administration Plan B Project.** (1-5 cr. [max 10 cr.]; S-N only; Every Spring)
Plan B project. prereq: [Health Services Research, Policy/Administration] MS student

**PUBH 7991. Independent Study: Public Health Nutrition.** (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Independent study supervised by a Public Health Nutrition faculty member. prereq: [PubH Nut MPH student or Nutr grad student], instr consent

**PUBH 7994. Integrative Learning Experience: Public Health Nutrition.** (1-6 cr.; S-N only; Every Fall, Spring & Summer)
MPH students complete an integrative learning experience (ILE) that demonstrates synthesis of foundational and concentration competencies. Students in consultation with faculty select foundational and concentration-specific competencies appropriate to the student's educational and professional goals. prereq: PubH Nut program, instr consent

**PUBH 7996. Field Experience: Public Health Nutrition.** (1-6 cr.; S-N only; Every Fall, Spring & Summer)
Supervised public health nutrition field study in health or public health setting under academic/professional supervision. Emphasizes application of acquired knowledge/skills to relevant issues/problems. prereq: Public health nutrition major, dept consent

**PUBH 8100. Topics: Applied Analyses of Occupational Health Data.** (1-4 cr. [max 80 cr.]; Student Option; Every Fall, Spring & Summer)
New course offerings or topics of interest in environmental health. prereq: Doctoral student in occupational health studies. Prior coursework in epidemiology, statistics

**PUBH 8120. Occupational Health and Safety Research Seminar.** (1 cr. [max 12 cr.]; S-N or Audit; Every Fall, Spring & Summer)
Facilitates student research training in occupational injury prevention. Roundtable discussions, interdiscipliary involvement. prereq: [PubH 6120, 6330 or 6341], 6450, environmental health major, [OIPRTF specialty or equiv] or instr consent

**PUBH 8140. Validity Concepts in Epidemiologic Research.** (2 cr.; S-N only; Every Fall)
Conceptual basis for validity in observational epidemiologic research. Recognizing, evaluating, preventing, and correcting for confounding specification error, measurement-error bias, and selection/follow-up bias.

**PUBH 8141. Doctoral Seminar in Observational Inference.** (2 cr. [max 20 cr.]; S-N or Audit; Every Fall & Spring)

**PUBH 8142. Epidemiologic Uncertainty Analysis.** (2 cr.; S-N only; Every Spring)
Scientific interpretation of statistical analysis as dependent on both data and assumptions. Techniques that enable an investigator to incorporate uncertainty about assumptions into a quantitative analysis. prereq: 8140

**PUBH 8160. Advanced Toxicology.** (2 cr.; A-F only; Every Fall)
Cellular/molecular mechanisms by which xenobiotics cause toxicity. Investigative approaches to current research problems in toxicology/carcinogenesis. Apoptosis, cell cycle regulation, genetic toxicology, molecular mechanisms of chemical carcinogenesis, genetic basis for susceptibility to environmental toxicants. prereq: 6160, one course in biochem, one course in molecular biol, instr consent

**PUBH 8161. Current Literature in Toxicology.** (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring)
Modern methods in toxicology, critical thinking skills. Topics vary each semester. Students read and discuss toxicological literature.

**PUBH 8162. Chemical Carcinogenesis and Chemoprevention.** (3 cr.; A-F or Audit; Periodic Fall)
Fundamental background in chemical carcinogenesis, carcinogen activation/detoxification, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated. prereq: [BioC 3001, BioC 3021, BioC 4331] or equiv. [Chem 2302 or equiv]

**PUBH 8163. Toxicology.** (5 cr.; A-F only; Every Fall)
Biological/physiological principles that govern toxicological methods. prereq: Enrolled in toxicology concentration of environmental health PhD program

**PUBH 8165. Current Topics in Toxicology.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring)
Seminars presented by students/faculty in toxicology grad program. prereq: [Environmental health PhD, toxicology concentration] student or instr consent

**PUBH 8166. Experiences in Toxicology Research.** (3 cr.; A-F only; Every Spring)
Students complete research projects in labs of toxicology program graduate faculty members. prereq: Environmental health PhD student in toxicology concentration

**PUBH 8170. Advanced Industrial Hygiene Applications.** (2 cr.; A-F or Audit; Periodic Fall)
Recognition, evaluation, and control of occupational health/safety hazards. Application of concepts to specific industrial hygiene problems related to gases/vapors, aerosols, and physical agents. prereq: 5170, eh grad major

**PUBH 8194. Directed Research: Environmental Health.** (1-6 cr.; Student Option; Every Fall, Spring & Summer)
Research, with direction from faculty member, in environmental/occupational stresses on human health. prereq: instr consent

**PUBH 8300. Topics: Epidemiology.** (1-4 cr. [max 80 cr.]; Student Option; Periodic Fall, Spring & Summer)
New course offerings or topics of interest in epidemiology.

**PUBH 8333. FTE: Master's.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

**PUBH 8341. Advanced Epidemiologic Methods: Concepts.** (3 cr.; Student Option; Every Fall)
Conceptual foundations of fundamental issues in epidemiologic methodology. How/why a given method, design, or approach might help explain population health. Strengths, limits, and potential alternatives for a given approach.

**PUBH 8342. Advanced Epidemiologic Methods: Applications.** (3 cr.; Student Option; Every Spring)
Applied methodology course designed for students in the Epi PhD program. Examples and readings are aimed at clinical/biological and social/behavioral track students.

**PUBH 8343. Synthesis and Application of Methods in Epidemiologic Research.** (4 cr.; Student Option; Every Fall)
Focuses on the extension, synthesis, and integration of research methods taught in the advanced epidemiology methods sequence (PubH 8341 and PubH 8342) and the application of these methods. Discussion of novel methods such as causal inferences related to the g-formula and penalized regression. Fosters a deeper understanding of current epidemiologic methods and how they are actually implemented in research.

**PUBH 8392. Readings in Clinical Research.** (1-4 cr.; Student Option; Every Fall, Spring & Summer)
Current readings in clinical research. prereq: Clinical research major, instr consent

**PUBH 8393. Directed Study: Clinical Research.** (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Directed research or field practice in clinical research. prereq: Clinical research major, instr consent

**PUBH 8394. Plan B Project: Clinical Research.** (1-10 cr.; S-N only; Every Fall, Spring & Summer)
Directed research toward completion of culminating experience project in clinical research.

**PUBH 8400. Topics: Biostatistics.** (0.5-4 cr. [max 20 cr.]; Student Option; Periodic Fall, Spring & Summer)
Topics of interest.

**PUBH 8401. Linear Models.** (4 cr.; Student Option; Every Fall)
Theory/application of statistical techniques for regression analysis. Computing for linear models. Modeling, computation, data analysis. prereq: [77405, concurrent registration is required (or allowed) in STAT 8101] or instr consent
PUBH 8403. Research Skills in Biostatistics. (1 cr.; S-N only; Every Fall) Introduces research skills necessary for writing/defending dissertation, career in research. prereq: Stat 8101-02 and admission to PhD program in Biostatistics. The course is meant to be taken the fall before PhD written exam is attempted, so Schedule 2 students typically wait to enroll until second year in program.

PUBH 8412. Advanced Statistical Inference. (3 cr.; Student Option; Every Spring) Overview of inferential methods needed for biostatistical research. Topics without overt reliance on measure-theoretic concepts. Classic likelihood inference, asymptotic distribution theory, robust inferential methods (M-estimation). prereq: Stat 8101-8102 or equivalent, students should be comfortable with multivariate normal distribution/have some introduction to convergence concepts.

PUBH 8422. Modern Nonparametrics. (3 cr.; Student Option; Every Fall) Classical nonparametric inference, exact tests, and confidence intervals. Robust estimates. The jackknife. Bootstrap and cross-validation. Nonparametric smoothing and classification trees. Models/applications. Formal development sufficient for understanding statistical structures/properties. Substantial development of algorithms. prereq: [7406, STAT 5102, [public health or grad student]] or instr consent

PUBH 8423. Probability Models for Biostatistics. (3 cr.; Student Option; Every Fall) Three basic models used for stochastic processes in the biomedical sciences: point processes (emphasizes Poisson processes), Markov processes (emphasizes Markov chains), and Brownian motion. Probability structure and statistical inference studied for each process. prereq: [7450, 7407, Stat 5102, [advanced biostatistics or statistics]] major or instr consent

PUBH 8435. Latent Variable Measurement Models and Path Analysis. (3 cr.; Student Option; Every Fall) Introduction to use of statistical techniques known collectively as latent variable models. Exploratory/confirmatory factor analysis, path analysis, structural equation modeling, latent trait models, latent class models. SAS/AMOS software is used. prereq: Biostatistics PhD student or instr consent

PUBH 8442. Bayesian Decision Theory and Data Analysis. (3 cr.; Student Option; Every Spring) Theory/application of Bayesian methods. Bayesian methods compared with traditional, frequentist methods. prereq: [7460 or experience with FORTRAN or with [C, S+]]. Stat 5101, Stat 5102, Stat 8311, grad student in [biostatistics or statistics] or instr consent

PUBH 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

PUBH 8445. Statistics for Human Genetics and Molecular Biology. (3 cr.; Student Option; Every Spring) Introduction to statistical problems arising in molecular biology. Problems in physical mapping (radiation hybrid mapping, DDP), genetic mapping (pedigree analysis, lod scores, TDT), biopolymer sequence analysis (alignment, motif recognition), and micro array analysis. prereq: [(Stat 8101, Stat 8102) or equiv]. PhD student or instr consent; some background with molecular biology desirable

PUBH 8446. Advanced Statistical Genetics and Genomics. (3 cr.; Student Option; Every Spring) Genetic mapping of complex traits in humans, modern population genetics with an emphasis on inference based observed molecular genetics data, association studies; statistical methods for low/high level analysis of genomic/molecular data. Multiple comparison, confidence subnetwork modeling. prereq: [7445, statistical theory at level of STAT 5101-2; college-level molecular genetics course is recommended] or instr consent

PUBH 8452. Advanced Longitudinal Data Analysis. (3 cr.; Student Option; Every Spring) Methods of inference for outcome variables measured repeatedly in time or space. Linear/nonlinear models with either normal or non-normal error structures. Random effects. Transitional/marginal models with biomedical applications. prereq: Stat 5101, Stat 8311, experience with [SAS or S-], advanced [biostats or stat] student or instr consent

PUBH 8452. Advanced Survival Analysis. (3 cr.; Student Option; Periodic Fall & Spring) Statistical methods for counting processes. Martingale theory (transforms, predictable processes, Doob decomposition, convergence, martingales). Applications to nonparametric intensity estimation. Additive/relative risk models. Inference for event history data, recurrent events, multivariate survival, diagnostics. prereq: [7450, 8432, Stat 5102, advanced [biostats or statistics]] major or instr consent

PUBH 8452. Spatial Biostatistics. (3 cr.; Student Option; Periodic Fall & Spring) Spatial data, spatial statistical models, and spatial inference on unknown parameters or unobserved spatial data. Nature of spatial data. Special analysis tools that help to analyze such data. Theory/applications. prereq: [(Stat 5101, Stat 5102) or (Stat 8101, Stat 8102)], some experience with S-plus; Stat 8311 recommended

PUBH 8475. Statistical Learning and Data Mining. (3 cr.; Student Option; Periodic Spring) Statistical techniques for extracting useful information from data. Linear discriminant analysis, tree-structured classifiers, feed-forward neural networks, support vector machines, other nonparametric methods, classifier ensembles (such as bagging/boosting), unsupervised learning. prereq: [(8450, 8451, 8452) or STAT 5303 or equiv], [biostatistics or statistics PhD student] or instr consent

PUBH 8482. Sequential and Adaptive Methods for Clinical Trials. (3 cr.; Student Option; Every Fall & Spring) Statistical methods for design/analysis of sequential experiments. Wald theorems, stopping times, martingales, Brownian motion, dynamic programming. Compares Bayesian/frequentist approaches. Applications to interim monitoring of clinical trials, medical surveillance. prereq: Stat 8101-8102 or equivalent, [students should be comfortable with the multivariate normal distribution or instr consent]

PUBH 8485. Methods for Causal Inference. (3 cr.; Student Option; Every Fall) Although most of statistical inference focuses on associational relationships among variables, in many biomedical and health sciences contexts the focus is on establishing the causal effect of an intervention or treatment. Drawing causal conclusions can be challenging, particularly in the context of observational data, as treatment assignment may be confounded. The first part of this course focuses on methods to establish the causal effect of a point exposure, i.e., situations in which treatment is given at a single point in time. Methods to estimate causal treatment effects will include outcome regression, propensity score methods (i.e., inverse weighting, matching), and doubly robust approaches. The second half of the course focuses on estimating the effect of a series of treatment decisions during the course of a chronic disease such as cancer, substance abuse, mental health disorders, etc. Methods to estimate these time-varying treatments include marginal structural models estimated by inverse probability weighting, structural nested models estimated by G-estimation, and the (parametric) G-computation algorithm. We will then turn our attention to estimating the optimal treatment sequence for a given subject, i.e., how to determine “the right treatment, for the right patient, at the right time,” using dynamic marginal structural models and methods derived from reinforcement learning (e.g., Q-learning, A-learning) and classification problems (outcome weighted learning, C-learning). PUBH 8485 is appropriate for PhD students in Biostatistics and Statistics. The homework and projects will focus more on the theoretical aspects of the methods to prepare students for methodological research in this area. PUBH 7485 is appropriate for Masters students in Biostatistics and PhD students in other fields who wish to learn causal methods to apply them to topics in the health sciences. This course uses the statistical software of R, a freely available statistical software package, to implement many of the methods we discuss. However, most of the methods discussed in this course can be implemented in any statistical software (e.g., SAS, Stata, SPSS, etc.), and students will be free to use any software for homework assignments.

PUBH 8489. Theories of Hierarchical and Other Richly Parametrized Linear Models. (3 cr.; A-F only; Spring Odd Year)

PUBH 8494. Directed Research: Biostatistics. (; 1-4 cr.; S-N only; Every Fall, Spring & Summer) Research, with direction from a faculty member, in biostatistics. prereq: instr consent

PUBH 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbdr prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before Summer 2007 may register up to four times, up to 60 combined cr

PUBH 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

PUBH 8800. Topics in Health Services Research and Policy. (; 1-4 cr. [max 20 cr.]; Student Option; Periodic Fall, Spring & Summer) Topics and credit vary by instructor.

PUBH 8801. Health Services Policy: Analysis - Theory. (; 3 cr.; Student Option; Every Fall) Integrated overview of U.S. health services policy. Related theoretical/empirical literature. Analysis of alternative policy-making models, political/philosophical underpinnings of those models. prereq: [Grad or professional school] student or instr consent

PUBH 8802. Health Services Policy: Analysis - Applications. (2 cr.; A-F or Audit; Every Spring) Emphasizes relationships between health services research/policy. Uses case studies to examine how research influences policy/vice versa.

PUBH 8803. Long-Term Care: Principles, Programs, and Policies. (; 2 cr.; Student Option; Periodic Spring) Long-term care policy for functionally impaired persons, particularly the elderly. Team taught from healthcare and social services perspective; grounded in research literature on evidence of program effects. Innovative programs addressing current fragmentation of services. prereq: Grad-level health-care policy course or instr consent

PUBH 8804. Advanced Quantitative Methods Seminar. (3 cr. [max 6 cr.]; Student Option; Spring Even Year) Understand/competently use advanced quantitative methods in applied social science, policy, demographic research. Methods considered largely within or related to framework of regression analysis. Effort will be made to reflect interests of class. prereq: This is an advanced, doctoral-level course. Students are expected to have completed a full year of doctoral-level introductory statistical and/or econometric classes in their respective field prior to enrolling in this course (e.g., PUBH 7401-2, ApEc8211-2, SOC 8801-8811). Exceptions may be granted with instr consent.

PUBH 8805. Sociological Theory in Health Services Research. (; 3 cr.; Student Option; Every Fall) Overview of sociological theories in medical sociology, occupations/professions. Emphasizes teaching students how to apply theories to health/social phenomena of their own interest/choice.

PUBH 8806. Sociology of Health Occupations and Organizations. (; 3 cr.; Student Option; Every Fall & Spring) Sociological theories of occupations/organizations as applied to health care. Functional, conflict, evolutionary theories applied to health care reorganization such as managed care, technology on organization of work/occupations. Emphasizes application of theories to develop hypotheses. prereq: Hsproconcurrent registration is required (or allowed) in a grad major or instr consent

PUBH 8810. Research Studies in Health Care. (; 3 cr. [max 6 cr.]; Student Option; Every Fall) Introduction to philosophy of science, conceptual modeling, experimental design, survey/sample design, issues relevant to health services research. prereq: [Grad or professional school] student or instr consent

PUBH 8811. Research Methods in Health Care. (; 3 cr.; Student Option; Every Fall & Spring) Research methods commonly used in analysis of health services research and health policy problems. prereq: [8810, [grad or professional school] student] or instr consent

PUBH 8813. Measurement of Health-Related Social Factors. (; 3 cr.; A-F or Audit; Every Fall & Spring) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data. prereq: Intro stat course, understanding of simple correlations or instr consent

PUBH 8820. Health Economics I. (; 3 cr.; A-F or Audit; Every Spring) Application of microeconomic theory to healthcare decisions of consumers and producers under different assumptions about market structure and behavior. prereq: One course each in intermediate microeconomics, calculus, intro to linear algebra

PUBH 8821. Health Economics II. (; 3 cr.; A-F or Audit; Every Fall & Spring) Examines application of microeconomic theory to health services research through selected reading from published and unpublished health economics literature. prereq: 8820 or instr consent

PUBH 8830. Writing for Research. (; 2 cr.; Student Option No Audit; Every Fall) Two-course sequence. Writing research grants/papers. Writing skills appropriate to research proposals and scholarly papers. How to review, synthesize, and critique research proposals and published articles. prereq: HSRPA PhD student or instr consent

PUBH 8831. Writing for Research. (; 2 cr.; Student Option No Audit; Every Spring) Second of two course sequence. Writing research proposals and scholarly papers. How to review, synthesize, and critique papers and research proposals. prereq: 8830

PUBH 8833. Integration of Public Health Research Methods in Health Services Research and Policy. (; 2 cr.; Student Option; Periodic Fall) Integration of concepts/designs of public health research methods, how they can be integrated into health services research and policy analysis. Experiential learning opportunities in clinical settings that illustrate need for integration. prereq: Professional school or grad student or instr consent

PUBH 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required; For Environmental Health Students ONLY: Contact Director of Graduate Studies and the Graduate Student Coordinator.

PUBH 8893. Directed Study: Health Services Research, Policy, and Administration. (; 1-3 cr.; Student Option; Every Fall, Spring & Summer) tbdr prereq: HSRPA grad student, instr consent

PUBH 8894. Directed Research: Health Services Research, Policy, and Administration. (; 1-8 cr.; Student Option; Every Fall, Spring & Summer) tbdr prereq: HSRPA grad student, instr consent

Radiology (RAD)

RAD 7101. Externship in Radiology. (; 4 cr.; H-N only; Every Fall, Spring & Summer) The student gains an appreciation for the radiologic examination, its capabilities, limitations, and hazards, and will be offered a review of fundamental physical and basic science aspects of the subject. The student learns how to work with technical and other auxiliary personnel. Emphasis is on how to approach radiologic diagnosis and work with the clinician in a radiologic consultation service. There is observation and participation in daily interpretation of films, fluoroscopy, and special procedures.

RAD 7104. Externship: Diagnostic Radiology--Regions Medical Center. (;}
RAD 7105. Externship in Radiology. (2 cr. [max 4 cr.]; H-N only; Every Fall, Spring & Summer)
The student gains an appreciation for the radiologic examination, its capabilities, limitations, and hazards, and will be offered a review of fundamental physical and basic science aspects of the subject. The student learns how to work with technical and other auxiliary personnel. Emphasis is on how to approach radiologic diagnosis and work with the clinician in a radiologic consultation service. There is observation and participation in daily interpretation of films, fluoroscopy, and special procedures.

RAD 7110. Radiology Research. (2-8 cr. [max 16 cr.]; H-N only; Every Fall, Spring & Summer)
After consultation with staff, the student performs well-defined, radiologic-related research projects adjusted to the student's level of experience and interest.

RAD 7140. Special Problems: Roentgenology. (1-15 cr.; H-N or Audit; Every Fall, Spring & Summer)
N/A prereq: enrolled med

RAD 7172. Radiation Biology. (2 cr.; H-N or Audit; Every Fall, Spring & Summer)
N/A prereq: enrolled med

RAD 7240. Special Problems: Nuclear Medicine. (1-15 cr.; H-N or Audit; Every Fall, Spring & Summer)
N/A prereq: enrolled med

RAD 7400. Interventional Radiology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Dedicated elective for prospective students to become familiar with interventional radiology and understand the clinical scope and research possibilities available in Interventional Radiology.

RAD 7511. Roentgen Technique. (1 cr.; H-N or Audit; Every Fall)

RAD 7530. Nuclear Medicine. (4 cr.; H-N only; Every Fall, Spring & Summer)
Provides the student with a better understanding of the various uses of radioactive materials in the practice of medicine.

RAD 7540. Special Problems: Radiological Physics. (1-15 cr.; H-N or Audit; Periodic Fall)
N/A prereq: enrolled med

RAD 7910. Radiology Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Radiology medical residency.

RAD 7930. Radiology Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Radiology medical fellowship.

RAD 8200. Nuclear Medicine. (1-15 cr.; Student Option; Every Fall, Spring & Summer)

RAD 8210. Fundamentals of Nuclear Medicine. (1 cr.; Student Option; Every Fall, Spring & Summer)
N/A prereq: 1st-yr resident

RAD 8250. Research: Nuclear Medicine. (1-15 cr.; Student Option; Every Fall, Spring & Summer)

RAD 8450. Research: Radiation Biology. (1-15 cr.; Student Option)

RAD 8550. Research: Radiological Physics. (1-15 cr.; Student Option)

Rehabilitation Science (RSC)

RSC 5058. Anatomy for Rehabilitation Science. (1-6 cr.; A-F or Audit; Every Summer)
Study of gross human anatomy through modular lecture/laboratory experiences that include cadaver dissection of extremities, head, neck, back, abdomen, thoracic, pelvic regions with correlation to clinical conditions. Prereq: Student enrolled in Rehabilitation Science Program, instr consent, dept consent

RSC 5060. Lower Extremity Anatomy Intensive. (2 cr.; A-F only; Every Summer)
Intensive and focused study of lower extremity gross human anatomy for graduate students. The content is presented through lecture and laboratory experiences that include cadaver dissection of human lower extremities with correlation to clinical conditions.

RSC 5065. Upper Extremity Anatomy Intensive. (2 cr.; A-F only; Every Summer)
Intensive and focused study of upper extremity gross human anatomy for graduate students. The content is presented through lecture and laboratory experiences that include cadaver dissection of human upper extremities with correlation to clinical conditions.

RSC 5101. Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences. (1 cr.; A-F or Audit; Every Fall, Spring & Summer)
Quantitative research approaches in health, rehabilitation, human movement sciences. Application examples/practice problems focus of the course. Basic algebra/geometry, solving equations for unknowns, logarithmic transforms, derivatives/integrals, matrix methods, use of macros in research applications. Prereq: Basic algebra, trigonometry, and geometry. Pre-calculus or calculus is helpful but not required.

RSC 5106. Introduction to Rehabilitation Science. (1 cr.; A-F or Audit; Periodic Fall)
This is one of a series of seminar courses that prepares students to think critically in reading and discussing the literature in rehabilitation science and to speak and write persuasively on scientific topics. This semester, the seminar will focus on the past, present, and future of rehabilitation science. This course will include lecture presentations from rehabilitation science faculty for the first 50 minutes of the weekly class time, as well as discussion/interaction sessions planned jointly by assigned students and faculty for the second 50 minute session each week.

RSC 5135. Advanced Biomechanics I: Kinematics. (3 cr.; A-F or Audit; Fall Odd Year)
How to describe/measure movement. Basic/ applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion. Meets with RSC 8135. Prereq: instr consent

RSC 5200. Introduction to Neuromodulation. (1-3 cr.; A-F or Audit; Fall Even Year)
This course will provide training in the theory, biophysics and evidence-based application of non-invasive magnetic and electric brain stimulation in humans. Course content will be delivered in three modules: (1) safety and administration of non-invasive brain stimulation, (2) neuromodulation methods, and (3) advanced assessment and modeling techniques. All registered students must take module #1. Testing methods will include various methods to assess intracortical, transcallosal and interhemispheric excitability. Neuromodulation methods presented will include non-invasive and invasive forms of brain stimulation. Hands-on instruction and laboratory applications will be provided for cortical excitability testing using transcranial magnetic stimulation (TMS) as well as for other non-invasive forms of brain stimulation. Those enrolled will both administer and receive non-invasive brain stimulation and will be asked to sign a consent form. Specific safety exclusion criteria for receiving non-invasive brain stimulation exist and enrollees who have questions should contact the Division of Rehabilitation Science.

RSC 5206. Academic Ethos. (1 cr.; A-F or Audit; Periodic Spring)
Explicit/implicit culture unique to academia. Early understanding within/beyond rehabilitation science. Role of higher education in society, academic freedom, tenure, corporatization of education, accreditation, globalization of education, regulatory monitoring of research, faculty scholarship/governance.

RSC 5231. Clinical Biomechanics. (2-5 cr.; A-F only; Every Fall)
Biomechanics. Internal/external forces/structures responsible for normal/abnormal human movement. Joint and tissue mechanics, muscle function, task analysis, and gait mechanics. Lecture and lab practice. Prereq: concurrent registration is required (or allowed) in PT 6231, general physics, [intro or short] calculus, anatomy; intensive anatomy course in human cadaver dissection recommended

RSC 5235. Advanced Biomechanics II: Kinetics. (3 cr.; A-F or Audit; Spring Even Year)
Forces that create human motion and are produced within body as a result. Measuring human motion. Clinical movement assessment, Exercise, sport, and activities of daily living. Two-dimensional rigid body dynamics models, forward/inverse dynamics solutions, hypotheses to describe whole body/joint
kinetics. Lectures, lab, discussion; prereq: 5135 or equiv or instr consent

RSC 5281. Scientific Foundations: Exercise Theory. (3 cr.; A-F only; Every Fall)
In-depth presentation of fundamental concepts in exercise physiology/exercise biochemistry related primarily to skeletal muscle, secondarily to cardiovascular system/connective tissue. Exercise/performance-enhancing ergogenic aids. prereq: Rehabilitation Science grad student

RSC 5294. Independent Study in Rehabilitation Science. (1-3 cr.; max 9 cr.; Student Option; Every Fall, Spring & Summer) Independent exploration into topics related to rehabilitation science. prereq: Rehabilitation science student or program approval

RSC 5306. Scientific and Professional Presentation. (1 cr.; A-F or Audit; Periodic Spring)
This course will focus on the process and practice of oral presentation of scientific inquiry and discoveries. These skills are essential for scientists in all disciplines, yet often guidelines for optimal scientific presentation are not taught or practiced in an educational setting. Specific areas to be covered in this course include presentation intent, audience analysis, timing, content, keys to effective communication, vocal behavior, and important things to avoid. Context will include conference-style platform or podium presentations, poster presentations, and seminar presentation. The course will involve opportunities to prepare and practice presentation skills and receive constructive feedback in a safe, supportive environment. It is appropriate for students from all disciplines and levels of PhD study.

RSC 5310. Physiology for Physical Rehabilitation. (1-5 cr.; A-F or Audit; Every Spring)
This course is designed to convey foundational information regarding human basic physiology and more advanced integrative physiology to provide the student a broad range of knowledge on how the human body works at rest, exercise, and as we age. Basic cell physiology, which serves the human body’s infrastructure for function in different cell types for various organ systems, will be discussed with the major emphasis of this course being on the human body as a system. Along these lines, most of the content will relate to integrative physiology, as our systems are often redundant in regulating homeostasis. The objective of this course is to prepare the student for the study of pathophysiologic changes within the human body.

RSC 5814. Age, Exercise, and Rehabilitation. (2 cr.; Student Option; Every Fall)
Overview of normal physiological responses to exercise in the elderly. Comparison of exercise-induced responses of physiological systems throughout aging process. Focuses on importance of exercise from rehabilitation perspective. Offered Fall semesters of even-numbered years. prereq: Rehabilitation science student or program permission

RSC 5841. Applied Data Acquisition and Processing. (3 cr. [max 4 cr.]; A-F or Audit; Fall Even Year)
This course will introduce students to collecting and processing biomedical time series data. Students will gain experience using data acquisition hardware common in many laboratories, as well as related software for acquisition of the data and digital signal processing. Data sources will include electroencephalography (EEG), electromyography (EMG), wearable sensors, and data from other systems based on the background and interests of students in the class. The objective of this course is to provide students with the necessary, fundamental skills to run a successful experiment, troubleshoot errors, and produce high quality data sets. prereq: prefer students to have completed general physics, introductory of short calculus

RSC 5901. Scholarly Inquiry in Health Sciences. (4 cr.; A-F or Audit; Every Spring)
How research evidence is developed, disseminated, utilized in health sciences. Qualitative/quantitative scholarly project proposal. Critique studies/peer proposals. Explore conduct of research. prereq: Three credits of undergraduate statistics. instr consent, dept consent.

RSC 8106. Critical Analysis of Scientific Literature. (2 cr.; A-F or Audit; Periodic Fall)
This course will focus on the process of critical review, appraisal, and synthesis of scientific literature. Overview of organizing and writing literature reviews for a traditional dissertation, systematic reviews, and peer review for scientific manuscripts will be included. The course will involve substantive review of the literature and writing in your anticipated area of dissertation work.

RSC 8130. Current Literature Seminar. (1-3 cr.; max 9 cr.; A-F or Audit; Every Fall, Spring & Summer)
Critical review of literature to evaluate efficacy of selected physical therapy interventions. prereq: Grad student in PT or rehabilitation science major or instr consent

RSC 8135. Human Kinematics. (3 cr.; A-F or Audit; Fall Odd Year)
How to measure/describe movement. Basic/ applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion. Meets in conjunction with RSC 5135. prereq: Rehabilitation science student or program permission, instr consent

RSC 8170. Special Topics in Rehabilitation Science. (1-3 cr.; max 9 cr.; A-F or Audit; Every Fall, Spring & Summer)
Topics vary by semester. Papers required.

RSC 8185. Problems in Rehabilitation Science. (1-3 cr.; max 9 cr.; Student Option; Every Fall, Spring & Summer)
Research practicum on selected topic. Use of systematic literature search. Critical analysis of scientific literature. Specific measurement systems. Data collection/reduction methods of on-going or new research projects. Preparing/defending research reports.

RSC 8188. Teaching Practicum. (1-5 cr.; A-F or Audit; Every Fall, Spring & Summer)
Supervised experience in teaching/evaluation. Effective use of instructional materials in lecture/lab courses. Students create learning objectives for teaching unit(s), conduct a review of current literature on topic, prepare/deliver presentations, compose test questions. Offered by individual arrangement with faculty. prereq: Rehabilitation science student or program permission, instr consent

RSC 8192. Research Design in Rehabilitation Science. (4 cr.; A-F or Audit; Every Fall)
The goals of this course are to develop abilities to critically evaluate peer-reviewed literature. It will also enable students to identify and apply appropriate statistical procedures, and interpret the meaning of statistical analyses. Finally, it will give students an opportunity to present the aims, methods, intended analyses, and preliminary results of their own research. Additionally, students will meet individually for 2 hours every month with the lecturer to work on the method section of a paper related to their PhD project. This paper will be critically reviewed and graded as end-evaluation for this class. prereq: instr consent

RSC 8206. Grant Writing. (2 cr.; A-F or Audit; Periodic Fall)
Process of applying for individual National Institutes of Health (NIH) pre-doctoral research training fellowship. Overview of NIH Program Announcement PA-11-111 NIH SF424; individual fellowship application guide required for application will be included. Substantive writing of components of NIH fellowship.

RSC 8235. Human Kinetics. (3 cr.; A-F or Audit; Spring Even Year)
Forces that create human motion or are produced within body as a result of motion. Measuring kinetics of motion. Clinical movement assessment. Measuring/analyzing exercise, sport, and activities for transfer of forces within body. Two-dimensional rigid body dynamics. Forward/inverse dynamics. Hypotheses for whole body/joint kinetics. Lectures, lab experiments, discussion. Meets with RSC 5235. prereq: [5135 or equiv] or instr consent

RSC 8282. Problems in Human Movement. (4 cr.; A-F or Audit; Every Spring)
Fundamental principles of neurophysiology, neurology, motor control, and motor learning as a basis for therapeutic intervention in motor dysfunction. prereq: Rehabilitation science student or program permission, instr consent

RSC 8306. Peer Review and Publication. (2 cr.; A-F or Audit; Periodic Spring)
This course will focus on the process of publication in the scientific literature, with emphasis on publication of original research. Overview of organizing and writing for publication, and the peer review process for scientific manuscripts will be included. The course will involve substantive writing practice in your anticipated area of scientific inquiry.

RSC 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
RELS 5001. Theory and Method in the Study of Religion: Critical Approaches to the Study of Religion. (3 cr.; Student Option; Every Spring) Theoretical/methodological issues in academic study of religion. Theories of origin, character, and function of religion as a human phenomenon. Psychological, sociological, anthropological, and phenomenological perspectives. Prereq: Sr or grad student or instr consent.


RELS 5070. Topics in Religious Studies. (3 cr. [max 18 cr.]; Student Option; Periodic Fall, Spring & Summer) Topics specified in Class Schedule and Course Guide.


RELS 5204. Development of Israelite Religion II. (3 cr.; Student Option; Periodic Fall) Ancient Judaism from the Persian restoration (520 B.C.E.) to Roman times (2nd century C.E.). Religious, cultural, and historical developments are examined to understand Jewish life, work, and worship under a succession of foreign empires: Persian, Greek, Roman.

RELS 5513W. Scripture and Interpretation in Israelite Religion and Judaism. (W; 3 cr.; Student Option; Spring Odd Year) Idea of divine revelation. Impact on religion/literature. How history of Bible's creation, transmission, interpretation helps us think critically about role of idea of revelation in history of religious traditions. Prereq: At least one upper level course (3xxx or higher) in academic biblical or religious studies.

RELS 5513W. Scripture and Interpretation in Israelite Religion and Judaism. (W; 3 cr.; Student Option; Spring Odd Year) Idea of divine revelation. Impact on religion/literature. How history of Bible's creation, transmission, interpretation helps us think critically about role of idea of revelation in history of religious traditions. Prereq: At least one upper level course (3xxx or higher) in academic biblical or religious studies.

RELS 5524. Archaeology of Ritual and Religion. (3 cr.; Student Option; Fall Even Year) The course discusses evidence for the origins of religion and its diverse roles in human societies over millennia. It focuses on how artifacts and architecture are essential to religious experience. It asks: What constitutes religion for different cultures? Why is religion at the heart of politics, social life, and cultural imagination?

RELS 5528W. Archaeology of Ritual and Religion. (3 cr.; Student Option; Periodic Fall & Spring) The course discusses evidence for the origins of religion and its diverse roles in human societies over millennia. It focuses on how artifacts and architecture are essential to religious experience. It asks: What constitutes religion for different cultures? Why is religion at the heart of politics, social life, and cultural imagination?

RELS 5593. Directed Studies. (1-4 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) Directed study at the instructor's discretion. Prereq: doctorate.

RELS 5707W. Anthropology of the Middle East. (GP,WI,SOCS; 3 cr.; Student Option; Fall Even Year) Anthropological field methods of analyzing/interpreting Middle Eastern cultures/societies.

RELS 5721. North Africa since 1500: Islam, Colonialism, and Independence. (3 cr.; Student Option; Spring Odd Year) History of Maghrib (Morocco, Algeria, Tunisia, Libya, disputed territories of Western Sahara) from time of Ottoman expansion/Shari'ah dynasties (Sa'dian/'Alawid) in 16th/17th Centuries to end of 20th century. Focus on encounter of Islamic cultures/societies of Maghrib with Africa/Europe.

RELS 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3 cr.; Student Option; Every Fall, Spring & Summer) Issues presented by sculpture, architecture and painting in India, from prehistoric Indus Valley civilization to present day.

RELS 5781. Age of Empire: The Mughals, Safavids, and Ottomans. (3 cr.; Student Option; Periodic Fall) Artistic developments under the three most powerful Islamic empires of the 16th through 19th centuries: Ottomans of Turkey; Safavids of Iran; Mughals of India. Roles of religion and state will be considered to understand their artistic production.

RELS 5870. Readings in Religious Texts. (3 cr. [max 12 cr.]; A-F or Audit; Periodic Fall & Spring) Close reading of selected literary or epigraphical texts of importance for the history of ancient Mediterranean religions, along with critical discussion of trends in recent scholarship. The texts may be read in the original languages (such as Greek, Latin, Hebrew, etc.) but may also be accessed in translation where appropriate.

RELS 5876. Archaeology of Ritual and Religion. (3 cr.; Student Option; Periodic Fall & Spring) The course discusses evidence for the origins of religion and its diverse roles in human societies over millennia. It focuses on how artifacts and architecture are essential to religious experience. It asks: What constitutes religion for different cultures? Why is religion at the heart of politics, social life, and cultural imagination?
illuminatr. prereq: Grad student in relevant field

**Russian (RUS)**

RUSS 5404. Tolstoy in Translation. (GP,LITR; 3 cr.; Student Option; Spring Even Year)
Novels, stories, and philosophical writings of Leo Tolstoy.

RUSS 5411. Dostoevsky in Translation. (GP,LITR; 3 cr.; Student Option; Spring Even Year)
Novels, stories, and other writings of Fyodor Dostoevsky.

RUSS 5421. Literature: Middle Ages to Dostoevsky in Translation. (LITR; 3 cr.; Student Option; Every Fall)
Russian literature from about 1000 A.D. to mid-19th century; emphasizing writers of the first half of the 19th century.

RUSS 5422. Literature: Tolstoy to the Present in Translation. (LITR; 3 cr.; Student Option; Every Spring)
Survey of Russian literature from mid-19th century to the present: realism, modernism, feminism and other trends.

RUSS 5900. Topics in Russian Language, Literature, and Culture. (1-4 cr. [max 3 cr.]; Student Option; Periodic Fall)
Variable topics in Russian language, literature, and culture. Prereq: 1102 for language topics

RUSS 5993. Directed Studies. (1-4 cr. [max 16 cr.]; Student Option; Every Fall & Spring)
Guided individual study. Prereq instr consent, dept consent, college consent.

**Scandinavian (SCAN)**

SCAN 5502. The Icelandic Saga. (3 cr.; Student Option)
Study of the sagas written in 13th-century Iceland. Discussion includes cultural and historical information about medieval Iceland and analysis of a selection of saga texts using contemporary critical approaches. All readings in translation.

SCAN 5605. The Scandinavian Short Story. (LITR; 3 cr.; Student Option; Fall Even, Spring Odd Year)
Short stories by 19th-20th century authors from all five Scandinavian countries. Genre theory/practical criticism. Readings in English for nonmajors.

SCAN 5613. Contemporary Scandinavian Literature. (3 cr.; Student Option)
An investigation of issues which emerged as extremely important after 1945 in Scandinavia, as articulated by writers and analyzed by researchers in social sciences. All readings in translation.

SCAN 5614. Blood on Snow: Scandinavian Thrillers in Fiction and Film. (3 cr.; Student Option; Periodic Fall & Spring)
Scandinavian crime novels/films against background of peaceful welfare states.

Readings in translation for non-majors. Scandinavian majors/minors read excerpts in specific languages.

**SCAN 5634. Scandinavian Women Writers.** (GP,LITR; 3 cr.; Student Option; Fall Even, Spring Odd Year)
Issues important to women as articulated by Scandinavian women writers. Historical overview of women's writing in Scandinavia. In-depth investigation of texts by contemporary women writers. All readings in translation.

**SCAN 5701. Old Norse Language and Literature.** (3 cr.; Student Option; Every Fall)
Acquisition of a reading knowledge of Old Norse; linguistic, philological and literary study of Old Norse language and literature.

**SCAN 5703. Old Norse Poetry.** (3 cr.; Student Option; Periodic Fall)
Reading and analysis of either eddic poetry from the Poetic Edda or skaldic poetry. Texts read in Old Norse.

**SCAN 5710. Topics in Old Norse Literature.** (3 cr. [max 9 cr.]; Student Option; Every Spring)
Topic may focus on Old Norse prose or poetry. Primary texts read in Old Norse. Critical literature about texts, medieval Icelandic culture in English. Topics specified in Class Schedule; prereq: 5701 or equiv

**SCAN 5993. Directed Studies.** (1-4 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer)
Guided individual reading and study. Prereq instr consent, dept consent, college consent.

**SCAN 8001. Parallel High-Performance Computing.** (3 cr.; Student Option; Every Fall)
Interdisciplinary overview of computer science aspects of scientific computation, both hardware and techniques. Parallel computing, architectures, programming, and algorithms; restructuring compilers and data structures. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8001. Scientific Visualization.** (3 cr.; Student Option; Every Spring)
Basic issues in scientific visualization, visualization software, graphics, representation of scientific data, modeling, hardware for visualization, user interface techniques, output, commonly used algorithms and techniques for visualization, animation, information visualization, higher dimensional data, case studies, and examples of successful visualizations. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8021. Advanced Numerical Methods.** (3 cr.; Student Option; Every Spring)
Interdisciplinary overview of advanced numerical methods of scientific computation, emphasizing computational aspects. Approximation methods for partial differential equations, numerical linear algebra, sparse matrix techniques, iterative methods, solution of eigenvalue problems, and case studies. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8031. Modeling, Optimization, and Statistics.** (3 cr.; Student Option; Periodic Fall)
Interdisciplinary overview of mathematical modeling, optimization, and statistics techniques for scientific computation. Nonlinear equations and nonlinear optimization, statistics, control theory, modeling, and simulation. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8041. Computational Aspects of Finite Element Methods.** (3 cr.; Student Option; Periodic Fall)
Fundamental concepts and techniques of finite element analysis. Variational equations and Galerkin's method; weak formulations for problems with nonsymmetric differential operators; Petrov-Galerkin methods; examples from solid and fluid mechanics; properties of standard finite element families, implementation. Prereq: Undergrad degree in field using sci comp or IT grad student or instr consent

**SCIC 8095. Problems in Scientific Computation.** (1-3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Selected topics in interdisciplinary aspects of scientific computing. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8190. Supercomputer Research Seminar.** (1 cr. [max 3 cr.]; Student Option; Periodic Fall & Spring)
Series of seminars by distinguished lecturers. Prereq: Undergrad degree in field using sci comp or instr consent

**SCIC 8253. Computational Nanomechanics.** (3 cr.; Student Option; Every Spring)
Fundamentals of mechanical properties in nanometer scale. Role of discrete structure and underlying atomic, molecular, and interfacial forces are illustrated with modern examples. Overview of computational atomistic methods. Lectures, hands-on computing using publicly available or personally developed scientific software packages. Prereq: CSE graduate student
SCIC 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prerequisite: Master's student, adviser and DGS consent

SCIC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prerequisite: Doctoral student, adviser and DGS consent

SCIC 8551. Multiscale Methods for Bridging Length and Time Scales. (3 cr.; A-F or Audit; Periodic Spring) Classical/emerging techniques for bridging length/time scales. Nonlinear thermoelasticity, viscous fluids, and micromagnetics from macro/atomic viewpoints. Statistical mechanics, kinetic theory of gases, weak convergence methods, quasicontinuum, effective Hamiltonians, MD, new methods for bridging time scales. prerequisite: Basic knowledge of [continuum mechanics, atomic forces], familiarity with partial differential equations, grad student in [engineering or mathematics or physics or scientific computation]

SCIC 8594. Scientific Computation Directed Research. (1-4 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer) tbd prerequisite: Undergrad degree in field using sci comp or instr consent

SCIC 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prerequisite: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SCIC 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prerequisite: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

SCIC 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prerequisite: Max 18 cr per semester or summer; 24 cr required

**Security Technologies (ST)**

ST 8109. Cybersecurity Foundations - Technology, Risk & Communication. (2 cr.; A-F only; Every Fall) Explore cybersecurity risks through evaluation of consumer driven technology concepts and their applicability to enterprise. Core technology concepts that face both consumers and businesses. How technology works, how to understand and communicate risks to business management, deliver actionable risk mitigation approaches. Security standards and benchmarks that guide industry. This course is also open to non-ST graduate students and non-degree graduate students who may register with permission/certificate from the ST program. (DGS, DGSA or teaching faculty)

ST 8110. Security Science and Technology Foundations. (3 cr.; A-F only; Every Summer) Essential areas of emerging science and pivotal technology disciplines for homeland security. Nanotechnology, sensor networks (biosensing, critical infrastructure protection), food and biosafety, cyber and control systems security, and secure energy technologies. Current state-of-the-art status for each technology, together with barriers and opportunities for commercialization. prerequisite: Admitted student in security technologies program

ST 8111. Methods, Theory, and Applications. (2.5 cr.; A-F only; Every Fall) Methods, theory, techniques and models for understanding risk and implementing security strategies. Processes, methods, and application of risk assessment and management. Approaches for building scenarios, assessing the effectiveness of alternative management strategies, and designing risk management and mitigation plans. Case studies/simulations. How to use emergency management tools, techniques, and resources.

ST 8112. Technology for Homeland Security. (2 cr.; A-F only; Every Fall) Technologies involved in homeland security issues from several perspectives, including science, engineering, business, policy, and society. Advanced tools for the analysis and forecasting of technology and developing strategies aligned with overall stakeholder and organizational goals. Micro- and nanotechnologies and biochemical/chemical, radiological agents. Readings/discussion. Select a technology topic and analyze its current status and possible future trajectories for application or relevance to key issues of importance to security, both threats and opportunities. Present this in the last class session.

ST 8113. Information and Cyber Security. (2 cr.; A-F only; Every Spring) Existing and emerging IT, cyber, communication networks, and coordination activities during emergencies. Technological and policy issues for the need to share information through the use of interoperable technologies and to rapidly collect and synthesize data in real time in order to achieve critical national security. In addition to MSST grad students this course is also open to non-ST graduate students and non-degree graduate students who may register with permission/certificate from the ST program (DGS, DGSA or teaching faculty).

ST 8200. Special Topics in Security Technologies. (0.5-5 cr.; A-F only; Every Fall & Spring) Leaders in the field related to security technologies. Special speakers.


ST 8221. Communications of Risk and Security. (1 cr.; A-F only; Every Fall) Analyze public speaking. How to be an effective listener, how to prepare for effective public speaking, how to be an effective writer, communicate by email, write for emphasis, tone, and business writing. prerequisite: MSST grad student

ST 8330. Critical Infrastructure Protections. (3 cr.; A-F only; Every Summer) Systems risk analysis, engineering, economics, and public policy. Investigate infrastructure security/support design and management of complex civil infrastructure systems. Systems' vulnerability assessment, asset and risk management, investigation of infrastructure interdependencies and couplings, along with judicious analyses of policies. Contribution of science and technology to strategically enhance security/quality of life. prerequisite: MSST grad student

ST 8331. Dynamic Systems Modeling and Simulation Tools. (2 cr.; A-F only; Every Fall) Techniques for modeling complex systems and predicting and evaluating consequences, risks and the potential utility of interventions and countermeasures in the context of intentional disruption or use of the system as an attack vehicle. Importance of inter/intra system modeling. Variety of modeling approaches. How systems can be characterized focusing on the parameters that are important for consequence assessment, risk assessment, capability benchmarking, and decision support. Develop a systems and simulation-based approach to risk assessment, preparedness, intervention assessment, and problem solving.

ST 8440. Security Practicum. (0.5-2 cr.; A-F only; Every Summer) Seminars and focused workshops on selected areas of security science and technology. prerequisite: Admitted to MSST grad program

ST 8441. Internship (optional). (0.5 cr. [max 1 cr.]; A-F only; Every Fall & Spring) Summer internship opportunities at the university centers, companies, state, and federal agencies.

ST 8510. Psychology/Behavior Intelligence for Homeland Security. (2 cr.; A-F only; Every Summer) Political, psychological, sociological, and economic foundations and dynamics of both terrorism and homeland security. Contemporary debates over terrorism, counterterrorism, and homeland security. Students develop their own (informed) perspectives.

ST 8511. Public Policy. (1 cr.; A-F only; Every Fall) Key policies in the U.S. addressing safety and security of citizens, institutions, and systems. Complex network of actors/organizations involved in S&T and security-related areas and their multiple objectives and values.

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SW 8020. Field Practicum II. (3 cr.; S-N or Audit; Every Fall, Spring & Summer) Integrates classroom learning within a concentration with the direct experience of an internship. Students expand competency in cross-cultural practice. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8030. Advanced Standing Social Work Practicum. (3-18 cr.; S-N or Audit; Every Fall, Spring & Summer) Integrates classroom learning with direct experience of a social work field internship. Professional support/learning groups discuss issues raised in field placement. Groups focus on professional/personal biases, ethical dilemmas, supervisory issues, cross-cultural sharing, and implications of students' privilege/power in relation to client systems. prereq: Adv standing

SW 8041. Specialized Field Placement. (1-4 cr.; S-N only; Every Fall, Spring & Summer) Field placement added to required foundation/concentration field placements (or to concentration placement for advanced standing students). prereq: [8020 or 8030], instr consent

SW 8151. Social Work Methods: Practice With Individuals and Systems. (3 cr.; A-F or Audit; Every Fall) Develops foundation knowledge and skills for social workers to work with individuals and systems. prereq: MSW student or instr consent

SW 8152. Social Work Practice Methods: Families and Groups. (3 cr.; A-F or Audit; Every Fall) Develop foundational knowledge and skills in relationship building, engagement, interviewing, and assessment with families and groups using the ecological-systems theoretical framework and resiliency-based approach. prereq: MSW student or instr consent

SW 8153. Social Work Practice Methods: Macro Practice and Organizations. (3 cr.; A-F only; Every Fall) Models of community intervention, community practice and macro-level interventions as integral to professional social work. Building upon theoretical approaches to human service organizations and their distinct attributes, the course addresses key practice knowledge, skills, and values that promote, develop, and maintain human service organizations that effectively meet community and client needs.

SW 8251. Social Work Practice in Health, Disabilities, and Aging. (3 cr.; A-F or Audit; Every Fall) Social work practice in health/disabilities/aging. History in social work, practice contexts/settings, service delivery systems. Practice/population overlaps, distinctions, co-operations. prereq: [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or instr consent

SW 8261. Advanced Social Work Practice in Health Care. (3 cr.; A-F only; Every Fall, Spring & Summer) Advanced social work practice in health care. Theoretical models/evidence-based interventions. Psychosocial assessment, treatment interventions, interdisciplinary teamwork, ethics, leadership. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8262. Empowerment Practice With Persons With Disabilities. (3 cr.; A-F or Audit; Every Fall) Models of disability, types of disability, common social work practices. Knowledge/skills for use across lifespan/culture/variables settings. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8263. Advanced Direct Practice and Community-Based Interventions in Gerontology. (3 cr.; A-F or Audit; Every Spring) Direct/community-based social work intervention with older adults in individual, family, group, residential, community settings. Geriatric assessment/therapy modalities. Evidence-based interventions/approaches. prereq: [SW 8251 or concurrent registration is required (or allowed) in 8251], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

SW 8351. Assessment and Engagement with Families and Children. (3 cr.; A-F or Audit; Every Fall & Spring) Utilizing evidence-informed, culturally respectful assessments/engagement models with families/children. Factors internal/external to families. Work with families/children around broad scope of stressors. Resiliency. prereq: [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or instr consent

SW 8352. Intervention Methods with Families. (3 cr.; A-F or Audit; Every Fall & Spring) Work with families/children in family-centered, community, preventive practice. Engagement, assessment, intervention, evaluation. prereq: [8351 or concurrent registration is required (or allowed) in 8351], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8361. Identification and Assessment of Family Violence. (3 cr.; A-F or Audit; Periodic Fall) Identification/assessment of family violence. Contextual knowledge of behaviors of perpetrators, victims, survivors. Gender, race, culture, age, ability, SES, sexual orientation. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8363. Social Work in Child Welfare. (3 cr.; A-F or Audit; Every Spring) Public, private, tribal child welfare related to assessment of strengths/risks. Develop appropriate plans that secure child safety/well-being. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

SW 8451. Assessment and Engagement in Clinical Social Work Practice. (3 cr.; A-F or Audit; Every Fall & Summer) Mental health diagnostic codes/classifications. Interviewing skills, assessment writing skills/techniques. Biopsychosocial perspective/engagement strategies. prereq: [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or instr consent

SW 8452. Core Concepts in Clinical Social Work Practice. (3 cr.; A-F or Audit; Every Fall & Spring) Interpersonal process skills. Developing/maintaining effective therapeutic alliances/positive intervention outcomes with diverse populations. prereq: [8451 or concurrent registration is required (or allowed) in 8451], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8461. Advanced Clinical Social Work Practice with Adults. (3 cr.; A-F or Audit; Every Fall) Research-informed clinical interventions for adults with mental health distress. Application of cognitive behavioral/psychodynamic psychotherapies through brief/long-term models across diverse populations. prereq: [8451 or concurrent registration is required (or allowed) in 8451], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8462. Advanced Clinical Practice With Children and Adolescents. (3 cr.; A-F or Audit; Every Fall) Social work interventions using normative developmental supports/mental health case planning. Develop advanced clinical social work practice knowledge/skills for working with children/adolescents with mental health risks. Provide knowledge for community social workers serving children exposed to stress. prereq: [8351 or concurrent registration is required (or allowed) in 8351] or [8451 or concurrent registration is required (or allowed) in 8451], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8463. Social Work Practice With Severe and Persistent Mental Illness and Severe Emotional Disturbance. (3 cr.; A-F or Audit; Every Spring) Integrated social work approach to assessing/working with individuals with SPMI, SED. Trends/modalities/evidence-supported approaches. Recovery/wellness approaches. Macro systems that impact lives of individuals/families. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8505. Advanced Community Organization and Advocacy. (3 cr.; A-F only; Every Fall & Spring) Methods for stimulating/supporting joint action for constructive change to fulfill community needs. Principles of working with local organizations. Social action to accomplish specific changes. prereq: [Foundation curriculum, advanced standing] or instr consent

SW 8507. Community Practice Seminar. (1 cr.; Student Option; Every Spring)
SW 8551. Advanced Community Practice: Assessment, Organizing, and Advocacy. (3 cr.; A-F or Audit; Every Fall) Community practice, including community organizing, policy advocacy, social service/ change leadership. prereq: [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or instr consent

SW 8552. Advanced Community Practice: Leadership, Planning, and Program Development. (3 cr.; A-F or Audit; Every Fall) Advanced community practice knowledge/ skills. Strategic planning, program design, organizational leadership/management, work groups. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8561. Human Resources Management in Human Services Agencies. (3 cr.; A-F or Audit; Every Fall) Processes/components of strategic human resources management in social services. Environmental scanning, job analysis, recruitment/selection, training/development, motivation, performance evaluation, compensation/benefits, termination. Human resources law. Promotion of inclusive workplace. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8562. Human Services Finances. (2 cr.; Student Option; Every Spring) Contexts, purposes, principles, strategies associated with human services financing. Acquiring, allocating, managing, reporting public/private funding. Financial policy, mission. Short/long term agency sustainability. prereq: [5051, 5801, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8563. Advanced Policy Advocacy. (3 cr.; A-F or Audit; Every Fall) Students paired with social service, social policy, social justice agencies, coalitions. Agenda setting, legislative research, legislative advocacy in relation to specific legislation proposed in Minnesota state legislature. Tie policy theory to real-world practice. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8602. Direct Practice Evaluation. (2 cr.; A-F only; Every Fall & Spring) Students design evaluations that incorporate current evaluation methods and principles derived from research, theory, practice wisdom, their own experience. Evaluation methods include single-system designs, client- focused evaluations, practitioner-focused evaluations, and use of event analyses, standardized instruments, self-constructed instruments. prereq: 8601 or equiv or instr consent

SW 8603. Program Evaluation. (2 cr.; A-F only; Every Fall) Conceptual, methodological, political, psychological, and administrative factors related to conduct and consequences of social work program evaluation. Social programs as cause and effect; models, types, and strategies of evaluation; appraisal of selected research literature. prereq: 8601 or equiv or instr consent

SW 8666. Doctoral Pre-Thesis Credits. (3 cr; max 12 cr.; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SW 8693. Directed Study. (1-6 cr.; Student Option; Every Fall, Spring & Summer) Independent study under tutorial guidance. prereq: instr consent

SW 8694. Directed Research. (1-6 cr.; Student Option; Every Fall, Spring & Summer) Individual or small group research inquiry translating introductory course content into research design and study. Projects may be conducted in conjunction with field learning experiences or other coursework. prereq: instr consent

SW 8801. Social Work Ethics and Legal Issues. (3 cr.; Student Option; Periodic Fall & Spring) Develops knowledge base and skills required to identify and understand legal and ethical issues, resolve ethical dilemmas, and make ethical decisions within social work. Values base, ethical standards, ethical decision-making models, and laws and legal procedures related to social work. Legal aspects of child welfare practice. prereq: Credit will not be granted if credit has been received for: 5811; foundation courses or adv standing or instr consent

SW 8804. Child Welfare Policy. (3 cr.; A-F or Audit; Every Spring) Develops advanced policy knowledge/skills for social workers practicing in or collaborating with public or private child welfare services. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8805. Aging and Disability Policy. (3 cr.; A-F or Audit; Every Spring) Social policy related to disability/aging. Major policy areas of income support, health, education, caregiving, employment, housing, retirement. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8806. Health and Mental Health Policy. (3 cr.; A-F or Audit; Every Spring) Critically engaged in health/mental health policy debate, analysis, development, implementation. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8807. International and Comparative Social Welfare Policy. (3 cr.; A-F or Audit; Every Spring) Cross-national comparisons of social welfare policies, major international conventions, treaties. Social welfare, social development theories/policies. In-depth analyses of selected countries' policies, international agreements, social development strategies. prereq: [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8821. Social Work and Difference, Diversity and Privilege. (2 cr.; A-F only; Every Fall & Summer) Essential knowledge/awareness/skills to support culturally competent social work practice. prereq: [5051, 5801, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8841. Social Work Research Methods. (2 cr.; A-F or Audit; Every Fall & Spring) Develops foundational research methods knowledge/skills fundamental to evidence-based social work practice. prereq: MSW student or instr consent

SW 8842. Advanced Social Work Evaluation. (1-3 cr.; max 6 cr.; A-F or Audit; Every Fall, Spring & Summer) Students design/conduct evaluation of program or own direct practice. Purposes/types of evaluations. Instrument design, data analysis, ethical issues. Organizational, political, social, cultural factors affecting evaluation in diverse human contexts. prereq: [concurrent registration is required (or allowed) in 8020 or 8030], [5051, 5801, 8151, 8152, 8153, 8841] or MSW Adv Standing or instr consent

SW 8843. Social Work Program Evaluation. (1-2 cr.; max 3 cr.; A-F only; Every Fall & Spring) Students design, implement and present an evaluation of a program either in their field practicum or of particular interest to them. Class topics include the purpose and types of evaluations; instrument design; data collection techniques and management; data analysis; ethical issues; and organizational, political, social and cultural factors influencing evaluation in diverse human contexts.

SW 8851. Social Welfare History and Historical Research Methods. (3 cr.; A-F only; Periodic Spring) Methods of historical research in, and survey of, history/evolution of social welfare/work, using primary/secondary source materials. prereq: Completed research courses for soc work PhD student or [equiv research methods courses, grad student]

SW 8855. Social Policy Formulation and Analysis. (3 cr.; A-F only; Periodic Fall) Application of theoretical perspectives, conceptual frameworks, and research methodologies to analysis of social issues and analysis/formulation of social welfare policy. prereq: Soci wk PhD student or instr consent

SW 8861. Theory and Model Development in Social Work. (3 cr.; A-F only; Periodic Fall) Intervention research methods, contemporary social work practice models. Direct intervention in systems, from individual to community. Theoretical, value, empirical foundations of
practice models for intervention research. prereq: Soc wk PhD student or instr consent

SW 8863. Social Work Teaching Methods and Educational Issues. (; 3 cr.; A-F only; Periodic Fall) Teaching methods, skills, strategies, and issues related to Teaching, scholarship, and service roles in social work education. Issues, including curriculum development. Teaching experience in a social work class. prereq: Soc wk PhD student or 2nd-yr MSW student or instr consent

SW 8871. Social Work Research Seminar I. (; 3 cr.; A-F only; Every Fall) Concepts/methods of social research. Issues in social science, social work research, and knowledge development. Development of research questions. Sampling, measurement, data collection in qualitative/quantitative research, prereq: Soc wk PhD student or instr consent

SW 8872. Social Work Research Seminar II. (; 3 cr.; A-F only; Every Spring) Methods/design of quasi-experiments, surveys, descriptive research. Grounded theory. Analysis of qualitative/quantitative data. prereq: 8871 or instr consent

SW 8875. Research Practicum. (; 2 cr. [max 6 cr.]; S-N or Audit; Every Fall & Spring) Experience in conduct of research, following completion of 8871 and 8872. Students work under faculty direction. prereq: Soc wk PhD student or instr consent

SW 8888. Thesis Credit: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

SW 8901. Assessment and Treatment of Trauma. (2 cr.; Student Option; Every Spring) Sociopolitical context of trauma. Impact on diverse populations of individuals, families, communities. Evidence-based approaches for addressing trauma on multiple system levels. Applications to case conceptualization, treatment planning. prereq: Advanced Standing or students who have completed entire foundation curriculum including SW 8010 or instr consent

SW 8902. Social Work Supervision, Consultation, and Leadership. (2 cr.; Student Option; Periodic Fall & Spring) Sociopolitical context of trauma/its impact on diverse populations of individuals, families, communities. Evidence-based approaches for addressing trauma on multiple system levels through applications to case conceptualization/treatment planning. prereq: Advanced Standing or students who have completed the entire foundation curriculum including SW 8010 or instr consent

Social, Adm, and Clinical Phar (SACP)

SACP 8333. FTE: Master’s. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)

SACP 8444. FTE: Doctoral. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer) 

SACP 8666. Doctoral Pre-Thesis Credits. (; 1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) 

SACP 8777. Thesis Credits: Master’s. (; 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) 

SACP 8888. Thesis Credits: Doctoral. (; 1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) 

tbd

Science of pharmacoepidemiology borrows from pharmacology and epidemiology. This course will introduce students to the field of pharmacoepidemiology including study methodology, relevant statistics, data sources, measurement of treatments and outcomes, sources of bias and control of confounding, techniques to reduce bias and confounding, survival analysis and regression techniques, interpretation of results, and drug safety surveillance and risk management.

SAPH 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) Doctoral pre-thesis credits. prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.

SAPH 8700. Hospital Pharmacy Administration. (3 cr.; A-F or Audit; Periodic Fall) History, classification, organization, and functions of hospital departments in relation to the pharmacy service. prereq: Grad SAPH major or instr consent

SAPH 8702. Hospital Pharmacy Survey. (1 cr. [max 3 cr.]; Student Option; Periodic Fall) Readings for self-directed students to explore contemporary issues in hospital pharmacy practices. prereq: Grad SAPH major or instr consent

SAPH 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

SAPH 8810. Social Psychology of Health Care. (3 cr.; Student Option; Periodic Spring) Behavioral and social aspects of recovery responses to drugs and other therapies, patients' compliance with prescribed therapies, relationships between healthcare professional and patient. prereq: Grad SAPH major or instr consent

SAPH 8840. Social Measurement. (3 cr.; A-F or Audit; Periodic Fall & Spring) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data, prereq: Intro stat course, understanding of simple correlations or instr consent

SAPH 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Sociology (SOC)

SOC 5090. Topics in Sociology. (1-3 cr. [max 9 cr.]; Student Option; Periodic Spring) Topics specified in Class Schedule. prereq: Undergrad soc majors/minors must register A-F

SOC 5104. Crime and Human Rights. (3 cr.; A-F or Audit; Periodic Fall & Spring) This course addresses serious violations of humanitarian and human rights law, efforts to criminalize those violations (laws and institutions), and consequences of these efforts. Special attention will be paid to the impact interventions have on representations and memories of atrocities on responses and the future of cycles of violence. Case studies on Holocaust, Balkan wars, Darfur, My Lai massacre, etc. Criminal justice, truth commissions, vetting, compensation programs. prereq: at least one 3xx SOC or GLOS course recommended

SOC 5170. Sociology of International Law: Human Rights, Trafficking, and Business Regulation. (GP; 3 cr.; A-F or Audit; Periodic Fall & Spring) Cultural values and practices in a globalized world. Role of international law. Immigration, terrorism, Americanization, and structure of international legal system.

SOC 5246. Disease, Disasters, and Other Killers. (ENV,HIS; 3 cr.; A-F or Audit; Every Fall) This course studies the social pattern of mortality, beginning with demographic transition theory. Students will study specific causes of death or theories of etiology, including theories about suicide, fundamental cause theory, and the role of early life conditions in mortality. Students learn tools for studying mortality, including cause of death classifications and life tables. Grad student or instructor consent.

SOC 5315. Never Again! Memory & Politics after Genocide. (GP; 3 cr.; A-F or Audit; Spring Odd Year) Course focuses on the social repercussions and political consequences of large-scale political violence, such as genocide, war crimes, and crimes against humanity. Students learn how communities and states balance the demands for justice and memory with the need for peace and reconciliation and addresses cases from around the globe and different historical settings. prereq: SOC 1001 or 1011V recommended. A-F required for Majors/Minors.

SOC 5411. Terrorist Networks & Counterterror Organizations. (3 cr.; A-F or Audit; Periodic Fall & Spring) Theories/evidence about origins, development, and consequences of terrorist networks. Efforts to prevent, investigate, and punish terrorists by use of law enforcement, security, and military forces. Terror involves using violent actions to achieve political, religious, or social goals. This course examines theories and evidence about the origins, development, and consequences of terrorist networks. It analyzes efforts to prevent, investigate, and punish terrorists by counterterror organizations, including law enforcement, security, and military forces. Graduate and honors students are expected to demonstrate greater depth of discussion, depth and to a degree length of writing assignments, presentations, and leadership of the students. prereq: Sociology Major/Minors must register A-F

SOC 5455. Sociology of Education. (; 3 cr.; Student Option; Every Fall) Structures and processes within educational institutions. Links between educational organizations and their social contexts, particularly as these relate to educational change. prereq: 1001 or equir or instr consent; soc majors/minors must register A-F

SOC 5511. World Population Problems. (3 cr.; Student Option; Every Fall) Population growth, natural resources, fertility/mortality in less developed nations, population dynamics/forecasts, policies to reduce fertility. prereq: Soc majors/minors must register A-F, credit will not be granted if credit has been received for PA 5301

SOC 5811. Social Statistics for Graduate Students. (MATH; 4 cr.; Student Option; Every Fall) This course will introduce statistical measures and procedures that are used to describe and analyze quantitative data in sociological research. The topics include (1) frequency and percentage distributions, (2) central tendency and dispersion, (3) probability theory and statistical inference, (4) models of bivariate analysis, and (5) basics of multivariate analysis. Lectures on these topics will be given in class, and lab exercises are designed to help students learn statistical skills and software needed to analyze quantitative data provided in the class. Soc 5811 is intended for new graduate students, undergraduate honors students, and students pursuing the Sociology BS degree. prereq: Credit will not be granted if credit has been received for Soc 3811 (Soc 5811 offered Fall terms only). Undergraduates with a strong math background are encouraged to register for 5811 in lieu of 3811. Soc majors must register A-F. 5811 is a good social statistics foundation course for MA students from other programs.

SOC 8001. Sociology as a Profession. (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) This 1 credit class fosters adaptation to the Graduate Program in Sociology and preparation for a sociological career. In the Fall, we explore professional careers in this field. We discuss the wide range of opportunities in sociology and help students further explore the next steps to becoming a scholar, educator, and member of various professional, intellectual, and social communities. We share practical information about being a student in sociology and about sociological careers, discuss presentations in department workshop seminars, and provide a safe place to discuss issues of student concerns. Students are encouraged to bring to the class their thoughts and reactions to experiences during their first semester in the PhD program. The Spring 8001 class is oriented to particular milestones in the Sociology Graduate Program and important student activities (for example, preparing reading lists for the preliminary exam and then writing the preliminary exam, preparing
a dissertation prospectus, writing grant proposals, preparing an article for publication, etc.). Pre-req: Soc PhD students

SOC 8011. Teaching Sociology: Theory & Practice. (3 cr.; Student Option; Every Spring)
Social/political context of teaching. Ethical issues, multiculturalism, academic freedom. Teaching skills (e.g., lecturing, leading discussions). Active learning. Evaluating effectiveness of teaching. Opportunity to develop syllabus or teaching plan; prereq: Soc grad student or instr consent

SOC 8090. Topics in Sociology. (1.5-3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Topics specified in Class Schedule. prereq: instr consent

SOC 8091. Independent Study. (1-5 cr. [max 20 cr.]; Student Option;)
Independent study of an established 8xxx course.

SOC 8093. Directed Study. (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Directed study in sociology. prereq: Grad soc major or instr consent

SOC 8094. Directed Research. (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
May be used to fulfill sociology graduate requirement for advanced methodological training.

SOC 8101. Sociology of Law. (3 cr.; Student Option; Periodic Fall & Spring)
Sociological analysis of law and society. In-depth review of research on why people obey the law, of social forces involved in creation of law (both civil and criminal), procedures of enforcement, and impact of law on social change.

SOC 8111. Criminology. (3 cr.; Student Option; Periodic Fall & Spring)
Overview of theoretical developments and empirical research. Underlying assumptions, empirical generalizations, and current controversies in criminological research.

SOC 8148. Law, Society, and the Mental Health System. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Intensive survey of psychopathology. Reference to criminal behavior, criminal justice system. prereq: [Grad student, 4148] or instr consent

SOC 8171. Cross-Disciplinary Perspectives in Human Rights. (3 cr.; Student Option; Periodic Spring)
This seminar will approach human rights issues from a variety of "disciplinary" perspectives, including history, the arts, law, the social sciences, and praxis. Empirical work in the social sciences will receive somewhat greater emphasis. One key focus will be the unique advantages (and disadvantages) of the different perspectives and fruitful ways to combine them to strengthen action that improves human rights situations in countries around the world, including the United States. prereq: Grad student or instr consent

SOC 8190. Topics in Law, Crime, and Deviance. (3 cr. [max 9 cr.]; A-F or Audit; Every Fall)
Advanced topics in law, crime, and deviance. Social underpinnings of legal/illegal behavior and of legal systems.

SOC 8211. The Sociology of Race & Racialization. (3 cr.; Student Option; Periodic Fall & Spring)
Major theoretical debates. Classic and contemporary theoretical approaches to studying U.S. race relations: contemporary and historical experiences of specific racial and ethnic groups.

SOC 8221. Sociology of Gender. (3 cr.; Student Option; Periodic Fall)
Organization, culture, and dynamics of gender relations and gendered social structures. Sample topics: gender, race, and class inequalities in the workplace; women's movement; social welfare and politics of gender inequality; theoretical and methodological debates in gender studies; sexuality; science; sociology of emotions.

SOC 8290. Topics in Race, Class, Gender and other forms of Durable Inequality. (3 cr. [max 12 cr.]; Student Option; Periodic Fall)
Comparative perspectives on racial inequality; race, class, and gender; quantitative research on gender stratification; stratification in post-communist societies; institutional change and stratification systems; industrialization and stratification. Topics specified in Class Schedule.

SOC 8311. Political Sociology. (3 cr.; Student Option; Every Fall)
Social dimensions of political behavior and social origins of different forms of the state. How various theoretical traditions--Marxist, Weberian, and feminist--address key issues in political sociology, including citizenship, revolution, state formation, origins of democracy, welfare state, and fascism.

SOC 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

SOC 8390. Topics in Political Sociology. (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Topics with common focus on social underpinnings of political behavior/change. Topics specified in Class Schedule. Sample topics: democracy and development, international legal and political systems, power and protest in advanced capitalist states, xenophobia and international migration, and civil society and democracy.

SOC 8412. Social Network Analysis: Theory and Methods. (3 cr.; Student Option; Periodic Fall)

SOC 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

SOC 8490. Advanced Topics in Social Organization. (3 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Content varies with instructor. Sample topics: gender and organizations, interorganizational relations, comparative study of organizations, nonprofit organizations, consumer behavior, industry and technology, social networks, conflict, coercion, and social exchange. Topics specified in [Class Schedule]. prereq: instr consent

SOC 8501. Sociology of the Family. (3 cr.; Student Option; Every Fall)
Theoretical and empirical works from contemporary family sociology. Content varies with instructor. Sample topics: definitions of the family, family roles, family interactions, marriage and divorce, childbearing, parenthood, and cultural variations in families.

SOC 8540. Topics in Family Sociology. (3 cr. [max 12 cr.]; Student Option; Periodic Fall & Spring)
Families and mental health; families, work, and the labor market; historical/comparative research on the family. Topics specified in [Class Schedule].

SOC 8551. Life Course Inequality & Health. (3 cr.; Student Option; Periodic Fall)
Seminar examines the changing life course in its social and historical context, including theoretical principles, methodologies, and policy implications. Focus on key societal institutions that offer unequal opportunities and constraints, depending on social class, race/ethnicity, and gender. Unequal access to age-graded social roles and resources shape the course of development, and in doing so, they have profound impacts on health. We will consider how inequality in the family, education, work, the military, and in the health care & criminal justice systems influence health behaviors and outcomes at different ages and life stages. prereq: grad student or instr consent

SOC 8590. Topics in Life Course Sociology. (3 cr. [max 12 cr.]; Student Option; Periodic Fall)
Sociology of aging, sociology of youth, and mental health and adjustment in early life course. Topics specified in [Class Schedule].

SOC 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SOC 8701. Sociological Theory. (4 cr.; A-F or Audit; Every Fall)
Traditions of social theory basic to sociological knowledge, their reflection and expansion.
Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
SENG 5115. Graphical User Interface Design, Evaluation, and Implementation. (2 cr. [max 3 cr.]; A-F or Audit; Every Fall & Spring)
Design and evaluation of interactive application interfaces, user- and task-centered approaches to design, guidelines for graphical design, interface evaluation techniques, current interface trends, including web interfaces and information visualization. Group projects that include designing, prototyping, and implementing an application interface. prereq: Grad SEng major

SENG 5116. Graphical User Interface Toolkits. (2-23 cr.; A-F or Audit; Periodic Fall)
Toolkit-centered introduction to GUI implementation technology. Students learn to use a GUI toolkit to implement a graphical application. Introduction to advanced techniques, including constraint-based data management, 3D visualization tools, and toolkit structure and design. prereq: Grad SEng major

SENG 5130. Introduction to Internet of Things: Systems-Level Design and Experimentation. (3 cr.; A-F or Audit; Every Spring)
Project-based examples from modern "Internet of Things" (IoT) systems. Hands-on experiments with core wireless hardware, sensors, and software elements. Students will gain the practical system-level skills and understandings able to be applied to any IoT system, and walk away with an IoT project created themselves. There will be discussions and team-centric activities focused on market trends, ground-breaking tech and products, security, communication protocols, and exciting emerging technologies related to IoT including machine learning, artificial intelligence, and augmented reality.

SENG 5131. Distributed Application Design and Development. (3 cr.; A-F or Audit; Every Spring)
Java programming, concurrent programming, workflow, distributed database, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, and intranet. prereq: Grad SEng major

SENG 5132. Web Application Development. (3 cr.; A-F or Audit; Every Spring)
This course is an in-depth discussion of the challenges and complexities involved in designing and implementing modern web applications. Students will gain experience designing and implementing a project during in the course of the semester.

SENG 5199. Topics in Software Engineering. (2-23 cr. [max 6 cr.]; A-F or Audit; Every Spring)
Topics specified in Class Schedule. prereq: SEng grad student

SENG 5271. Cybersecurity. (3 cr.; A-F or Audit; Every Spring)
This course introduces the major topics of cyber security. Class time will focus on demonstrations, exercises, mini-projects, and discussions. Topics include authentication, access control, file system forensics, symmetric and asymmetric cryptography, network monitoring and controls, dynamic web site attacks, and network cryptography.

SENG 5511. Artificial Intelligence. (2-3 cr.; A-F or Audit; Periodic Spring)
Introduces ideas and theories of AI. Problem solving, search, inference techniques. Logic and theorem proving. Knowledge representation, rules, frames, semantic networks. Planning and scheduling. prereq: Grad SEng major

SENG 5551. Introduction to Intelligent Robotic Systems. (3 cr.; A-F or Audit; Periodic Fall)
Transformations, kinematics and inverse kinematics, dynamics, and control. Sensing (robot vision, force control, tactile sensing), applications of sensor-based robot control, robot programming, mobile robotics, and micro-robotics. prereq: Grad SEng major

SENG 5707. The Principles of Database Systems. (3 cr.; A-F or Audit; Every Fall)
Fundamental concepts; representing instances; prototypic model shapes; model evolution; interviewing user skills, reverse engineering; mapping to DBMS schema; database querying. prereq: Grad SEng major

SENG 5708. Data Analytics. (2-3 cr.; A-F or Audit; Every Spring)
Applications/motivation. Extended relational, object-relational, and object-oriented data models. Object identifier, types/constructors, versions, schema evolution. Query language (e.g., recursion, path expressions). Object indices, buffer management, and other implementation issues. Triggers, rules, complex objects, and case studies. prereq: Grad SEng major

SENG 5709. Big Data Engineering and Analytics. (3 cr.; A-F or Audit; Every Spring)
This course aims to teach students how to evaluate and engineer solutions that traditional data systems cannot handle, as well as various real-world use cases related to big data problems. This course will integrate theory and hands-on learning of various big data systems like NoSQL, streaming architectures, along with popular industry tools for scalable analytics. The focus of the course is largely around big data engineering, with some coverage of data science and analytics.

SENG 5801. Software Engineering I: Overview, Requirements, and Modeling. (3 cr.; A-F or Audit; Every Fall & Spring)
Software engineering as a discipline. Preview of topics to be covered in subsequent courses in master of science in software engineering program; in-depth study of requirements engineering; modeling techniques applicable to requirements and specification, including UML and formal modeling. prereq: Grad SEng major

SENG 5802. Software Engineering II: Software Design. (3 cr.; A-F or Audit; Every Spring)
Software design quality, processes that produce quality design, graphical and textual representations, including UML, common problems and patterns that solve them, refactoring. Students develop fluency in object-oriented design, and ability to read, critique, and advocate design ideas. Students work in teams to complete a multiphase project. prereq: Grad SEng major

SENG 5851. Software Testing and Verification. (2 cr.; A-F or Audit; Every Spring)
Theoretical/practical aspects of testing software. Analyzing a requirements document for test conditions. Writing a test plan. Designing, creating, and executing test cases. Recording defects. Writing a test report. prereq: 5801, grad SEng major

SENG 5853. Software Development for Real-Time Systems. (2-3 cr.; A-F or Audit; Periodic Fall)
Analysis, design, verification, and validation of real-time systems. Periodic, aperiodic, and sporadic processes, scheduling theory. Pragmatic issues. prereq: Grad SEng major

SENG 5841. Model-based Development. (3 cr.; A-F or Audit; Every Spring)
Formal specification of software artifacts. Applicability of formal specifications. Methods such as Z, SCR, and Statecharts. Formal analysis. Theorem proving. Reachability analysis. Model checking. Tools such as PVS, Statemate, SPIN, and SMV. prereq: Grad SEng major

SENG 5851. Software Project Management. (3 cr.; A-F or Audit; Every Fall & Spring)
Concepts used to manage software projects. Project management cycle: initiation, planning/control, status reporting, review, post-project analysis. Leadership and motivation strategies. Lecture, discussion, individual/team presentations/projects. prereq: Grad SEng major

SENG 5852. Quality Assurance and Process Improvement. (3 cr.; A-F or Audit; Every Fall & Spring)
Theory and application of capability maturity model: process assessment, modeling, and improvement techniques. Life cycle issues related to development and maintenance; quality, safety, and security assurance; project management; and automated support environments. Group projects and case studies. prereq: Grad SEng major

SENG 5861. Introduction to Software Architecture. (3 cr.; A-F or Audit; Periodic Fall)
Software/systems architecture. Representation/design, how they fit into software engineering process. Description of architectures, including representation and quality attributes. prereq: 2nd year, MSSE grad student

SENG 5899. Software Engineering Seminar. (1 cr. [max 2 cr.]; Student Option; Every Fall)
Software engineering trends. Talks by invited speakers, selected readings. prereq: Grad SEng major, instr consent

SENG 5900. Directed Study. (1-3 cr.; Student Option; Every Fall & Spring)
Directed study/research in software engineering. Topics/scope decided in collaboration with instructor.

**SENG 8333. FTE: Master’s.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prerequisite: Master’s student, adviser and DGS consent

**SENG 8494. Capstone Project (Plan B Project).** (3 cr.; S-N or Audit; Every Spring) Students work in teams on software projects using tools, techniques, and skills acquired during previous coursework. Each team works with a client to establish requirements, agree upon design, and achieve a successful acceptance test of resulting software system. prerequisite: SEng major

**SENG 8891. Independent Project.** (2-6 cr. max 12 cr.; Student Option; Every Fall & Spring) Independent project arranged with faculty.

### Soil, Water, and Climate (SOIL)

**SOIL 5125. Soil Science for Teachers and Professionals.** (4 cr.; Student Option; Every Fall & Spring) Basic physical, chemical, and biological properties of soil. Soil genesis classification, principles of soil fertility. Use of soil survey information to make a land-use plan. WWW used for lab preparation information.

**SOIL 5232. Vadose Zone Hydrology.** (3 cr.; Student Option; Every Fall) Basic soil physical properties/processes governing transport of mass/energy in soils. Emphasizes water/solute transport through unsaturated root/vadose zones, their impact on subsurface hydrology and on water quality. Lectures, hands-on laboratory exercises, discussion of real world problems, problem solving. prerequisite: Math 1271 or equiv. Phys 1042 or equiv

**SOIL 5555. Wetland Soils.** (3 cr.; A-F or Audit; Every Fall) Morphology, chemistry, hydrology, formation of mineral/organic soils in wet environments. Soil morphological indicators of wet conditions, field techniques of identifying hydric soils for wetland delineations. Peatlands. Wetland benefits, preservation, regulation, mitigation. Field trips, lab, field hydric soil delineation project. prerequisite: SOIL 1125 or 2125 or equiv or instr consent; concurrent registration is required (or allowed) in SOIL 4511 recommended

**SOIL 5611. Soil Biology and Fertility.** (4 cr.; Student Option; Every Fall) Properties of microorganisms that impact soil fertility, structure, and quality. Nutrient requirements of microbes and plants, and mineral transformations in biogeochemical cycling. Symbiotic plant/microbe associations and their role in sustainable agricultural production. Biodegradation of pollutants and bioremediation approaches. prerequisite: Biol 1009 or equiv. Chem 1021 or equiv; Soil 2125 recommended

**SOIL 8005. Supervised Classroom or Extension Teaching Experience.** (2 cr.; S-N or Audit; Every Fall & Spring) Teaching experience in one of five departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; or Plant Pathology. Participation in discussions about effective teaching to strengthen skills and develop a personal teaching philosophy. prerequisite: instr consent

**SOIL 8110. Colloquium in Soil Science.** (1-3 cr. max 6 cr.; S-N or Audit; Every Fall, Spring & Summer) Research or intellectual areas in soil science or climatology not covered in regular courses. Topics vary; contact department for current offerings.


**SOIL 8282. Modeling Water, Carbon, and Nitrogen Dynamics in the Soil-Plant-Air System.** (3 cr.; A-F or Audit; Spring Even Year) Integrative/quantitative treatment of dynamics of water, carbon, and nitrogen in soil-plant-air continuum.

**SOIL 8510. Advanced Topics in Pedology.** (2-4 cr. max 12 cr.; A-F or Audit; Fall Odd Year) Sample topics: soil-landscape relations, soil genesis, landscape evolution, land use and management, precision agriculture, digital terrain modeling, forest soils. prerequisite: 5515

**SOIL 8541. Aquatic and Soil Chemistry.** (3 cr.; A-F or Audit; Spring Even Year) Physical chemical principles, geochemical processes controlling chemical composition of natural waters, soil-sediment-water interactions. Emphasizes behavior of inorganic contaminants in natural waters, engineered systems, dissolved natural organic matter. prerequisite: Credit will not be granted if credit has been received for: CE 8541; 5311 or CE 4541

### Spanish (SPAN)

**SPAN 5110. Discursive Formulations at the Threshold of 20th-Century Spain.** (3 cr.; Student Option; Periodic Fall & Spring) Theory and representative examples of the realist/naturalist novel (Galdas, Pardo Bazan) in the context of its antecedents ("costumbrosmo"), opposites (the idealist/sentimental novel), and turn-of-the-century innovations of modernism and the "generation of 1898." prerequisite: Grad student or instr consent

**SPAN 5150. Contemporary Spanish Literature.** (3 cr.; Student Option; Periodic Fall & Spring) Major literary works/movements in Spain from 1915 to 2000. Neomodernism, surrealism, social realism, literatures of dictatorship/exile. Postmodernism. Poetry, novel, drama, essays, film, video/TV. Problems of literary history. prerequisite: Grad student or instr consent

**SPAN 5160. Medieval Iberian Literatures and Cultures.** (3 cr.; Student Option; Periodic Fall & Spring) The major literary genres developed in Spain from the Reconquest to 1502, with reference to the crucial transformations of the Middle Ages, including primitive lyric, epic, clerical narrative, storytelling, debates, collections, chronicles, "exempa," and the Celestina (1499-1502).

**SPAN 5170. The Literature of the Spanish Empire and Its Decline.** (3 cr.; Student Option; Periodic Fall & Spring) Major Renaissance/Baroque works of Spanish Golden Age (16th-17th-century poetry, nonfiction prose, novel, drama) examined against historical background of internal economic decline, national crisis, ideological apparatus developed by modern state. prerequisite: Grad student or instr consent

**SPAN 5180. Don Quixote.** (3 cr.; Student Option; Periodic Spring) Analysis of Cervantes’ [Don Quixote] in its sociohistorical context; focus on the novel’s reception from the romantic period to postmodern times. prerequisite: Grad student or instr consent

**SPAN 5190. The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism.** (3 cr.; Student Option; Periodic Fall & Spring) Major literary works/intellectual movements/conflicts represented in written culture. of 18th/early 19th centuries (1680-1845), examined as expressions of long crisis of Spain’s Old Regime and rise of bourgeois liberalism. prerequisite: Grad student or instr consent

**SPAN 5316. Spanish Picaresque Narratives.** (3 cr.; Student Option; Periodic Fall) Literary autobiography, residual elements of Erasmian humanism, post-Tridentine repression/censorship. Picaro’s critique of imperial Spain’s system of values/authority. Cultural critics’ challenge to rediscover popular
SPAN 5531. Hispanic Literature of the United States. (3 cr.; Student Option; Periodic Fall)
Interdisciplinary approach providing a framework for deconstructing issues of national identity, marginalization, and gender. U.S. Hispanic theatre/literature and its ethnic diversity, regional variations, cultural links, and scope of its genres. prereq: Grad student or instr consent

SPAN 5550. Caribbean Literature: An Integral Approach. (3 cr.; Student Option; Periodic Fall & Spring)
Literature of Spanish-speaking Caribbean. Emphasizes historical legacy of slavery. African culture, independence struggles. prereq: Grad student or instr consent

SPAN 5560. Global Colonial Studies in the Hispanic World. (3 cr.; Student Option; Periodic Fall)
Discourse production in Spanish America between 1492 and 1700. Conquest/colonial writing/counter writing. Historical origin, evolution, impact of cultural, political, socioeconomic factors. prereq: Grad student or instr consent

SPAN 5570. Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse. (3 cr.; Student Option; Periodic Spring)

SPAN 5580. Latin American Cultural Integration in the Neocolonial Order. (3 cr.; Student Option; Periodic Fall & Spring)
Modernismo, historical vanguard, impact of populist politics in patterns of culture/literature. 1900-50. prereq: Grad student or instr consent

SPAN 5590. The Impact of Globalization in Latin American Discourses. (3 cr.; Student Option; Every Fall & Spring)

SPAN 5701. History of Ibero-Romance. (3 cr.; Student Option; Periodic Spring)
Origins and developments of Ibero-Romance languages; evolution of Spanish, Portuguese, and Catalan. prereq: Grad student or instr consent

SPAN 5711. The Structure of Modern Spanish: Phonology. (3 cr.; Student Option; Periodic Fall)
Formulating and evaluating a phonological description of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories. prereq: Grad student or instr consent

SPAN 5714. Theoretical Foundations of Spanish Syntax. (3 cr.; Student Option; Periodic Fall & Spring)
Linguistic types/processes that appear across languages. Grammatical relations, word order, transitivity, subordination, information structure, grammaticalization. How these are present in syntax of Spanish. prereq: Grad student or instr consent

SPAN 5715. The Structure of Modern Spanish: Semantics. (3 cr.; Student Option; Periodic Fall)
Applying semantic theory to Spanish: conceptual organization and the structuring of experience; meaning and cultural values; semantic fields; categorization and prototypes; cognitive model theory; metaphor, metonymy, and mental imagery as source and change of meaning. prereq: Grad student or instr consent

SPAN 5716. Structure of Modern Spanish: Pragmatics. (3 cr.; Student Option; Periodic Fall)
Concepts in current literature in Spanish pragmatics. Deixis, presupposition, conversational implicature, speech act theory, conversational structure. prereq: Grad student or instr consent

SPAN 5717. Spanish Sociolinguistics. (3 cr.; Student Option; Periodic Spring)
Sociolinguistic variation, cross-dialectal diversity in different varieties of Spanish in Latin America and Spain. Impact of recent cultural, political, and socioeconomic transformations on language. prereq: Grad student or instr consent

SPAN 5718. Spanish Language Contact. (3 cr.; Student Option; Periodic Fall & Spring)
Analysis of different types/results of Spanish language contact globally, taking into account varying social conditions under which contact occurs. prereq: Grad student or instr consent

SPAN 5721. Spanish Laboratory Phonology. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Core literature on Spanish laboratory phonology. Phonology from a laboratory perspective. Students evaluate laboratory research methodologies, perform basic acoustic analyses, and design laboratory phonology studies. prereq: Grad student or instr consent

SPAN 5910. Topics in Spanish Peninsular Studies. (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring)
Crucial moment or characters, works, or events marking beginning of new phase in literary/cultural landscape. prereq: Grad student or instr consent

SPAN 5920. Topics in Spanish-American Studies. (3 cr. [max 9 cr.]; Student Option; Periodic Fall, Spring & Summer)
Spanish-American literature analyzed according to important groups, movements, trends, methods, and genres. Specific approaches depend on topic and instructor. Topics specified in Class Schedule. prereq: Grad student or instr consent

SPAN 5930. Topics in Ibero-Romance Linguistics. (3 cr. [max 9 cr.]; Student Option; Periodic Spring & Summer)
Problems in Hispanic linguistics; a variety of approaches and methods.

SPAN 5970. Directed Readings. (1-4 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer)
Students must submit reading plans for particular topics, figures, periods, or issues. Readings in Spanish and/or Spanish-American subjects. Prereq: Grad student or instr consent.

SPAN 5985. Sociolinguistic Perspectives on Spanish in the United States. (3 cr.; Student Option; Periodic Spring)
Sociolinguistic analysis of issues such as language maintenance/shift in U.S. Latino communities; code switching, attitudes of Spanish speakers toward varieties of Spanish and English; language change in bilingual communities, and language policy issues. prereq: Grad student or instr consent

SPAN 5990. Directed Research. (1-4 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer)
Directed research. Prereq Grad student or instr consent.

SPAN 5991. The Acquisition of Spanish as a First and Second Language. (3 cr.; Student Option; Periodic Spring)
Analysis of issues such as the acquisition of Spanish and English by bilingual children; Spanish in immersion settings; developmental sequences in Spanish; classroom language learners’ attitudes, beliefs, and motivation; development of pragmatic competence. prereq: Grad student or instr consent

SPAN 6100. Research in Sociohistorical Approaches to Spanish Literature. (3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Sociohistorical functions of Spanish literary works and major theories concerning literary production of tests. Testing modern theories in terms of representative fictional discourses from specific historical periods. prereq: 5xxx courses in Span literature and culture

SPAN 8200. Spanish Literary Texts: Theories of Formal Structures. (3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Advanced research in methods of literary analysis of discourse. Emphasizes theoretical and practical frameworks within which representative texts are analyzed and interpreted from differing perspectives. prereq: 5xxx courses in Span literature and culture

SPAN 8212. Spanish Theater of the 16th Century: Drama up to Lope. (3 cr.; Student Option; Periodic Fall)
Medieval origins of drama to [La Celestina] (1499-1502), pastoral dialogues, crossover plays of Spanish and Portuguese dramatists, popular theater up to emerging public and private theaters under Italian influence. Rojas, Encina, Vicente, Naharro, Cervantes, and new tragedians. prereq: 5xxx courses in Span literature and culture

SPAN 8223. The Poetry of the Spanish Golden Age. (3 cr.; Student Option; Periodic Fall)
New Spanish poetic forms, from Garcilaso de la Vega’s, mystics, and San Juan de la Cruz to Baroque trends by Góngora, Lope, and Quevedo. Classic traditions and modern adaptations.
I ideological foundations of lyric genres—eclogue, lira, mystics, satire, conceptismo/ culturanismo, and sonnet. prereq: 5xxx courses in Span literature and culture

SPAN 8300. The Construction of Spanish Literary History. (3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Origins and development of Hispanic literary canon: sociocultural theories of Spanish literary histories as academic and historiographic disciplines. Critiques of modern literary theories through analysis of literary works by major writers. prereq: Two 5xxx courses in Spanish literature and culture

SPAN 8312. Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina]. (3 cr.; Student Option; Periodic Fall)
Cultural reappraisal of the late Middle Ages by reference to two Spanish masterpieces: the Archpriest's [Book of True Love] and Rojas' [La Celestina] (1499-1502). Emphasizes historical function of varied genres, motifs, and sources adapted by the authors. prereq: 5106, 5107 or 5xxx course in Portuguese

SPAN 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

SPAN 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

SPAN 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; dept consent for 3rd/4th registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SPAN 8710. Seminar in Hispanic Linguistics. (3 cr. [max 9 cr.]; Student Option; Fall Even Year)
Critical examination of readings/research on specific topic. prereq: 5711, [Ling 5302 or instr consent]

SPAN 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

SPAN 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

SPAN 8900. Spanish Seminar. (3 cr. [max 9 cr.]; Student Option; Every Fall, Spring & Summer)
Projects relying heavily on advanced research in Spanish problems. Investigation of assigned fields, analysis of problems, appraisal of principles. Limited to small group of students. For list of sample seminars, consult department and director of graduate studies. prereq: Span 5xxx series required for MA or instr consent

SPAN 8940. Advanced Research in Spanish-American Literary Historiography. (3 cr. [max 9 cr.]; Student Option;)
Sources and procedures that have given rise to institutionalizations of Spanish-American literary history. Evaluation and review of epistemological principles and assumptions in theory of literary criticism and histories of literature.

SPAN 8960. Workshop: Research in Hispanic Cultural Issues. (3 cr. [max 9 cr.]; A-F or Audit; Every Fall, Spring & Summer)
Individualized support and advice in framing, theorizing, problematizing, and interpreting areas of cultural research. Taught in Spanish, Portuguese, and English. prereq: Reading knowledge of Spanish and Portuguese

SPAN 8990. Advanced Comparative Research of Caribbean Genres. (3 cr. [max 9 cr.]; Student Option; Periodic Fall)
Major literary works and genres of Caribbean literature studied against the background of sociohistorical vicissitudes of the process leading to the formation and consolidation of the national states. prereq: 5525 or instr consent

Spanish and Portuguese (SPPT)

SPPT 5930. Selected Topics in Hispanic and Lusophone Cultural Discourse. (1-3 cr. [max 9 cr.]; A-F or Audit; Periodic Fall & Spring)
Cultural discourses in Spanish- and Portuguese-speaking areas. Historical intersections/divergences. Taught in Spanish or Portuguese, and in English when cross-listed. Topics specified in Class Schedule. prereq: Reading knowledge of Spanish and Portuguese

SPPT 5995. Directed Teaching. (1 cr.; S-N only; Every Fall)
Taken in conjunction with SPPT 5999. Language acquisition theory as applied to foreign language instruction at college level. How current theory translates into practice through hands-on practical application particular to communicative language instruction practiced in Department of Spanish/Portuguese Studies. prereq: Grad student with concurrent enrollment in 5999

SPPT 5999. The Teaching of College-Level Spanish: Theory and Practice. (3 cr.; Student Option; Every Fall)
Theoretical grounding in the general principles of second language acquisition and guidance with their practical applications to the teaching of first- and second-year Spanish at the college-level. prereq: Grad or instr consent

SPPT 8400. Topics in Modern Hispanic and Lusophone Culture. (3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring)
Advanced research in methods of analysis of cultural products, including but not limited to literature. Emphasizes historical, ideological, and theoretical frameworks within which representative texts/events may be interpreted. prereq: Three 5xxx SPAN or PORT courses

SPPT 8920. Introduction to Hispanic and Lusophone Literatures, Cultures, and Languages. (2 cr. [max 9 cr.]; S-N only; Every Spring)
This two-credit seminar will familiarize beginning doctoral students in the areas of Hispanic/Lusophone literary and cultural studies and Hispanic linguistics. Course must be taken during spring semester of the first year. Topics to be covered include: expected milestones and progress prior to reaching ABD status; methods for writing conference abstracts and presentations; the basics of academic writing in cultural studies and linguistics; how to transform a seminar paper into a publishable piece of scholarship; best practices for determining appropriate conference and publication venues; how to start formulating a dissertation project in the early stages of the graduate career; tactics for requesting funding and completing scholarship/grant applications; collegiality and professionalism in the discipline prereq: Graduate Student

SPPT 8930. Dissertation & Professionalization Workshop. (1 cr. [max 6 cr.]; S-N only; Every Spring)

Speech-Language-Hearing Science (SLHS)

SLHS 5401. Counseling and Professional Issues. (3 cr.; Student Option; Every Fall)
Basic counseling principles and current professional issues related to practice in a dynamic multicultural environment. Application of counseling theory to clinical practice. Analysis of regulation, practice, and future direction of communication disorders. prereq: [concurrent registration is required (or allowed) in 8720 or concurrent registration is required (or allowed) in 8820, grad student] recommended

SLHS 5502. Voice and Cleft Palate. (3 cr.; Student Option; Every Spring)
Disordered voice and resonance. Presentation and discussion of the nature of etiologies, assessment and management of organic/functional voice disorders and cleft palate to meet clinical competencies for speech-language pathology. prereq: [3305, 4301] or [CDs 3305, CDIs 4301] or instr consent

SLHS 5503. Fluency and Motor Speech Disorders. (3 cr.; Student Option; Every Fall)
Nature/management of stuttering and other motor speech disorders in adults/children. prereq: graduate SLHS student or department permission, [3305, 4301] or instr consent

SLHS 5504. Evaluation and Management of Dysphagia. (2 cr.; Student Option; Every Fall)

**SLHS 5602. Speech Sound Disorders: Assessment and Treatment across Languages.** (3 cr.; Student Option; Every Fall)

Nature, assessment, and treatment of speech sound disorders in children. Assessment and treatment of phonological awareness and pre-literacy skills. This course covers cross-linguistic issues in speech sound disorders, including characteristics of speech sound disorders in a variety of languages, and the differential diagnosis of speech sound disorder from the effects of normal second-language acquisition. Emphasis on functional speech sound disorders, with some coverage given to disorders of a clear organic origin, like cerebral palsy, hearing impairment, and cleft palate. prerequisite: [3303, 3304, 4601] or instr consent

**SLHS 5603. Assessment and Intervention of Language Disorders in Children.** (3 cr.; Student Option; Periodic Fall & Spring)

Assessment and intervention techniques approaches for treating language impairment in children with disabilities, such as specific language impairment, developmental delays, and autism spectrum disorder. prerequisite: 3303 or CDIs 3303 or equiv or grad student or instr consent

**SLHS 5605. Language and Cognitive Disorders in Adults.** (3 cr.; Student Option; Periodic Fall & Spring)

Acquired cognitive and communicative disorders in the adult population specifically including: stroke/aphasia, right hemisphere dysfunction, traumatic brain injury, and dementia. Consideration of neurolinguistic substrates, disorder symptomology, assessment, clinical intervention, and functional impact across the lifespan and amongst diverse populations. prerequisite: [3302, 4301] or [CDIs 3302, CDIs 4301] or instr consent

**SLHS 5606. Introduction to Augmentative and Alternative Communication.** (3 cr.; Student Option; Every Fall & Spring)

Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities. Topics include assessment, intervention strategies, progress monitoring, generalization, and maintenance; collateral behavior resulting from AAC applications.

**SLHS 5608. Clinical Issues in Bilingualism and Cultural Diversity.** (3 cr.; A-F only; Every Spring)

Topics in cultural diversity, bilingualism, and second language learning needed for clinical competency in speech-language pathology. Basic/applied issues across a broad range of culturally/linguistically diverse populations. prerequisite: 3303 or equiv or instr consent

**SLHS 5609. Child Language Disorders in Diverse Populations.** (3 cr. [max 6 cr.]; Student Option; Every Spring)

This course covers topics across three broad areas of child language: cultural and linguistic diversity, early intervention, and social communication. The first section will address multicultural issues and bilingualism. The second section will focus on assessment and treatment of language disorders from birth through preschool. Finally, we will address the assessment and treatment of social communication and pragmatic language deficits across disorders and developmental levels, including early prelinguistic communication. The course will include both theoretically and clinically motivated content.

**SLHS 5801. Advanced Audiologic Assessment.** (3 cr.; Student Option; Every Fall)

Basic audiometric battery, including pure tone thresholds, measures of speech understanding, masking and immittance in adults. Topics include video otostopy, otoxicity, functional hearing loss, and identification of middle-ear fluid. Students enrolled in this course concurrently enroll in SLHS 5810. prerequisite: 4801 or CDIs 4801 or instr consent

**SLHS 5802. Hearing Aids I.** (3 cr.; Student Option; Every Fall)

Survey of modern hearing aids including history of development, electroacoustic functions, clinic and laboratory measurement techniques, sound field acoustics, techniques for selection. prerequisite: [3305, 4801] or [CDIs 3305, CDIs 4801]. SLHS grad or instr consent

**SLHS 5803. Pediatric Audiology.** (3 cr.; Student Option; Every Fall)

Behavioral, physiological approaches to assessment and identification, development of the auditory mechanism, etiologies of hearing losses in infants, children, principles of case management with children and families. prerequisite: [4801 or CDIs 4801]. SLHS grad or instr consent

**SLHS 5804. Cochlear Implants.** (3 cr.; A-F or Audit; Periodic Spring)

Implantable auditory prostheses. History of device development, including cochlear implants and auditory brainstem implants. Signal processing. Techniques for selection, fitting, and rehabilitation. Behavioral/physiological changes across life span. prerequisite: [4802, 5801, 5802] or [CDIs 4802, CDIs 5801, CDIs 5802]. SLHS grad or instr consent

**SLHS 5805. Advanced Rehabilitative Audiology.** (3 cr.; A-F only; Periodic Spring)


**SLHS 5806. Auditory Processing Disorders.** (3 cr.; A-F or Audit; Fall Even Year)

Normal and disordered auditory processing abilities. Anatomy and physiology of central auditory pathway, assessments to evaluate auditory processing skills, techniques to address auditory processing weaknesses. Current and historical theories and controversies surrounding auditory processing assessment. prerequisite: [4802 or CDIs 4802]. SLHS grad or instr consent

**SLHS 5807. Noise and Hearing Conservation.** (3 cr.; A-F or Audit; Periodic Fall)


**SLHS 5808. Pathophysiology of Hearing Disorders.** (3 cr.; A-F or Audit; Summer Odd Year)

Classifiers of auditory system, including anatomical, physiological, perceptual, and audiological manifestations of pathologies affecting hearing. Focus will be on understanding current data on physiology, pharmacology, and novel treatment alternatives. prerequisite: [8801, 8802] or [CDIs 8801, CDIs 8802]. SLHS grad or instr consent

**SLHS 5810. Laboratory Module in Audiology.** (1-2 cr. [max 10 cr.]; A-F only; Every Fall & Spring)

Intensive study of clinical methods in audiology. Supplemental didactic courses in audiology curriculum. Laboratory study, individually or in small groups. Students enroll in this course concurrently with SLHS 5801, 5802, 8801, 8802. prerequisite: [4801 or CDIs 4801, SLHS grad] or instr consent

**SLHS 5820. Clinical Research and Practice: Grand Rounds.** (1-6 cr.; S-N or Audit; Every Fall & Spring)

Group discussions of current professional issues in audiology. Case presentations, guest presentations on current technology, clinical-research ethics. Group meets for an hour weekly with faculty coordinator who leads discussion. Integrates academic/clinical education. prerequisite: [4801 or CDIs 4801 or equiv]. SLHS grad or instr consent

**SLHS 5830. Clinical Foundations in Audiology.** (1-8 cr. [max 24 cr.]; S-N or Audit; Every Fall, Spring & Summer)

Clinical foundations in audiology for first year AuD graduate students. prerequisite: Grad SLHS major

**SLHS 5900. Topic in Speech-Language-Hearing Sciences.** (1-3 cr. [max 6 cr.]; Student Option; Periodic Fall & Spring)

Topics listed in Speech-Language-Hearing Sciences office. prerequisite: SLHS grad student or instr consent

**SLHS 5993. Directed Study.** (1-12 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer)

Directed readings and preparation of reports on selected topics. prerequisite: SLHS grad or instr consent

**SLHS 8333. FTE: Masters.** (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
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Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.

(No description) prereq: Master's student, adviser and DGS consent

SLHS 8410. Seminar: Research. (3 cr.; Student Option; Periodic Fall & Spring) Advanced study exploring application of experimental and quasi-experimental research designs used in single-subject and group research.

SLHS 8420. Seminar: Teaching. (3 cr.; [max 9 cr.]; Student Option; Periodic Fall & Spring) Advanced study to prepare doctoral students for careers in undergraduate and graduate teaching. prereq: Grad com dis major

SLHS 8430. Proseminar in Speech-Language-Hearing Sciences. (1-6 cr. [max 60 cr.]; S-N only; Every Fall & Spring) Presentations/discussions led by faculty and PhD students in the department, based on research or issues in the discipline.

SLHS 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

SLHS 8501. Interdisciplinary Management in Cleft Palate and Craniofacial Disorders. (3 cr.; Student Option; Every Fall) Communication problems associated with cleft palate and craniofacial disorders within interdisciplinary context; structural bases for speech problems, and physical and behavioral approaches to speech treatment; interdisciplinary medical and dental concerns and management. prereq: 3305 or CDIs 3305 or instr consent

SLHS 8530. Seminar: Speech. (3 cr.; [max 12 cr.]; Student Option; Periodic Fall & Spring) Advanced study and analysis of research in speech science and speech pathology.

SLHS 8602. Traumatic Brain Injury. (3 cr.; Student Option; Periodic Fall) Survey of communicative and cognitive disorders in adults who have traumatic brain injuries. Demographics, neuropathologic substrates, assessment and diagnosis, clinical applications. prereq: [3302, 4301] or [CDIs 3302, CDIs 4301] or instr consent

SLHS 8630. Seminar: Language. (3 cr.; [max 12 cr.]; Student Option; Periodic Fall & Spring) Research in language acquisition, language science, and language disorders.

SLHS 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) lbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SLHS 8720. Clinical Education in Speech-Language Pathology. (1-8 cr. [max 24 cr.]; S-N or Audit; Every Fall, Spring & Summer) Clinical experience. Prereq Grad CDIs major, adviser, DGS consent.

SLHS 8777. Thesis Credits: Master's. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

SLHS 8801. Electrophysiologic Assessment of Auditory Function. (3 cr.; Student Option; Every Spring) Basic terminology and theoretical aspects of the auditory evoked potentials, electrococchlography, acoustic reflectance, and otoacoustic emissions. Topics include case studies with clinical application of short-latency responses such as the auditory brainstem response and otoacoustic emissions in adults. Students enrolled in this course concurrently enroll in SLHS 5810. prereq: 5801 or CDIs 5801 or instr consent

SLHS 8802. Hearing Aids II. (3 cr.; Student Option; Every Spring) Instrumentation and methods for fitting and evaluating personal hearing aids; ear impression techniques and materials; repair and modification of hearing aids. prereq: 5802 or CDIs 5802 or instr consent

SLHS 8803. Signals and Systems in Audiology. (3 cr.; Student Option; Every Fall) This mostly laboratory class includes familiarization and application of test equipment and methods for calibrating audiometric equipment. Sessions will include topics such as sound-field calibration, earphone calibration, filters, spectra of transient signals, and use of an artificial mastoid. prereq: [3305, 3306, 4801] or [CDIs 3305, CDIs 3306, CDIs 4801] or instr consent

SLHS 8805. Hearing Science Foundations of Audiology. (3 cr.; Student Option; Periodic Fall) Physiological/psychological acoustics. Emphasizes hearing loss. Acoustics of the middle and external ear, cochlear mechanics, neural codes for perception, frequency selectivity, loudness, temporal resolution, clear speech, attention, prediction of speech understanding ability using stimulus measures, and binaural hearing. prereq: Knowledge of acoustics, basic anatomy/physiology of ear, intro coursework in hearing/speech science

SLHS 8806. Audiology Capstone. (1-6 cr.; S-N or Audit; Periodic Fall) Students research a case history of patient with an auditory disorder, write paper that summarizes the literature on the disorder, and recommend assessment tools and treatment plans. prereq: 8802, 8807

SLHS 8807. Balance Assessment. (3 cr.; Student Option; Spring Odd Year) Anatomy/physiology of vestibular mechanism. Assessment techniques to evaluate balance function. Treatment options available for persons with balance disorders. prereq: 5801, 8801

SLHS 8820. Clinical Education in Audiology. (1-8 cr. [max 24 cr.]; S-N or Audit; Every Fall, Spring & Summer) Clinical experience. prereq: Grad CDIs major

SLHS 8830. Seminar: Hearing. (3 cr.; [max 12 cr.]; Student Option; Periodic Fall, Spring & Summer) Advanced study/analysis of research in hearing science and audiology.

SLHS 8840. Audiology Externship. (1-8 cr. [max 24 cr.]; S-N or Audit; Periodic Fall & Spring) Students intern at external clinical setting under supervision of certified audiologist. Entry-level knowledge and skills required for professional practice as clinical audiologist. External internship settings may include hospitals, schools, private otolaryngology practices, hearing aid dispensing practices, industrial settings, or community clinics. prereq: [8802, 8807] or [CDIS 8802, CDIS 8807]

SLHS 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 24 cr required.

SLHS 8994. Directed Research. (1-12 cr. [max 18 cr.]; Student Option; Every Fall, Spring & Summer) Directed research prereq: instr consent

Statistics (STAT)

STAT 5021. Statistical Analysis. (4 cr.; Student Option; Every Fall & Spring) Intensive introduction to statistical methods for graduate students needing statistics as a research technique. prereq: Credit will not be granted if credit has been received for: 3011; College algebra or instr consent; Stat course recommended

STAT 5031. Statistical Methods for Quality Improvement. (4 cr.; Student Option; Periodic Spring) Random variability/sampling. Controlling statistical process. Shewhart/accumulative charting. Analyzing plant data, trend surface, and variance/design of experiments. prereq: [3021 or 3022 or 4102 or 5021 or 5102 or 8102], Math 1272

STAT 5101. Theory of Statistics I. (4 cr.; Student Option; Every Fall) Logical development of probability, basic issues in statistics. Probability spaces. Random variables, their distributions and expected values. Law of large numbers, central limit theorem, generating functions, multivariate normal distribution, prereq: [Math 2263 or Math 2374 or Math 2574H], [CSCI 2033 or Math 2373 or Math 2243]


STAT 5201. Sampling Methodology in Finite Populations. (3 cr.; Student Option; Every Spring)
Simple random, systematic, stratified, unequal probability sampling. Ratio, model based estimation. Single stage, multistage, adaptive cluster sampling. Spatial sampling. prereq: 3022 or 4102 or 5021 or 5102 or instr consent

STAT 5302. Applied Regression Analysis. (4 cr.; Student Option; Every Fall, Spring & Summer)
Simple, multiple, and polynomial regression. Estimation, testing, prediction. Use of graphics in regression, Stepwise and other numerical methods. Weighted least squares, nonlinear models, response surfaces. Experimental research/applications. prereq: 3022 or 4102 or 5021 or 5102 or instr consent

STAT 5303. Designing Experiments. (4 cr.; Student Option; Every Fall, Spring & Summer)
Analysis of variance. Multiple comparisons. Variance-stabilizing transformations. Contrasts. Construction/analysis of complete/incomplete block designs. Fractional factorial designs. Confining split plots. Response surface design. prereq: 3022 or 4102 or 5021 or 5102 or instr consent

STAT 5401. Applied Multivariate Methods. (3 cr.; Student Option; Periodic Fall)

STAT 5421. Analysis of Categorical Data. (3 cr.; Student Option; Every Fall & Spring)

STAT 5511. Time Series Analysis. (3 cr.; Student Option; Every Fall)

STAT 5601. Nonparametric Methods. (3 cr.; Student Option; Every Fall & Spring)
Order statistics. Classical rank-based procedures (e.g., Wilcoxon, Kruskal-Wallis). Goodness of fit. Topics may include smoothing, bootstrap, and generalized linear models. prereq: 3022 or 4102 or 5021 or 5102 or instr consent

STAT 5701. Statistical Computing. (3 cr.; A-F or Audit; Every Fall)
Statistical programming, function writing, graphics using high-level statistical computing languages. Data management, parallel computing, version control, simulation studies, power calculations. Using optimization to fit statistical models. Monte Carlo methods, reproducible research. prereq: (Stat 5102 or Stat 8102) and (Stat 5302 or Stat 8051) or instr consent

STAT 5931. Topics in Statistics. (3 cr.; Student Option; Periodic Fall)
Topics vary according to student needs and available staff.

STAT 5993. Tutorial. (1-6 cr. [max 12 cr.]; Student Option; Every Fall & Spring)
Directed study in areas not covered by regular offerings. prereq: instr consent

STAT 8051. Advanced Regression Techniques: linear, nonlinear and nonparametric methods. (3 cr.; A-F or Audit; Every Fall)
Linear/generalized linear models, modern regression methods including nonparametric regression, generalized additive models, splines/basis function methods, regularization, bootstrap/other resampling-based inference. prereq: Statistics grad or instr consent prereq: Statistics grad or instr consent

STAT 8052. Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling. (3 cr.; A-F or Audit; Every Spring)

STAT 8053. Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression. (3 cr.; A-F or Audit; Every Fall)
Standard multivariate analysis. Multivariate linear model, classification, clustering, principal components, factor analysis, canonical correlation. Topics in advanced regression. PhD student in stat or DGS permission and 8052

STAT 8054. Statistical Methods 4: Advanced Statistical Computing. (3 cr.; A-F or Audit; Every Spring)
Optimization, numerical integration, Markov chain Monte Carlo, related topics. prereq: STAT 8053 or instr consent

STAT 8055. Applied Project. (2 cr.; S-N only; Every Fall)
Collaborative applied statistical practice with a member of University community, including consulting, problem solving, presentation, documentation of results. prereq: [8054, 8801] or instr consent

STAT 8056. Statistical Learning and Data Mining. (3 cr.; Student Option No Audit; Periodic Spring)
Statistical techniques for extracting useful information from data. Linear discriminant analysis, tree-structured classifiers, feed-forward neural networks, support vector machines, other nonparametric methods, classifier ensembles (such as bagging/boosting), unsupervised learning. prereq: [[B6450, 6451, 6452]] or STAT 5303 or equiv., [biostatistics or statistics PhD student]] or instr consent

STAT 8101. Theory of Statistics 1. (3 cr.; Student Option; Every Fall)

STAT 8102. Theory of Statistics 2. (3 cr.; Student Option; Every Spring)

STAT 8111. Mathematical Statistics I. (3 cr.; Student Option; Every Fall)
Probability theory. Basic inequalities, characteristic functions, and exchangeability. Multivariate normal distribution. Exponential family. Decision theory, admissibility, and Bayes rules. prereq: [5102 or 8102 or instr consent], [Math 5615, Math 5616] or real analysis, matrix algebra

STAT 8112. Mathematical Statistics II. (3 cr.; Student Option; Every Spring)

STAT 8141. Probability Assessment. (3 cr.; Student Option; Periodic Spring)
Probability as a language of uncertainty for quantifying and communicating expert opinion and for use as Bayesian prior distributions. Methods for elicitation and construction of subjective probabilities. De Finetti coherence, predictive elicitation, fitting subjective-probability models, computer-aided elicitation, and use of experts. prereq: 5102

STAT 8171. Sequential Analysis. (3 cr.; Student Option; Periodic Fall)
Wald's sequential probability ratio test and modifications. Sequential decision theory. Martingales. Sequential estimation, design, and hypothesis testing. Recent developments. prereq: 8112

STAT 8201. Topics in Sampling. (3 cr.; S-N or Audit; Periodic Fall)
Sampling theory: stratified sampling, ratio estimators, cluster sampling, double sampling, superpopulation theory, Bayesian methods, multiple imputation, nonresponse. prereq: 8102 or instr consent

STAT 8311. Linear Models. (4 cr.; Student Option; Every Fall)
General linear model theory from a coordinate-free geometric approach. Distribution theory, ANOVA tables, testing, confidence statements, mixed models, covariance structures, variance components estimation. prereq: Linear algebra, 5102 or 8102 or instr consent
STAT 8312. Linear and Nonlinear Regression. (3 cr.; Student Option; Periodic Fall)
Nonlinear regression: asymptotic theory, Bates-Watts curvatures, super leverage, parameter plots, projected residuals, transform-both-sides methodology, Wald versus likelihood inference. Topics in linear and generalized linear models as they relate to nonlinearity issues, including diagnostics, semi-parametric models, and model assessment. prereq: 8311

STAT 8313. Topics in Experimental Design. (3 cr.; Student Option; Periodic Fall)
Optimal, Bayes, and nonlinear designs; algorithms for computing designs; sample size; recent developments. prereq: 8311

STAT 8321. Regression Graphics. (3 cr.; Student Option; Periodic Fall)

STAT 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

STAT 8401. Topics in Multivariate Methods. (3 cr.; Student Option; Every Fall)

STAT 8411. Multivariate Analysis. (3 cr.; Student Option; Periodic Fall & Spring)
Multivariate normal distribution. Inference on the mean, covariance, and correlation and regression coefficients; related sampling distributions such as Hotelling's T-squared and Wishart distribution. Multivariate analysis of variance. Principal components and canonical correlation. Discriminant analysis. prereq: 8311

STAT 8421. Theory of Categorical Data Analysis. (3 cr.; Student Option; Periodic Fall)
Categorical data, multidimensional cross-classified arrays, mixed categorical and continuous data. Loglinear, logit, and multinomial response models. Ordinal responses. Current research topics. prereq: 8062 or instr consent

STAT 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

STAT 8501. Introduction to Stochastic Processes with Applications. (3 cr.; Student Option; Periodic Fall)
Markov chains in discrete and continuous time, renewal processes, Poisson process, Brownian motion, and other stochastic models encountered in applications. prereq: 5101 or 8101

STAT 8511. Time Series Analysis. (3 cr.; Student Option; Periodic Fall)
Characteristics of time series. Stationarity. Second-order descriptions. Time-domain representation, ARIMA/GARCH models. Frequency domain representation, univariate/multivariate analysis. Periodograms, non-parametric spectral estimation, state space models. prereq: 5102 or 8111 or instr consent

STAT 8666. Doct Pre-Thesis Cr. (1-6 cr.; No Grade Associated; Every Fall, Spring & Summer)
TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

STAT 8701. Computational Statistical Methods. (3 cr.; Student Option; Every Spring)
Random variate generation, variance reduction techniques. Robust location estimation and regression, smoothing additive models, regression trees. Programming projects: basic programming ability and familiarity with standard high-level language (preferably FORTRAN or C) are essential. prereq: 8311, programming exper

STAT 8711. Statistical Computing. (3 cr.; Student Option; Periodic Fall)
Basic numerical analysis for statisticians. Numerical methods for linear algebra, eigen-analysis, integration, and optimization and their statistical applications. prereq: 8701 or instr consent

STAT 8721. Programming Paradigms and Dynamic Graphics in Statistics. (3 cr.; Student Option; Periodic Fall)
Alternative programming paradigms to traditional procedural programming, including object-oriented programming and functional programming. Applications to development of dynamic statistical graphics and representation and use of functional data, such as mean function in nonlinear regression log likelihoods and prior densities in Bayesian analysis. prereq: 8062, 8102

STAT 8777. Thesis Credits: Master's. (1-18 cr.; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

STAT 8801. Statistical Consulting. (3 cr.; S-N or Audit; Every Spring)
Principles of effective consulting/problem-solving, meeting skills, reporting. Aspects of professional practice/behavior, ethics, continuing education. prereq: STAT 8051 and STAT Grad Student or Instructor Consent

STAT 8811. Statistical Consulting Practicum. (3 cr.; max 12 cr.; S-N or Audit; Every Fall & Spring)
Providing (under faculty supervision) statistical support to clients, primarily University researchers. Exercises in problem solving, ethics, listening/communication skills. prereq: Statistics grad student or instr consent

STAT 8821. Curricular Practical Training. (1 cr.; max 3 cr.; S-N only; Every Fall, Spring & Summer)
Industrial work assignment using advanced statistical techniques. Grade based on final report and presentation covering work assignment. prereq: Statistics grad student, dept consent

STAT 8888. Thesis Credit: Doctoral. (1-24 cr.; max 100 cr.; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

STAT 8900. Student Seminar. (1 cr.; max 2 cr.; S-N or Audit; Every Fall & Spring)
Preparation or presentation of seminar on statistical topics. prereq: Statistics graduate student

STAT 8913. Literature Seminar. (1 cr. max 4 cr.; S-N only; Every Fall & Spring)
Students will read, present, discuss, and critique current literature/research. prereq: Statistics grad major or instr consent

STAT 8931. Advanced Topics in Statistics. (3 cr.; max 12 cr.; Student Option; Periodic Fall & Spring)
Topics vary according to student needs/available staff.

STAT 8932. Advanced Topics in Statistics. (3 cr.; max 12 cr.; Student Option; Periodic Fall & Spring)
Topics vary according to student needs/available staff.

STAT 8933. Advanced Topics in Statistics. (3 cr.; max 12 cr.; Student Option; Every Fall & Spring)
Topics vary according to student needs and available staff.

STAT 8992. Directed Readings and Research. (1-6 cr.; max 12 cr.; Student Option; Every Fall, Spring & Summer)
Directed study in areas not covered by regular offerings. prereq: instr consent

STEM Cell Biology (SCB)

SCB 5051. Stem Cell Biology Practical Training Module. (1 cr.; A-F only; Every Fall)
Intensive two-week course. Hands-on instruction in techniques of tissue culture. Conventional, fluorescence, and confocal microscopy. Flow cytometry for both analysis of cell populations and sorting of cells. prereq: Acceptance into stem cell biology master's program

SCB 5054. Stem Cell Institute Research Seminar and Journal Club. (2 cr.; max 6 cr.; A-F or Audit; Every Fall & Spring)
Students attend weekly Stem Cell Institute research seminars and journal clubs, write brief summaries, participate in journal club, and present original research paper. prereq:
Acceptance into stem cell biology [master's prog or PhD minor prog] or instr consent

SCB 5900. Master's Plan B Research Paper and Presentation. (2 cr.; A-F only; Every Fall, Spring & Summer)
Students write research paper based on primary literature on stem cell biology topic of interest, mentored by faculty member. prereq: Admission to stem cell biology master's plan B program

SCB 8181. Stem Cell Biology. (3 cr.; Student Option; Every Fall)
Stem cell research and its applications. Critical analysis, written summaries/critiques, oral presentations. prereq: [GGD 4034], [GGD 4161] or equiv or instr consent

SCB 8333. FTE: Master's. (; 1 cr.; No Grade Associated; Every Fall, Spring & Summer)
FTE: master's prerequisite. Master's student, adviser consent, DGS consent

SCB 8777. Thesis Credits: Master's. (; 1-18 cr. (max 50 cr.); No Grade Associated; Every Fall, Spring & Summer)
Thesis credits: master's

SCMC 5001. Critical Debates in the Study of Cinema and Media Culture. (4 cr.; Student Option; Every Fall)
Basic concepts in historical/international debates over production/reception of media culture. Emphasizes cinema. Advanced orientation toward intellectual traditions that inform contemporary scholarship.

SCMC 5002. Advanced Film Analysis. (4 cr.; A-F only; Every Spring)
Application of textual analysis to the reading of a film. Students work collaboratively to discern and interpret all component aural/visual elements of what the film says and how it says it.

SCMC 5993. Directed Study. (1-3 cr. (max 6 cr.); Student Option; Every Fall & Spring)
Guided individual reading or study.

SST 8000. Colloquium. (; 1.5 cr. (max 3 cr.); S-N or Audit; Every Fall & Spring)
Series of weekly lectures by nationally and internationally known scholars with diverse disciplinary and methodological backgrounds speaking on a variety of issues. prereq: Grad SST minor

SST 8100. Seminar: Models, Theories, and Reality. (3 cr.; Student Option; Every Fall & Spring)
Students participate in ongoing research on the role of models and theories in science, and prepare and present research papers. prereq: HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or instr consent

SST 8200. Seminar: Philosophy of the Physical Sciences. (3 cr. (max 6 cr.); Student Option; Periodic Fall)

Students participate in ongoing research in history, philosophy, and social study of physical sciences and prepare and present research papers. prereq: instr consent

SST 8300. Seminar: The Biological and Biomedical Sciences. (3 cr.; Student Option; Every Fall & Spring)
Students participate in ongoing research in history, philosophy, and social study of biological and biomedical sciences, and prepare and present research papers. prereq: HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or instr consent

Supply Chain and Operations (SCO)

SCO 6041. Project Management. (2 cr.; A-F only; Every Fall & Spring)
In the course of their careers, contemporary managers spend a significant amount of time either participating in or leading projects. Projects are frequently used as proving-grounds for high-potentials. The skills that are required in project management are often the very same attributes that are required for successfully managing a business. While every project is by definition unique, some concepts and tools (e.g., critical path method, time and cost tradeoffs, resource utilization, methods to deal with uncertainties) in project management apply to a wide range of different types of projects. The aim of this course is to equip students with these concepts and tools (e.g., Monte Carlo simulation, risk analysis) and to develop them into successful project managers, as well as team members.

SCO 6045. Strategic Sourcing. (2 cr.; A-F only; Every Spring)
Procurement and supply management has become increasingly visible in a world where supply is a major determinant of organizational success. Supply chain performance influences not only operational and financial risks but also reputational risk. Although this course explores cost containment and supply process improvement methods, it also pushes into revenue enhancement. The job of the supply manager today goes way beyond the scope of value and efficiency to the search for competitive advantage through the supply network. In addition to organizing the supply function for strategic advantage, the course explores strategic sourcing, supplier selection and evaluation techniques, supplier development methods, global sourcing techniques, as well as legal and ethical challenges. High-performance supply managers live for the challenges associated with building and maintaining a high-performance supply chain.

SCO 6048. Logistics and Transportation. (2 cr.; A-F only; Every Spring)
As supply chains become increasingly global, managing the complexity of distribution and transportation is critical to supply chain performance. This course focuses on the role of logistics and distribution networks in customer order fulfillment. Particular emphasis is placed on the linkage among logistics, warehousing and information systems, and the trade-offs involved in alternative distribution strategies. The course also explores the role of third-party logistics providers. Students learn models and techniques related to designing distribution networks that align with the firm's supply chain and corporate strategy.

SCO 6051. Service Management. (2 cr.; A-F only; Every Fall)
Designing and managing business interactions with customers. Creating service innovations, and designing processes and systems for delivering value-added services to customers. prereq: [MBA 6220 or equiv], MBA student

SCO 6056. Managing Supply Chain Operations. (4 cr.; A-F only; Every Fall & Spring)
Decisions/trade-offs managers face when directing operations of supply chain. How supply chain operations are coordinated within manufacturing, distribution, and retail organizations. prereq: [MBA 6220 or equiv], MBA student

SCO 6059. Quality Management and Lean Six Sigma. (4 cr.; A-F only; Every Fall)
Management/technical aspects of process improvement. Organizational performance and financial measures as they relate to process improvement. Strategy, improvement tools/methods. prereq: [MBA 6220 or equiv], MBA student

SCO 6061. New Product Design and Business Development. (3 cr.; A-F or Audit; Periodic Fall & Spring)
Nine-month intensive course. Engineering and business students work in teams on actual product development projects sponsored by business organizations to design prototype products and develop business plans for commercialization. Lectures, workshops, guest speakers, team meetings, company visits.

SCO 6072. Managing Technologies in the Supply Chain. (2 cr.; A-F only; Every Spring)
Course prepares students to develop capabilities for (i) making well-informed technology choice decisions; (ii) effectively managing the development and implementation of technologies; and (iii) collaboratively engaging in crisis management and problem solving during technology development and
implementation. The central question around which the course will be organized is: How can technologies and the related process and people issues be managed to design and sustain reliable, responsive, resilient, and responsible supply chains? Contemporary topics such as big data analytic applications to supply chain management; technology project management as it relates to offshoring and near-shoring; managing technologies in the context of supply chains in emerging economies; and managing technologies for sustainable supply chains will be covered in the course. Implications of globalization for managing technologies in supply chains will be a theme that will run through the entire duration of the course.

SCO 6081. Global Operations Strategy. (4 cr.; A-F only; Every Spring) Operational implications of strategic decisions, such as global facility location, outsourcing, supplier selection and relationship management, process automation and standardization, concurrent product development. prereq: [MBA 6220 or equiv], MBA student

SCO 6082. International Operations Management. (2 cr.; A-F only; Every Fall) Managing operations in global economy. Coordinating product design, technology transfer, sourcing, supply chains, quality standards, product assignment, facility location, and multicultural workforce management across national boundaries. Cross-functional decision making. prereq: [MBA 6220 or equiv], MBA student

SCO 6090. Sales, Inventory, and Operations Planning. (2 cr.; A-F only; Every Fall) Sales, inventory, and operations planning (SI&OP) is an important process for a firm and can provide significant payoffs. SI&OP links strategic goals with production while coordinating financial, operations, sales, marketing, and HR objectives. Sales, inventory, and operations plans serve as input to the master production schedule (MPS), helping coordinate material resources and capacity levels with strategic business objectives. SI&OP focuses on getting the big picture right by balancing demand and supply at product family level. Planning of mix (individual products and orders) becomes easier once volume (rates & levels) is effectively planned. Course is designed to address these questions: What should an executive know about SI&OP? How does SI&OP link with strategic planning, MPS, capacity plans, etc.? What are the challenges in developing an effective SI&OP process? What techniques are most effective? To address these questions, the course covers: forecasting, aggregate planning, master production scheduling, capacity planning, inventory planning, and material requirement planning.

SCO 6091. Process Improvement Methods. (2 cr.; A-F only; Periodic Spring) This course introduces the tools, problem solving methods, and organizational structures for process improvement. The course is organized around the DMAIC (Define Measure Analyze Improve and Control) method for process improvement in Six Sigma, but will also consider more general methods like PDCA (Plan Do Check Act). In addition, the course will consider broader aspects of process improvement that includes understanding organizational change and aligning process improvements with strategy. This course takes both a project level and organizational level perspective to understand process improvement and Six Sigma.

SCO 6092. Supply Chain Risk and Security. (2 cr.; A-F only; Periodic Spring) This course covers the organizational and behavioral aspects of managing quality, risk, and security within and across organizations. It covers various frameworks such as ISO 28000 (security) as a starting point. It covers various organizational issues such as managing organizational culture and navigating across national boundaries to address quality, risk, and security issues. It draws on various management theories to understand how to manage quality, risk, security, and disruptions across the supply chain. The course draws on examples from a variety of industries and government.

SCO 6093. Negotiations in Supply Chain. (2 cr.; A-F only; Periodic Spring) Negotiation is the art and science of securing agreements between two or more interdependent parties. Managing supply chains often requires extensive negotiations related to pricing, joint problem solving and collaboration. This course (i) helps students understand the theory and processes of negotiation as it is practiced in supply chains, (ii) highlight the components of an effective negotiation, and (iii) help students analyze their own behavior in negotiations. The course is largely experiential, providing an opportunity to develop skills by participating in supply chain negotiation exercises and integrating experiences with the principles presented in the assigned readings and class discussions.

SCO 6094. Responsible Supply Chain Management. (2 cr.; A-F only; Every Spring) Companies around the world are facing increasing pressure to perform well on the triple bottom line?People, Planet, and Profit?and responsible supply chain management is often a cornerstone of the CSR strategy for many companies. This course looks at how and why responsible supply chain management could be a powerful strategy to enhance a company's triple bottom line. The course focuses on the social and environmental aspects of managing supply chain operations. Particular emphasis is placed on human rights, health and safety, and environmental issues faced by supply chain managers and the linkage to the firm's supply chain strategy.

SCO 6095. Supply Chain Management in the Food and Agribusiness Sector. (2 cr.; A-F only; Periodic Spring) The food and agribusiness supply chain is complex. It spans input companies, farmers, traders, food companies, and retailers. The goal of this supply chain is to provide access to affordable food, feed, fiber, and fuel in a sustainable manner. The course covers topics relevant to achieving this goal such as supply management, production management, demand management to consumers. Issues such as diversity of production and demand, bulkiness of produce, perishability, seasonality, and complexity of supply chains of food and agricultural products will be addressed.

SCO 6096. Supply Chain Management in the Health Care and Medical Devices Sector. (2 cr.; A-F only; Periodic Spring) This course identifies the inter-relationships between the partners in a health care supply chain that links the development of care to the delivery of care. Issues addressed in the course include managing health care supply chain variables: increasing complexity of manufacturing pharmaceuticals and medical devices; increasing variety in drugs, devices and equipment to meet rapidly changing markets; increasing demand for affordable products from emerging economies; growing quality and compliance challenges with drugs and devices becoming more complex and regulatory scrutiny becoming stricter; and increasing frequency of recalls. Some examples of specific problems in health care delivery are: capacity planning and management in hospitals, location of health care facilities, supply chain management of blood banks, ambulance service planning, etc.

SCO 6097. Supply Chain Management in the Retail Sector. (2 cr.; A-F only; Periodic Spring) This course reviews how the retail sector has evolved over the years and the significance of supply chain management in the retail sector. The course examines the various functional components of retail supply chain management, and focuses on analysis and metrics required to effectively manage a retail supply chain. The students learn the language of retailing and acquire the fundamental skills needed to effectively analyze the performance of retail supply chains. Cases are discussed to illustrate how customers are becoming more exacting and demanding ever-increasing levels of service; and how retailers are responding by increasing product variety, becoming more price competitive, striving towards higher service levels, and utilizing advances in computing capabilities, information technologies, and retail analytics to improve their supply chain efficiency.

SCO 6098. Operations Excellence via Lean Thinking. (2 cr.; A-F only; Every Fall) This course introduces the concepts and theory of quality control, philosophial foundations of lean thinking, and technical concepts related to flow and pull, and tools such as value stream mapping, A3, and 5S. Students learn to identify, measure, and eliminate non-value added activities; process capability analysis; statistical process control; and acceptance sampling from extended value chains in manufacturing and service settings through hands-on exercises.

SCO 6190. Statistics. (2 cr.; A-F only; Every Fall) Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
This course introduces quantitative and business statistics concepts for managerial decision making and problem solving. The course first focuses on the nature of statistical studies and the differences between observational and experimental studies. Methods for producing data, including sampling techniques, process monitoring, and designed experiments will be discussed. Students learn graphical and numerical methods for descriptive statistics. Foundations for statistical inference are covered, including basic probability, discrete and continuous probability distributions, and sampling distributions of statistics. Students then learn how to apply the two basic inferential methods of statistics, statistical estimation, and tests of statistical hypotheses. These methods are used to make inferences about population parameters including means, proportions, and standard deviations. The students also learn to identify sample size requirements.

**SCO 6191. Big Data Analytics in Supply Chains. (2 cr.; A-F only; Every Fall)**
With the advancement of digital technologies and networking capabilities, firms are actively engaged in capturing data related to their supply chains. Firms recognize the immense potential in mining big data for improving the quality and timeliness of decisions, and becoming proactive in detecting and responding to external and internal signals of threats and opportunities. Course develops the capability to analyze and interpret data that is fundamental to managing supply chains and provides an overall understanding of the data and information management framework. This includes an overview of enterprise resource planning, value chain management and customer relationship management frameworks, the interconnections and interdependencies of functions from an information and data perspective. Through a combination of case studies and hands-on exercises, students learn (i) various facets of data analytics: data access, data aggregation, data analysis and data visualization; (ii) appropriateness and inappropriateness of big data analysis; and (iii) big data based predictive analytics.

**SCO 6192. Supply Chain Finance. (2 cr.; A-F only; Every Summer)**
Managing the financial flows and capital is just as important as managing the physical flow of goods and services. This course focuses on the underlying link between supply chain performance and the financial systems within an organization. Students learn concepts and tools related to supply chain costing, valuation, and projecting cash flow and capital requirements. The course looks at issues including tax and trade credits, and students develop an understanding of how financial considerations influence and inform a firm’s supply chain strategy.

**SCO 6290. Managing Supply Chain Operations. (4 cr.; A-F only; Every Fall)**
This course serves as an introduction to the program, providing an overview of the fundamental concepts of supply chain and operations management. The course is taught as a cohort experience with opportunities to interact outside the classroom. Supply chain professionals from a variety of industries are featured throughout to highlight how the concepts apply in different contexts. Students learn methods and models for evaluating and improving end-to-end processes and gain an understanding of the operational challenges inherent in managing global supply chains. The course takes a strategic and cross-functional view of supply chains in both product and service based industries.

**SCO 6291. Leadership Development. (0-2 cr.; A-F only; Every Fall, Spring & Summer)**
Carefully designed lectures, exercises and assignments are positioned through the year to assess and develop leadership skills personalized to each student at three levels: (i) how to lead self: leveraging current strengths, (ii) how to lead others: teamwork, collaboration, motivation, and feedback, and (iii) how to lead organizations: operating in complex global work environments. Substantively, the course is committed to creating an intellectual context that is now viewed as central to developing supply chain leaders. Specifically, the course provides opportunities for raising environmental, social and political awareness; learning about social media and related communications technologies and channels; and interacting with non-commercial organizations such as government and NGOs.

**SCO 6292. Global Operations Capstone. (4 cr.; A-F only; Every Summer)**
This course will examine, compare and contrast business models that work globally, and require a careful design of processes and supply chains to deliver the capabilities necessary to create a competitive advantage. This course helps students understand the strategic nature of decision making in operations, and allows them to apply such thinking to the design and improvement of global supply chain networks that span both developed and developing economies. The course contains an essential experiential component. Students will work with companies, either locally in Minnesota or across the world, on real world supply chain applications.

**SCO 6850. Topics in Operations and Management Science. (2-4 cr. [max 12 cr.]; A-F only; Every Fall & Spring)**
Topics seminar. Provides forum for topics in operations/management science.

**SCO 6851. Experimental Design. (3 cr.; A-F or Audit; Spring Even Year)**
Analysis of variance for one-way, two-way, and multi-way data. Basic concepts of statistical design and analysis of results. Randomized block, Latin square, cross-over, factorial designs, confounding, estimation and comparison of effects, response surfaces, and applications to management. prereq: MBA 6120 or equiv or business admin PhD student or instr consent; offered alt yrs

**SCO 6852. Regression Analysis. (3 cr.; A-F or Audit; Periodic Spring)**
Regression and correlation models, inferences in simple and multiple regression, multicollinearity, indicator variables, variable selection techniques, treatment of assumption violations, applications to management problems, basic concepts of experimental design, prereq: MBA 6120 or equiv, business admin Ph.D student or instr consent; offered alt yrs

**SCO 8711. Research in Operations Strategy. (3 cr.; A-F or Audit; Periodic Fall)**
Operations performance, competitive advantage; focused factory, product, and process innovation; and operations strategy implementation. Research results and methods. prereq: Business admin PhD student or instr consent; offered alt yrs

**SCO 8721. Management of Technological Operations. (3 cr.; A-F or Audit; Periodic Spring)**
Theories and models used to address problems of managing technological operations and operations in manufacturing and service firms. Technology strategy, economic/organizational perspectives on technology, productivity analysis, technology evaluation, project selection and evaluation, learning, etc. prereq: Business admin PhD student or instr consent; offered alt yrs

**SCO 8735. Supply Chain Management. (3 cr.; A-F or Audit; Periodic Fall & Spring)**
Research on forecasting, inventory control, materials requirements planning, just-in-time manufacturing, aggregate planning, scheduling, routing, sequencing, and dispatching in manufacturing and service industries. Research papers and methods are discussed. prereq: Business admin PhD student or instr consent

**SCO 8745. Research on Quality Management. (3 cr.; A-F or Audit; Periodic Fall & Spring)**
Research literature, methods, and results. Research on quality strategy, economics of quality, statistical process control, vendor management, off-line quality, and quality practice. prereq: Business admin PhD student or instr consent; offered alt yrs

**SCO 8755. Behavioral Operations. (3 cr.; A-F only; Periodic Fall & Spring)**
Research/review classic behavioral literature in economics and other business disciplines; identify behavioral problems within operations contexts; test/analyze operations phenomenon through experimental study, empirical methods, and analytical modeling. Supply chain problems. prereq: Business admin Ph.D. student or instr consent

**SCO 8800. Research Topics in Operations and Management Science. (2-4 cr. [max 16 cr.]; A-F or Audit; Periodic Fall)**
Topics selected from new areas of research. Research methods, issues in operations/management science. prereq: Business admin Ph.D. student or instr consent

**SCO 8892. Readings in Operations and Management Science. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer)**
Readings useful to student’s individual program and objectives that are not available in regular
courses. prereq: Business admin PhD student or instr consent

SCO 8894. Graduate Research in Operations and Management Science. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Individual research on an approved topic appropriate to student's program and objectives. prereq: Business admin PhD student or instr consent

Surgery (SURG)


SURG 7502. Externship in the Surgical Intensive Care Unit. (2-6 cr. ; H-N or Audit; Every Fall, Spring & Summer) This service provides the student with direct bedside experience and opportunities to apply the principles of physiology, biochemistry, and metabolism to critically ill and injured patients. Required reading: Abrams and Cerra, Essentials of Surgical Critical Care, Quality Medical Publishers, 1993. prereq: 7500

SURG 7503. Surgery Research. (4 cr. [max 8 cr.]; H-N only; Every Fall, Spring & Summer) The student will participate in a research experience designed around a specific topic, arranged on an individual basis by the Course Instructor with staff members in the Department of Surgery.

SURG 7504. Externship in Hospital-based Nutrition. (3-6 cr. ; H-N or Audit; Every Fall, Spring & Summer) This multidisciplinary patient care service is designed to provide one student with direct experience in hospital-based parenteral and enteral nutrition.

SURG 7505. Solid Organ Transplant Surgery. (4-46 cr. ; H-N only; Every Fall, Spring & Summer) Deceased and live donor kidney, liver, and pancreas transplantation. Pre-operative evaluation and management and post operative care (including immune monitoring). Intra-operative management (donor and recipient) of transplant patients and back-table work. Clinical rounds/teaching conferences/seminars. Complete abstract in area of interest. Scrub in organ donor operations as well as kidney, liver, and pancreas transplant.

SURG 7509. Burn Surgery. (4 cr. ; H-N only; Every Fall, Spring & Summer) The student is exposed to all aspects of burn care including small outpatient burns as well as massive life threatening burns.

SURG 7510. Advanced Surgery Externship. (4 cr. [max 6 cr.]; H-N only; Every Fall, Spring & Summer) Instruction and advanced experience in surgery and its components. Students participate in patient care at level similar to first year intern. Students work with team in general/vascular surgery, surgical oncology/colorectal, or MIS/thoracic/foregut under faculty supervision and participate in care of patients, in operating room, and in clinics. Students take call on assigned service.

SURG 7511. Advanced Surgery Externship (Subinternship) at VA Medical Center. (3-6 cr. [max 12 cr.]; H-N or Audit; Every Fall, Spring & Summer) Instruction/experience in surgery and its components. Students participate directly in patient care at a level of responsibility exceeding that given to beginning students. Students work under direct supervision of faculty and participate fully with surgical team on assigned service in care of hospitalized patients, in operating room, and in clinics. prereq: 7500, dept consent

SURG 7522. Plastic & Reconstructive Surgery. (4 cr. ; H-N only; Every Fall, Spring & Summer) The student is exposed to the full spectrum of plastic and reconstructive problems while on the rotation.

SURG 7523. Colon and Rectal Surgery. (4 cr. ; H-N only; Every Fall, Spring & Summer) Each student has the opportunity to become adept in the use of the sigmoidoscope as well as performing various outpatient anorectal procedures.

SURG 7524. Externship in Outpatient and Ambulatory Surgery. (3 cr. ; H-N or Audit; Every Fall, Spring & Summer) Surgery clinic. Operating room experience. Surgical pathology review. prereq: instr consent

SURG 7525. Cardiovascular and Thoracic Surgery. (4 cr. ; H-N only; Every Fall, Spring & Summer) Students will have the opportunity to become involved in the evaluation and management of patients with cardiac and thoracic surgical diseases. They will be incorporated at the level of a sub-intern on very busy clinical services. They will attend teaching conferences in addition to clinical duties. They may first or second assist on routine thoracic cases and second assist on some cardiac surgeries.

SURG 7526. Pediatric Surgery. (4 cr. ; H-N only; Every Fall, Spring & Summer) Students participate in all aspects of patient care. Initial evaluation, detailed history, physical exams, initiation/evaluation of diagnostic laboratory/radiologic testing. Formulating plans of resuscitation and patient care. Students also participate in outpatient clinics.

SURG 7910. Surgery Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Surgery medical residency.

SURG 7930. Surgery Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Surgery medical fellowship.

SURG 8200. Clinical Surgical Problems in Management. (3 cr. ; A-F or Audit; Every Fall, Spring & Summer) Diagnostic and management instruction in all phases of clinical surgery, inpatient and outpatient. prereq: Grad surg major

SURG 8201. Surgery Roentgenological Pathology Conference. (1 cr. ; A-F or Audit; Every Fall, Spring & Summer) Weekly review of surgical patients presenting interesting roentgenal and pathological findings. Staff from the Departments of Surgery, Radiology, and Laboratory Medicine and Pathology. Basic science and management principles of the surgical patient. prereq: Grad surg major

SURG 8202. Surgical Research. (3 cr. ; A-F or Audit; Every Fall, Spring & Summer) Graduate students undertake original investigation of problems in either experimental or clinical surgery. prereq: Grad surg major

SURG 8203. Surgery Complications and Research Conference. (1 cr. ; A-F or Audit; Every Fall, Spring & Summer) Evaluation of surgical patients, including postoperative course. Discussion and critical evaluation of current research problems. prereq: Grad surg major

SURG 8207. Transplantation Conference. (1 cr. ; A-F or Audit; Every Fall, Spring & Summer) Interdepartmental discussion and evaluation of current clinical and research problems. prereq: Grad surg major

SURG 8293. Applied Statistics. (1 cr. ; S-N or Audit; Every Fall & Spring) Interactive computer course. Concepts of applied statistics. Examples, problem sets based on surgical research. How to independently set up appropriate experiments and perform basic descriptive/inferential analysis. prereq: Grad student in [surgery or experimental surgery or health sciences] or

SURG 8333. FTE: Master's. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Master's student, adviser and DGS consent

SURG 8444. FTE: Doctoral. (1 cr. ; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

SURG 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) TBD prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

SURG 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall & Spring)
to improve operational and environmental performance.

SSM 5413. A Systems Approach to Residential Construction. (4 cr.; Student Option; Every Fall)
Dynamic/interrelated issues of energy, moisture control, indoor air quality in residential buildings. Emphasizes design, construction, and operational aspects to provide an energy efficient, durable structure, and healthy living environment. Interaction between moisture and wood products within building system.

SSM 5414. Advanced Residential Building Science. (4 cr.; Student Option; Fall Even Year)
Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer. prereq: Grad student or instr consent

SSM 5416. Building Testing & Diagnostics. (2 cr.; Student Option; Spring Even Year)
Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/remedial applications. Digital differential pressure gauges, blow doors, airflow hoods/ grids, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving. prereq: Grad student or instr consent

SSM 5418. Advanced Building Science: Applications. (3 cr.; A-F or Audit; Every Spring)
This course is intended to be a capstone applications course, where students will learn how to apply key building science principles (from SSM 4414/5414: Advanced Building Science: Fundamentals) to common building enclosure and mechanical system problems. Students will be guided to develop both qualitative and quantitative solutions for many common energy, moisture, and indoor air quality problems facing contemporary buildings. prereq: SSM 4414 or SSM 5414

SSM 5503. Marketing of Bio-based Products. (4 cr.; A-F or Audit; Every Fall)
Introduction to marketing function as it relates to current/emerging bio-based products industries (building materials, paper, fuels, etc.). Product positioning, pricing, promotion, and channel management within strategic planning and environmental marketing management.

SSM 5504. Sustainable Products Systems Management. (3 cr.; A-F only; Every Spring)
Concepts of new product development and product management and their application to bio-based products.

TMDP 8441. Seminar in Temporomandibular Disorders & Orofacial Pain. (1 cr.; A-F or Audit; Every Fall, Spring & Summer)
Advanced topics on theories and application of recently developed techniques of data collection, diagnostic strategies, and management.

TMDP 8442. Advanced Clinical Temporomandibular Disorders and Orofacial Pain. (1-4 cr.; A-F or Audit; Every Fall, Spring & Summer)
Interdisciplinary study of patients with TMD and orofacial pain using techniques of assessment currently being researched; background and clinical knowledge of patient synthesized with respect to current literature on management; management program is developed, discussed with faculty, and implemented. prereq: Participation in TMJ and orofacial pain advanced education program

Theatre Arts (TH)

TH 5100. Theatre Practicum. (1-4 cr.; max 20 cr.; Student Option; Every Fall & Spring)
Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright. (See 5500 for design practicums) prereq: instr consent, dept consent; 4 cr of 3100 for undergrads

TH 5103. The Theatre Dramaturg. (3 cr.; Student Option; Periodic Fall)

TH 5117. Performance and Social Change. (3 cr.; A-F or Audit; Periodic Fall)
Reading, writing, research, presentations and workshops explore activist performance projects. Theories of social formation and ideology provide framework to discuss/animate theater’s potential for social change. prereq: Jr or sr or grad student

TH 5152. Global Avant-Gardes: Theatre, Music, Modernity. (HIS; 3 cr.; Student Option; Every Spring)
What does it mean to be an avant-garde artist in the Global South? In postcolonial Africa and Asia, where arts were linked to national modernization projects, artists have played a key role in shaping citizens’ identity, alongside schools and universities. While participating in modernizing projects, avant-garde artists maintained independence from state institutions and voiced criticism of dictators. This course examines avant-garde performance in several locations of the Global South, analyzing dramas of national history, modernist music, activist theater, cosmopolitan dance, transnational cultural circuits, and politically radical performances. Reading historical, social, and performance studies, we will develop methods for analyzing performances that aim to make transformative social interventions. These include textual

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analysis, ethnography, performance analysis, and tracking transnational cultural exchange. You will apply select methods in your final research paper, which centers on an avant-gardist cultural phenomenon in the contemporary Global South.

TH 5179W. Text and Performance. (WI; 3 cr.; A-F or Audit; Every Fall) How to read texts toward performance in various dramatic/ nondramatic material. Method of unlocking metaphorical energy of texts. Vocabulary/techniques of analysis that transform text from page to stage. prereq: [1322, [3171 or 3172]] or grad student

TH 5181W. Blacks in American Theatre. (WI; 3 cr.; Student Option; Periodic Spring) Historical survey of significant events in the development of American black theatre traditions. Essays, plays, playwrights, and theatre from early colonial references to the Black Arts Movement.

TH 5182W. Contemporary Black Theatre: 1960–Present. (WI; 3 cr.; Student Option; Spring Even Year) Essays, plays, playwrights, theatres that have contributed to contemporary black theatre from beginning of Black Arts Movement to present.

TH 5183. Critical Literacy, Storytelling, and Creative Drama. (3 cr.; Student Option; Every Summer) How storytelling and creative drama can be used as tools to help develop K-12 students’ critical literacy and to assist them in becoming more fluent readers/writers. prereq: Jr. or sr or grad student

TH 5330. Comedy: Advanced Physical Performance Studio. (3 cr. [max 9 cr.]; A-F only; Every Spring) Mechanics of creating physical comedy. Focuses on process using clown, Commedia dell’arte, Bouffons, or improvisational comedy. Exercises on how comedy is born from tragedy and state of conflict within one’s self. prereq: 3330, audition

TH 5340. Tragedy/Poetry: Advanced Physical Performance Studio. (3 cr. [max 6 cr.]; A-F only; Every Fall) Specific tragic/poetic training paradigms in physical theater employed by Stanislavski, Grotowski, Brecht, Lecoq, etc. Psychological, emotional, technical, and physical work. Tragic action in Greek tragedy, Shakespeare, Melodrama, operatic characterization, Brecht. Original tragic/poetical work. prereq: [3322, 3331, grad student] or instr consent

TH 5355. Puppetry: Techniques and Practice in Contemporary Theater. (3 cr.; Student Option; Every Fall & Spring) Fundamentals of puppet and object theater/performance are introduced through traditional/contemporary puppetry forms. Focuses on object theater, toy theater, hand puppets, and shadow/Bunraku-style puppets. Readings, in-class screenings of videos/slides. Students build/create series of short works for in-class performance. prereq: [3513 or concurrent registration is required (or allowed) in 3513], instr consent or grad student

TH 5370. Hand, Mind, and Gesture: An Independent Study in the Creation of Image Driven Performance. (3 cr.; Student Option; Every Spring) Create single or collaborative performance/event that lives in time/space. Work will draw from personal investigation, amplify personal signature, explore modalities of image driven forms. Propose, develop, construct, rehearse, present finished public performance. prereq: 5355, instr consent

TH 5500. Theatre Design Practicum. (1-3 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Individual projects in production of approved plays as a designer of scenery/properties, costumes, lighting, or sound. (See 5100 for other creative practicums.) prereq: Th 3521, 3531, or 3541

TH 5510. Drawing, Rendering, and Painting for the Theatre Designer I. (3 cr.; Student Option; Periodic Fall & Spring) Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Basic drawing/graphic skills. prereq: 1501 or grad

TH 5520. Scene Design. (3 cr. [max 9 cr.]; Student Option; Every Fall & Spring) Conceiving/communicating design ideas in both two-dimensional sketches and three-dimensional models for theatre and allied venues. Drafting. prereq: 3521

TH 5530. Costume Design. (3 cr. [max 9 cr.]; Student Option; Every Fall) Theory and process of costume design for theatrical productions (e.g., dance, opera, film) through hypothetical productions. prereq: 3531

TH 5540. Lighting Design for the Theatre. (3 cr. [max 9 cr.]; Student Option; Every Spring) Design aesthetics and exploration of design for various stage forms and venues. Development of the lighting plot and paperwork; use of the computer in lighting design. prereq: 3541

TH 5545. Stage Lighting Technology. (3 cr.; Student Option; Periodic Fall) The lighting technician’s skills and crafts: equipment, techniques, control operation, wiring, and maintenance. prereq: 3515 or grad or instr consent

TH 5559. Sound Design for Performance. (3 cr.; Student Option; Periodic Fall & Spring) Audio technology/psychology, their impact on audience in a performance. Communication, design process, psychoacoustics, script analysis. prereq: 4555 or instr consent

TH 5560. Drawing, Rendering, and Painting for the Theatre Designer II. (3 cr.; Student Option; Periodic Spring) Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Rendering and scene painting skills. prereq: 5510

TH 5570. Properties/Scenery Technology. (1-3 cr. [max 15 cr.]; Student Option; Every Fall & Spring) Management, structures, upholstery, mask-making, furniture construction, stage mechanics, soft properties, faux finishes. Topics specified in Class Schedule. prereq: 3515 or grad or instr consent

TH 5580. Costume Technology. (3 cr. [max 15 cr.]; Student Option; Every Fall & Spring) Fabric enhancement techniques, masks, wig-making, millinery, makeup prosthetics, pattern drafting, and draping. Topics specified in Class Schedule. prereq: 3571 or grad or instr consent

TH 5590. Theatre Technology Practicum. (1-3 cr. [max 15 cr.]; Student Option; Every Fall, Spring & Summer) Individual creative project in technology/craft area of theatre. Practical work in costume, lighting, makeup, props, scenery, sound, or theatre management. prereq: 3515, instr consent, dept consent; 4 cr max for undergrads

TH 5711. Advanced Stage Direction. (3 cr.; Student Option; Periodic Fall & Spring) Realistic/non-realistic dramatic forms. Theory/technique of rehearsal. Production problems. Includes directing of three one-act plays. prereq: [4711, instr consent] or grad student

TH 5716. Stage Management for the Theatre. (4 cr.; Student Option; Every Fall) Theories, practicalities, and techniques for rehearsal/performance. Organizing/managing various types of performance venues. prereq: [1101, 1321, soph] or grad

TH 5760. Advanced Stage Management. (2 cr.; Student Option; Every Fall & Spring) Practical experience in stage management for specific productions of the University Theatre with emphasis on rehearsal and performance. prereq: 5716 or concurrent registration is required (or allowed) in 5716, instr consent; 4 cr max for undergrads

TH 5950. Topics in Theatre. (1-4 cr. [max 80 cr.]; Student Option; Every Fall, Spring & Summer) Topics specified in Class Schedule.

TH 5993. Directed Study. (1-5 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Guided individual reading or study. Prereq 6 Th cr, instr consent, dept consent, college consent.

TH 6100. Theatre Practicum. (1-4 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright (see 8500 for design practicums). prereq: instr consent, dept consent

TH 8102. Theatre Historiography. (3 cr.; Student Option; Periodic Fall) Current trends in historiography; research strategies and methods.

TH 8111. History and Theory of Western Theatre: Ancient World and Early Medieval. (3 cr.; Student Option; Periodic Fall) History, theories, arts, and crafts of western theatre from the ancient world to the present.
TH 812. History and Theory of Western Theatre: Medieval Through Renaissance. (3 cr.; Student Option; Periodic Fall)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 813. History and Theory of Western Theatre: National Theatres to the French Revolution. (3 cr.; Student Option; Periodic Fall & Spring)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 814. Theatre: Performance and Political Modernity. (3 cr.; Student Option; Periodic Fall & Spring)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 815. History and Theory of Western Theatre: 20th Century Through World War II. (3 cr.; Student Option; Periodic Fall)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 816. History and Theory of Western Theatre: 20th Century From 1945 to the Present. (3 cr.; Student Option; Periodic Fall)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

TH 820. Seminar. (3 cr.; [max 12 cr.]; Student Option; Every Fall & Spring)
Selected research topics from various theatre fields and periods. Sample topics: Border Crossings--Theatre History and Representation; The Theatre and Drama of the Third Reich, 1927-1944.

TH 8333. FTE: Master's. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

TH 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Doctoral student, adviser and DGS consent

TH 8500. Theatre Design Practicum. (1-3 cr.; [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Individual creative projects in production of approved plays as a designer for scenery/properties, costumes, lighting, or sound (see 8100 for other creative practicums); prereq: instr consent, dept consent

TH 8510. Professional Design Workshop. (1-3 cr.; [max 18 cr.]; A-F only; Every Fall & Spring)
Development of graduate student as individual artist working collaboratively in performing arts industry. Further mastery of designer collaboration, self-promotion, management, displaying of job materials. Attend both professional/university productions throughout semester. prereq: MFA candidate

TH 8590. Theatre Technology Practicum. (1-3 cr.; [max 20 cr.]; Student Option; Every Fall & Spring)
Individual creative projects in the technology or craft of costume, lighting, makeup, props, scenery, sound, or theatre management. prereq: instr consent, dept consent

TH 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer)
tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

TH 8711. Theory and Practice of the Modern Stage Director. (3 cr.; Student Option; Periodic Fall)
Survey of principal stage directors (e.g., Saxe-Meiningen, Meyerhold, Brecht, Strehler, Mnouchkine, Brook) and their theories and practices from 1871 to today using books, journals, firsthand accounts, and videos.

TH 8750. MFA Directing Practicum. (2-3 cr.; [max 10 cr.]; A-F or Audit; Every Fall & Spring)
Rehearsed and performed production of published or original one-act (2 cr) or full-length play (3 cr) with budgeted design and technical support. prereq: MFA directing specialization

TH 8777. Thesis Credits: Master's. (1-18 cr.; [max 50 cr.]; No Grade Associated; Every Fall & Spring)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

TH 8888. Thesis Credit: Doctoral. (1-24 cr.; [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

TH 8950. Topics in Theatre. (1-4 cr.; [max 8 cr.]; Student Option; Every Spring)
Topics specified in Class Schedule.

TH 8990. Directed Research. (1-5 cr.; [max 10 cr.]; Student Option; Every Fall & Spring)
tbd prereq: instr consent, dept consent

TH 8994. Directed Research. (1-6 cr.; [max 18 cr.]; No Grade Associated; Every Spring & Summer)
tbd prereq: instr consent, dept consent

Therapeutic Radiology (TRAD)

TRAD 7170. Basic Radiological Physics. (3 cr.; H-N or Audit; Every Fall & Spring)

TRAD 7171. Physics of Nuclear Medicine. (2 cr.; H-N or Audit; Periodic Fall)
N/A prereq: 7170 or instr consent

TRAD 7174. Physics of Diagnostic Radiology. (2 cr.; H-N or Audit;)

TRAD 7177. Radiation Therapy Physics Laboratory: Radiation Physics Basics. (3 cr.; A-F only; Every Spring)
Hands-on experience with hardware/software used in radiation therapy clinic for physics measurements. prereq: 7170 or concurrent registration is required (or allowed) in 7173 or instr consent

TRAD 7505. Introduction to Radiation Oncology. (2 cr.; H-N only; Every Fall, Spring & Summer)
This course is designed not only for the student who plans to go into radiation therapy, but for those who plan to go into a field such as family practice, internal medicine, pediatrics, or surgery, where oncologic patients may be part of their practice. It provides training in clinical oncology, especially the diagnosis, disposition, and care of patients with cancer. The student attends all departmental and interdepartmental functions including follow-up clinics, new patient oncology conference, etc. radiation physics will provide supplemental teaching. There is no night call.

TRAD 7507. Advanced Radiation Oncology. (4 cr.; H-N only; Every Fall, Spring & Summer)
Here the student will gain more familiarity with the role of radiation therapy in the treatment of cancer patients. The student will be able to work-up new patients and present to the staff, assist in the treatment planning and follow patients through therapy. The student will see follow-up patients and new patient in the clinic. Student will observe or assist in brachytherapy source implantation for gynecology cancer.

TRAD 7510. Radiation Oncology Research. (8 cr.; H-N only; Every Fall, Spring & Summer)
This elective provides an opportunity for each interested student to participate in a clinical research project designed around a specific topic related to radiation oncology. The student may choose to participate in an ongoing research project within the radiation oncology division or in an original investigative project of the student's design arranged on an individual basis by the course director with staff members in the Department of Therapeutic Radiology/Radiation Oncology.

TRAD 7910. Therapeutic Radiology Residency. (6 cr.; [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer)
Therapeutic radiology residency.

TRAD 8149. Advanced Topics in Radiation Therapy Physics. (2 cr.; A-F only; Every Fall)
Special procedures, including total body irradiation, intensity-modulated radiation therapy, stereotactic radiosurgery/radiotherapy, image-guided radiation therapy. Treatment planning algorithms and techniques. Advanced techniques in brachytherapy. prereq: [7170, 7173] or [BPHY 5170, BPHY 5173]

Toxicology (TXCL)

TXCL 5000. Directed Research in Toxicology. (1-5 cr.; [max 80 cr.]; A-F or Audit; Every Fall & Spring)
Special project that addresses specific issue in toxicology. Under guidance of faculty member. prereq: instr consent
TXCL 5011. Principles of Toxicology. (2 cr.; A-F or Audit; Periodic Fall) Introduction to fundamentals of poisoning in individuals and the environment, assessment of potential health hazards, and application of toxicology in various professional careers. prereq: Grad tcxL major or instr consent

TXCL 5012. Principles of Toxicology. (3 cr.; A-F or Audit; Every Spring) Science of toxicology. Biomedical principles. Regulatory practices governing protection of human health and environmental quality. prereq: At least one semester [biochemistry, calculus, cell biology]; at least one semester of [human or animal] physiology recommended

TXCL 5013. Chemical Toxicology. (3 cr.; A-F or Audit; Every Fall) Signs, symptoms, and mechanism of toxicity of different classes of chemicals spanning several organ systems, including chemical carcinogenesis. prereq: 5012, instr consent

TXCL 5010. Molecular and Cellular Basis of Nanoparticle Toxicology. (3 cr. [max 6 cr.]; A-F or Audit; Fall Odd Year) Introduction to science of nanotoxicology. Nanotechnology in scientific research. Assessment of impact on biological systems. prereq: Introductory toxicology course

TXCL 5195. Veterinary Toxicology. (3 cr.; A-F or Audit; Every Fall) Toxicology of minerals, pesticides, venoms, and various toxins. Identification of poisonous plants. Recognition, diagnosis, and treatment of animal poisons. prereq: Grad student or instr consent

TXCL 5545. Introduction to Regulatory Medicine. (2 cr.; A-F or Audit; Periodic Spring) Explanation of products requiring pre-market approval and those that may be marketed without approval. Post-market surveillance. Adverse reactions, removal of product from market. prereq: Grad student or instr consent

TXCL 8012. Advanced Toxicology I. (3 cr.; A-F or Audit; Every Spring) Absorption, distribution, metabolism, and excretion of xenobiotics: toxicokinetics; mechanisms of toxicity or specific classes of chemical agents. prereq: 5011 or BioC 4331, PubH 5104 or instr consent

TXCL 8013. Advanced Toxicology II. (3 cr.; A-F or Audit; Every Fall) Kinetic and dynamic determinants of target organ toxicity; pathological alterations in structure/function relationships for major target organ systems; mechanisms of mutagenesis, carcinogenesis, and teratogenesis. prereq: 8012, BioC 4332, Phsl 5062 or Phsl 6101 or instr consent

TXCL 8100. Investigative Toxicology. (1 cr. [max 2 cr.]; A-F or Audit; Every Fall & Spring) Evaluating toxicology research issues and literature; prereq: 8013 or instr consent

TXCL 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Spring & Summer) (No description) prereq: Master’s student, adviser and DGS consent

TXCL 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer) (No description) prereq: Doctoral student, adviser and DGS consent

TXCL 8666. Doctoral Pre-Thesis Credits. (1-6 cr. [max 12 cr.]; No Grade Associated; Every Fall, Spring & Summer) tbd prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

TXCL 8777. Thesis Credits: Master’s. (1-18 cr. [max 50 cr.]; No Grade Associated; Every Spring & Summer) (No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

TXCL 8888. Thesis Credit: Doctoral. (1-24 cr. [max 100 cr.]; No Grade Associated; Every Fall & Spring) (No description) prereq: Max 18 cr per semester or summer; 24 cr required

Translation and Interpreting (TRIN)

TRIN 5993. Directed Study. (1-3 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Directed study in translation/interpretation.

University College (UC)

UC 5075. Directed Study. (1-8 cr.; Student Option; Every Fall, Spring & Summer) Directed study.

UC 5950. Special Topics. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Special topics.

Urologic Surgery (UROL)

UROL 7200. Surgical Specialty: Urology. (2 cr.; P-N only; Every Fall, Spring & Summer) Each student learns the basic principles of urology in this externship. Pediatric and adult urology are available. At the completion of the rotation, the student should be able to read an IVP, place Foley catheters, and read a urinalysis.

UROL 7252. Urological Conference. (3 cr.; No Grade Associated; Every Fall, Spring & Summer) Urological conference.

UROL 7253. Research in Urology. (3 cr.; No Grade Associated; Every Fall & Spring) Two-week urologic surgery externship. Principles of Urology students are use in a general medical practice. Urologic emergencies, infections, hematuria, stones, prostate cancer, and erectile dysfunction. How to read an IVP, place Foley catheters, and read a urinalysis. Frequent opportunities for student participation in rural consultations in primary care offices.

UROL 7900. Advanced Urological Surgery. (4-10 cr. [max 20 cr.]; H-N only; Every Fall, Spring & Summer) Advanced clinical urology rotation. Students act as sub-interns on busy clinical urology service. Students participate in weekly conferences and function as integral component of health care team.

UROL 7953. Urologic Research. (4-10 cr. [max 20 cr.]; H-N only; Every Fall, Spring & Summer) This is a full-time laboratory course in which the student learns the basic techniques of cell biology as they apply to urologic research. Basic techniques of protein purification for amino acid composition and sequencing, electrophoresis, Western blots, immunocytochemistry, and tissue culture are used in a well-defined project. The mechanics of working in a lab and research methodology are covered in this course.

UROL 7971. Urologic Surgery Medical Residency. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Urologic surgery medical residency.

UROL 7980. Urologic Surgery Medical Fellowship. (6 cr. [max 120 cr.]; No Grade Associated; Every Fall, Spring & Summer) Urologic surgery medical fellowship.

UROL 8254. Urological Seminar. (2 cr.; Student Option; Every Spring & Summer) tbd

UROL 8255. Urological Radiological Conference. (2 cr.; Student Option; )

UROL 8256. Urological Pathological Conference. (2 cr.; Student Option;)

UROL 8257. Selected Topics in Genitourinary System. (1 cr.; Student Option;)

Veterinary Medicine (CVM)

CVM 6000. Gopher Orientation and Leadership Experience. (2 cr. [max 4 cr.]; S-N only; Every Fall & Spring) Introduces first-year students to the veterinary college, program, and profession. Two-day and one-night off-site orientation program and monthly meetings are experiential in design and focus on leadership development, emotional intelligence, communication, and conflict management. Third orientation day on campus and subsequent noon meetings introduce students to the college facilities and resources and address logistics necessary for participation in the program. Students work in mentor groups of 9-11 students and 2-3 faculty mentors throughout the course. prereq: Admission to veterinary program

CVM 6001. Global and Intercultural Opportunities. (0.5 cr. [max 1 cr.]; S-N only; Every Fall)
Finding and applying for opportunities. Securing funding. Travel safety. Topics in cultural competence. Presentations from students who have participated in international projects.


**CVM 6006. Global One Health: Thailand.** (3 cr.; S-N only; Periodic Spring) Self-guided study. Monthly in person seminars prior to three week study abroad in Thailand. Journal on recommended topics. Assessment via evidence of reading provided references through active participation in discussions, presentation of learning topics, active participation. **CVM 6007. Global Perspectives and Intercultural Development.** (0.5 cr.; S-N only; Every Spring) This course provides information on international and cultural immersion opportunities including finding and applying for opportunities, securing funding, and traveling safely. Additionally, students will explore cultural humility through the Intercultural Development inventory, case studies, and class activities. Students will also have the opportunity to view posters and ask questions from current students who have participated in international projects

**CVM 6026. Small Animal ICU Practicum: Year 4.** (1 cr.; max 3 cr.; S-N or Audit; Every Fall, Spring & Summer) Management of dogs/cats requiring urgent medical care, intensive medical management. Providing primary case support through patient evaluation, problem solving, health care delivery, equipment operation. Practicum in Small Animal Intensive Care Unit.

**CVM 6027. Large Animal Practicum: Year 3.** (1 cr.; S-N only; Every Fall & Spring) Experience in procedures/policies involved in after-hours care of hospitalized/emergency cases in the large-animal hospital. Prereq: 3rd yr DVM or [instr consent, college consent]

**CVM 6028. Large Animal Clerk Duty.** (4 cr. [max 12 cr.]; S-N or Audit; Every Fall, Spring & Summer) Team leadership in procedures/policies involved in after-hours care of hospitalized/emergency cases in large-animal hospital. Prereq: All 4th year students in Food Animal, Equine, Mixed tracks, as well as affiliate students.

**CVM 6029. Small Animal Hospital Practicum: Year 3.** (1 cr.; max 2 cr.; S-N only; Every Fall, Spring & Summer) Management of dogs/cats requiring urgent medical care, intensive medical management. Providing primary case care and service support through patient evaluation, problem solving, health care delivery, equipment operation. Practicum is served in Small Animal Intensive Care Unit. prereq: DVM 3rd yr or instr consent

**CVM 6030. Veterinary and Community Public Health.** (; 2 cr.; A-F or Audit; Every Spring) Epidemiological approach to veterinary public health. Major zoonoses, animal sentinel, meat/milk inspection, preharvest food safety, environmental dispositional health and safety, euthanasia, carcass disposal methods, cruelty investigations, welfare issues. Problem-solving examples, prereq: 6201, 6202, 6220

**CVM 6137. Small Animal Clinical Nutrition.** (2 cr. [max 6 cr.]; A-F only; Every Fall, Spring & Summer) Students participate in clinical nutrition service of VMC, manage nutritional needs of patients, perform nutritional assessments of ICU patients, perform internal/referring nutritional consults, and see outpatient appointments. prereq: 3rd or 4th yr DVM or instr consent

**CVM 6206. Introduction to Integrative Medicine.** (1 cr.; S-N only; Every Spring) This 1 week elective rotation is primarily provided for 4th year veterinary students. The integrative medicine rotation will cover traditional eastern veterinary medicine, animal chiropractic, nutritional therapy, neurotreaticals, physical therapy, and massage therapy.

**CVM 6222. Advanced Clinical Epidemiology.** (; 1 cr. [max 2 cr.]; A-F only; Every Fall) Apply epidemiologic principles to control of infectious diseases in animal populations. Scientific literature. Global impacts of infectious diseases. Diagnostic tests, disease outbreak investigation, economics of disease control/surveillance.

**CVM 6308. Lab Animal Medicine.** (2 cr.; A-F only; Every Spring & Summer) This course is designed to introduce students to the field of laboratory animal medicine and provide a strong foundation in the discipline. Using a mix of didactic and hands-on training methods, students will gain proficiency in the veterinary care of lab animals, and apply their skills and knowledge gained in all previous courses in their veterinary curriculum. Discussions will be challenging and require independent thought and application of concepts to real-world situations. Students will be well-prepared for additional training in laboratory animal medicine as would occur though residency.

**CVM 6312. Veterinary Dental Rotation (SDen).** (2 cr. [max 6 cr.]; A-F only; Every Fall, Spring & Summer) Routine/complex dental problems. Students diagnose and formulate treatment plans. Hands-on training. Basic periodontal procedures, single/multi-rooted extractions, dental radiographic techniques, instrument/equipment care, dental charting. prereq: DVM 3rd or 4th yr student or instr consent

**CVM 6404. Small Animal Dermatology: Advanced Block.** (1 cr.; A-F or Audit; Every Spring) Case-base discussion of common dermatologic conditions that affect dogs/cats. Students work on clinical cases outside classroom. Cases are discussed in classroom.

**CVM 6452. Metabolic Disorders II.** (; 3 cr.; A-F or Audit; Periodic Fall) Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocols for metabolic and endocrine based disorders of domestic species. prereq: DVM 3rd yr or instr consent

**CVM 6482. Small Animal Theriogenology.** (1 cr. [max 2 cr.]; A-F only; Every Fall) Normal/abnormal reproduction in dogs/cats. Dystocia management. Diagnosis/treatment of reproductive tract disease. Exotics. prereq: 3rd yr DVM or instr consent


**CVM 6500. Animal, Public, and Ecosystem Health.** (2 cr. [max 4 cr.]; S-N only; Every Fall, Spring & Summer) Emphasize interactions with public health, policy, and regulatory partners to provide a basic understanding of the essential roles veterinary professionals play in public health, disease control, food safety, and ecosystem health. prereq: DVM 3rd or 4th yr or grad student or instr consent

**CVM 6501. Advanced Veterinary Public Health: Current Topics.** (1 cr. [max 2 cr.]; S-N only; Every Fall, Spring & Summer) Systems used to raise livestock/poultry, deliver through markets to slaughter or processing facilities, and deliver to consumers. Methods to assess/mitigate risks. Emphasizes public health/food safety issues. Field trips, problem solving, assignments. prereq: DVM or MPH or grad student or instr consent

**CVM 6502. Necropsy.** (2 cr. [max 40 cr.]; S-N only; Every Fall, Spring & Summer) Students perform necropsies, collect tissues for lab analysis, interpret clinicopathologic findings, prepare reports on animals submitted to Veterinary Diagnostic Lab, apply basic clinical science to diseases for animals and populations of animals. Students may participate in history taking. Case findings discussed daily. Student groups present case reports at weekly departmental seminar. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6503. Exotic Animal Necropsy Rotation.** (2 cr.; A-F only; Every Fall, Spring & Summer) Zoo/wildlife pathology service similar to required necropsy rotation (CVM 6502). Perform necropsies of incoming cases of “nontraditional” animals. Write report and
CVM 6504. Remediation course. (0.5-9 cr. [max 27 cr.]; S-N or Audit; Periodic Fall, Spring & Summer) Remediation course.

CVM 6505. Topics course. (0-8 cr. [max 80 cr.]; Student Option; Every Fall, Spring & Summer) Topics Course

CVM 6506. Directed Studies in Large Animal Medicine (DistL). (1-2 cr. [max 40 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students, under guidance of a faculty member, conduct a special project addressing an issue in large animal medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by the College of Veterinary Medicine’s curriculum committee. prereq: DVM 4th yr or instr consent

CVM 6507. Directed Studies in Small Animal Medicine (DistS). (1-2 cr. [max 40 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students, under guidance of a faculty member, conduct a special project addressing an issue in small animal medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by CVM’s curriculum committee. prereq: DVM 4th yr or instr consent

CVM 6508. Directed Studies: Pathobiology (DistP). (1-2 cr. [max 40 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students, under guidance of a faculty member, conduct a special project addressing an issue in veterinary pathobiology. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by adviser and approval by CVM’s curriculum committee. prereq: DVM 4th yr or instr consent

CVM 6509. Directed Studies: Diagnostic Medicine (DistD). (1-2 cr. [max 40 cr.]; S-N or Audit; Every Fall, Spring & Summer) Students, under guidance of a faculty member, conduct a special project addressing an issue in diagnostic medicine. Project proposals include hypothesis, objectives, plan of study, and product for evaluation by faculty adviser and approval by CVM’s curriculum committee. prereq: DVM 4th yr or instr consent

CVM 6510. MPH Project: PHP. (1-3 cr. [max 9 cr.]; S-N only; Every Fall, Spring & Summer) Directed field research. Original or secondary analysis of data sets related to public health practice. prereq: DVM student or instr consent

CVM 6511. Zoo and Wildlife Rounds. (0.5 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring) Zoo, wildlife, and exotic pet conservation. Seminars involving topics of exotic animal conservation, medicine, and pathology encountered at Minnesota, Como, and Lake Superior zoos; Raptor Center; and Minnesota Veterinary Diagnostic Laboratory. Basic biology of the affected animals, clinical aspects, and pathology of encountered diseases. Apply principles of basic/clinical science to address the cause of disease for individual animals as well as populations of species.

CVM 6512. Zoo and Wildlife Rounds. (1-2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Large Animal Medicine Rotation at another accredited veterinary college and used to meet a core medicine requirement.

CVM 6521. Avian & Exotic Medicine. (2 cr.; A-F only; Every Fall, Spring & Summer) Develop the knowledge and technical skills needed to manage common medical and surgical issues of popular avian and exotic species.

CVM 6532. Clinical Laboratory Medicine (Labs). (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer) One-week intensive rotation in veterinary clinical lab medicine. Hematology, cytology,
CVM 6535. RaOl Large Animal Surgery and Lameness. (2 cr.; A-F only; Every Fall, Spring & Summer) Large Animal Surgery Rotation at another accredited veterinary college and used to meet a core medicine requirement.

CVM 6538. Lakefield Clinical Rotation. (2 cr.; A-F only; Every Fall, Spring & Summer) Managing general/c Clinical caseload in a non-referral setting. Working with patients at Banfield, The Pet Hospital, under supervision of mentor. Managing acute/chronic cases. Client communication. Clinical skills.

CVM 6539. Wellhaven. (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) The intent of this rotation is to provide the student with experience, instruction, and supervision managing a general/caseload in a non-referral, non-academic setting. The student will use knowledge gained in didactic coursework to refine their medical knowledge base. The student will be provided the opportunity to improve their clinical skills working with patients seen at a Wellhaven hospital under the supervision of an assigned Wellhaven mentor and staff.

CVM 6540. Advanced Veterinary Toxicology. (: 2-8 cr. [max 40 cr.]; S-N or Audit; Every Fall, Spring & Summer) In-depth examination of toxins. Clinical, diagnostic, mechanistic, and therapeutic aspects of biotoxins, organic, and inorganic toxins that affect livestock, poultry, wildlife, and companion animals or that threaten public health, prereq: DVM 3rd or 4th yr or instr consent

CVM 6560. Public Health Issues and Veterinary Medicine Opportunities. (: 1 cr. [max 20 cr.]; A-F only; Every Fall & Spring) Public health practice and veterinary medicine. Day-to-day work of public health professionals. Public health principles in context. Veterinary medicine related to public health research/practice. Students interact with advocacy groups, media, lobbyists, legislators, regulatory officials, industry leaders, and public health professionals.

CVM 6601. Small Animal Internal Medicine: (SAM A). (: 2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Primary case responsibility for wide range of clinical diseases. History taking, physical examination, problem definition, diagnostic/therapeutic plans on assigned cases. Cases typically relate to gastroenterology, urology, nephrology, oncology, neurology, immunology, and cardiology. Daily rounds. Students present case discussion topics and interpret lab data, radiographic evaluations, and biopsy information. Emphasizes effective communications with clients/referring veterinarians. prereq: DVM 3rd or 4th yr or instr consent

CVM 6602. Small Animal Internal Medicine: (SAM B). (: 2 cr. [max 52 cr.]; Student Option; Every Fall, Spring & Summer) Problem-solving skills, clinical skills, communication skills, record keeping, ethical issues in referral cases. Methods of knowledge acquisition, including computerized searches and diagnostic programs. Small group rounds discussions. Students assist clinicians in management of referral/emergency cases. Cases typically related to gastroenterology, nephrology, urology, oncology, nutrition, neurology, and cardiology. prereq: [6601, [DVM 3rd or 4th yr]] or instr consent

CVM 6605. Banfield Elective Clinical Rotation. (: 2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Managing general/caseload in non-referral setting. Working with patients at Banfield, The Pet Hospital, under supervision of mentor. Managing acute/chronic cases. Client communication. Clinical skills.

CVM 6609. Emergency/Critical Care (ECC). (: 2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Emergency/critical-care cases in small animal practice or emergency practice. History taking, physical exams. Creating problem lists, proposing diagnostic/therapeutic plans. prereq: Sr

CVM 6630. Behavior. (2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Students participate in behavior consultations: history taking, diagnosis, outline of treatment protocols, sample collection, demonstration of training techniques, writing of treatment plans, case follow-up. Students present one case, prepare one topic of their choice for presentation during rounds. Daily rounds include discussion of cases, review of behavior-related articles, discussion of problem complexes. prereq: DVM 3rd or 4th yr or grad student or instr consent

CVM 6632. Dermatology (Derm). (: 2 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer) Routine dermatologic problems in companion animal practice. History taking, clinical diagnosis, patient management, client education. Students participate in all phases of diagnosis/management of cases. Small-group discussions. prereq: DVM 3rd or 4th yr or instr consent

CVM 6634. Ophthalmology. (2 cr. [max 40 cr.]; Student Option; Every Fall, Spring & Summer) Entry-level ophthalmology. Diagnosis, treatment. Outside readings, review papers, final essay exam. prereq: DVM 3rd or 4th yr or instr consent

CVM 6636. Cardiology. (2 cr. [max 40 cr.]; Student Option; Every Fall, Spring & Summer) Clinical problem solving. Cases of cardiopulmonary disease, including canine/feline congenital heart disease, acquired valvular/myocardial disease, dirofilariasis, arrhythmias, pulmonary disorders. Hands-on experience in conducting physical exams, recording electrocardiograms/echocardiograms, and reading thoracic radiographs. Group discussions, rounds. prereq: DVM 4th yr or CVM grad or instr consent

CVM 6644. Primary Care A. (2 cr. [max 40 cr.]; Student Option; Every Fall, Spring & Summer) Students manage their own cases including developing diagnostic, treatment, and preventive health maintenance plans for each patient, performing routine medical and surgical procedures, and conducting client communication and education. Wide variety of cases.

CVM 6648. Advanced Clinical Oncology Rotation. (: 2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Case management, self-directed research. Students receive oncology referrals, work with emergency cases and special procedures, assist in treatment decisions and therapeutic options for new cases, and manage ongoing chemotherapy/radiation therapy patients. Emphasizes principles of oncology and patient care. prereq: DVM 3rd or 4th yr or grad student or instr consent

CVM 6649. Primary Care B. (2 cr.; A-F only; Every Fall, Spring & Summer) Students manage their own cases including developing diagnostic, treatment, and preventive health maintenance plans for each patient, performing routine medical and surgical procedures, and conducting client communication and education. Wide variety of cases.

CVM 6651. Small Animal Ultrasound. (2 cr. [max 8 cr.]; A-F only; Every Fall, Spring & Summer) Students practice routine abdominal ultrasound. Principles for interpretation of exam. Learning through use of clinical caseload. Daily practice of particular ultrasound skills. Students scan clinical patients and interpret radiographic procedures as needed. prereq: [3rd or 4th yr] DVM or instr consent

CVM 6661. Neurology. (2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Medical/surgical neurology. Providing complete neurological service for clients, patients, and hospital. Integration into all aspects of service, including receiving, work up, surgery, care, communications, and discharges. prereq: 3rd or 4th yr DVM or instr consent

CVM 6662. Comparative Anesthesiology (Anes). (: 2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Practical experience in sedating/anesthetizing routine clinical cases. Previously taught lab protocols/techniques are used in healthy normal clinical cases and adapted for high risk cases. Emphasizes problem solving in formulation of anesthetic plans, management of patients under anesthesia, team work, and pain management. prereq: DVM 3rd or 4th yr

CVM 6663. SA Surgery. (2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Diagnostic/therapeutic management of surgical patients. History taking, physical examination,
communication, problem solving, and surgical techniques. Economic issues. Students work as part of a surgical service team with faculty member, resident, and intern. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6664. University of Minnesota: Spay and Neuter (UMSN).** (2 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) Elective surgeries such as ovariohysterectomy, neuter, and declaws for small animals. Two-student teams are responsible for pre-surgical evaluation, anesthesia induction/maintenance, surgical procedure, and post-operative care of animals supplied by Humane Society for Companion Animals. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6665. Small Animal Physical Rehabilitation.** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Students work closely with veterinary technician and physical therapist who are certified canine rehabilitation practitioners. Evaluating a patient to determine a rehabilitation problem list. Establishing treatment goals. Application of basic physical modalities, proper passive range of motion, beginning therapeutic exercises. Students develop treatment goals and plan for one orthopedic and one neurologic case.

**CVM 6666. Special Procedures in Veterinary Radiology.** (2 cr.; Student Option; Periodic Fall & Spring) Contrast agents and procedures used to examine various body systems or anatomical areas. prereq: DVM 3rd or 4th yr or grad or instr consent

**CVM 6668. Small Animal Radiology (RAD).** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Making high quality radiographs. Students practice routine and special procedures. Principles for interpretation. Exposure to CT and MRI. Daily radiographic interpretation in small animal species. Issues related to radiation protection. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6669. Radiology: Mixed Animal.** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Making high quality radiographs. Students practice routine and special procedures. Principles for interpretation. Exposure to CT and MRI. Daily radiographic interpretation in small animal species. Issues related to radiation protection. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6690. Integrative Medicine.** (1 cr.; S-N only; Every Spring) History/principles of acupuncture, chiropractic, and other commonly used complementary approaches to care of domestic animals. Training requirements for certification. Lectures, case examples, demonstrations. prereq: 2nd yr DVM student or instr consent

**CVM 6691. Veterinary Acupuncture (AcPunct).** (2 cr. [max 6 cr.]; Student Option; Every Fall, Spring & Summer) Basic veterinary acupuncture theory, point combination, treatment, diagnosis of diseases, hands-on veterinary acupuncture technique. prereq: [6690, [yr 3 or 4 DVM]] or instr consent

**CVM 6702. Large Animal Palpation Labs.** (1.5 cr. [max 2 cr.]; S-N only; Every Fall) Hands-on clinical experiences in equine, bovine, or large animal reproductive status/disorders. Students select species. prereq: DVM or instr consent

**CVM 6704. Reproductive Diseases of Cattle.** (2 cr. [max 6 cr.]; A-F or A/audit; Every Fall) Common diseases affecting reproductive function in cattle, swine, and small ruminants. prereq: 3rd yr DVM or instr consent

**CVM 6711. Large Animal Medicine (LAM).** (2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Medical diseases of horses, cattle, small ruminants, South American camels, and potbellied pigs. History taking, clinical diagnosis, patient management. Assessment of treatment responses. Clinic case material, opportunities to practice common procedures. Small group discussions on clinical diagnosis, treatment, and prevention of common medical disorders. prereq: DVM 3rd or 4th yr or instr consent

**CVM 6712. Equine Ambulatory Rotation.** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Equine ambulatory rotation meeting for two weeks performing farm calls, call backs, x-ray development, and restocking the van. Student and practitioner discuss cases as calls are being made.

**CVM 6715. Large Animal Surgery and Lameness.** (2 cr. [max 10 cr.]; Student Option; Every Fall, Spring & Summer) General surgery, lameness cases. Emphasizes horses. Some cattle, small ruminants/camels. Diagnostic/therapeutic management in hospital setting. Cases, rounds, exercises. Students work as part of surgical management or advanced diagnostic/therapeutic techniques available in a referral setting. prereq: 3rd or 4th yr DVM student or instr consent

**CVM 6720. Problem Solving in Equine Medicine.** (2 cr.; A-F or Audit; Every Spring) Evidence-based medicine and clinical epidemiology concepts are integrated into discussion of cases. Assignments include reading of journal articles, working through case scenarios on Web CT, and answering case-based questions. prereq: DVM 3rd yr or instr consent

**CVM 6721. Large Animal Neonatology.** (1 cr. [max 2 cr.]; S-N or Audit; Every Fall) Instruction, emergency duty, practical application of principles in evaluating/treating sick equine neonates. Seasonal participation in clinically managing hospitalized foals/pennally reviewing past cases.

**CVM 6727. Equine Palpation.** (0.5 cr. [max 1 cr.]; S-N only; Every Fall) Hands-on clinical experience in evaluation of equine reproductive status and reproductive disorders. prereq: DVM or instr consent

**CVM 6728. Reproductive Diseases of the Horse.** (1 cr.; A-F or Audit; Every Fall) Reproduction patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses. prereq: DVM 3rd yr or instr consent

**CVM 6732. Equine Dentistry and Preventative Medicine.** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Two-week rotation on dental health care and general preventative health care for horses. Field trips, presentations, labs, case studies, clinical cases. prereq: 3rd or 4th yr DVM or instr consent; intended for equine track or mixed track students

**CVM 6733. Equine Dentistry and Nutrition.** (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) Equine dentistry and practical abilities for diagnosis/treatment of dental disorders. Equine nutrition and the practical application of common nutrition related health problems. Lectures, hands on activities, group work, and case correlates.

**CVM 6736. Equine Lameness and Podiatry.** (2 cr. [max 4 cr.]; A-F only; Every Fall, Spring & Summer) Rotation introduces diagnosis/treatment of equine lameness/hoof disorders. Clinical cases, presentations, case studies, labs. prereq: Intended for equine track or mixed track students

**CVM 6737. Equine Sports Medicine.** (2 cr.; S-N or Audit; Every Fall) Equine lameness and podiatry. Develop lameness and evaluation skills. Diagnostic principles for identifying lameness. Medical, surgical and rehabilitation therapies available to treat lameness. Didactic material, labs, and clinical cases. prereq: 6736

**CVM 6747. Equine Theriogenology.** (2 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Techniques in equine reproduction. Handling of stallions and mares. Testing for estrus detection. Rectal palpation, ultrasound exam of reproductive tract. Breeding management, hormone treatments, vaginal examination, uterine culture, cytology and biopsy, semen collection and evaluation, intrauterine therapy, artificial insemination.

**CVM 6750. Equine Sports and Rehabilitation Medicine.** (2 cr. [max 4 cr.]; A-F only; Every Fall & Spring) Rotation on equine sports medicine, exercise physiology, and rehabilitation therapy. Common injuries, prevention/management protocols. Principles/practices of athletic conditioning, performance testing, and rehabilitation therapy. Field trips, presentations, labs, case studies, clinical cases. prereq: DVM 3rd or 4th yr or instr consent; intended for equine track or mixed track students

**CVM 6789. Fresh Dairy Doe and Newborn Goat Kid Management.** (2 cr. [max 4 cr.]; A-F only; Every Spring) Rotation at Poplar Hill Goat Dairy during fresh doe/goat kid season. How to recognize,
diagnose, and treat kid illnesses. Health strategies to control Johne's, caprine arthritis encephalitis virus, coccidiosis, neonatal diarrhea, mastitis, mastitis, parasitism, and nutritional deficiencies.

CVM 6792. Small Ruminant Health and Production Rotation (SmRu). (2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer)
Sheep, goat, llama, farmed-deer production, medicine, and health. Nutrition/health management, new stock, facility maintenance, husbandry, diagnosis, record keeping, zoonosis, necropsy. Reproductive management. Breeding soundness, body condition, vasectomy, ultrasound, castration, tail docking, disbudding, dehorning, vaccination, parasites, restraint/handling, venipuncture, foot trimming, tuberculin testing. Farm visits. prereq: DVM 3rd or 4th yr or instr consent

CVM 6794. Camelid Medicine, Surgery, Reproduction, and Health Management. (2 cr. [max 4 cr.]; A-F only; Every Spring)
Two-week rotation. Approximately 15 farm visits are made to alpaca/llama farms. Approximately 10 alpacas/llamas are evaluated at VMC. Hands-on learning environment. Physical exam, venipuncture, ultrasound. Field surgeries such as castration, dental work, foot trimming, venipuncture, body condition score, preventive herd health management, pharmaceuticals. Common medical/reproductive problems. Interstate health certificates. Tuberculosis testing and necropsy. prereq: 3rd or 4th yr DVM or instr consent

CVM 6796. Beef Production Systems Medicine: Feedlot A. (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer)
Beef cattle feedlot production, medicine, health management. Production systems. Receiving protocols, economics. Livestock selection/evaluation, health management, facility evaluation. Pre-conditioning, pre-immunization, environmental pollution monitoring, transportation/vaccine protocols, nutrition, respiratory diseases, epidemics/disease. Evaluation of small/large feedlot operations. Body condition scoring, castration, dehorning/parasite control. Necropsy, field pathology sampling. Feedlot A rotation is located in Canada. Students are required to fund travel expense. prereq: DVM 3rd or 4th yr student or instr consent

CVM 6797. Beef Production Systems Medicine: Feedlot B. (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer)
Beef cattle feedlot production, medicine, health management. Production systems. Receiving protocols, economics. Livestock selection/evaluation, health management, facility evaluation. Pre-conditioning, pre-immunization, environmental pollution monitoring, transportation/vaccine protocols, nutrition, respiratory diseases, epidemics/disease. Evaluation of small/large feedlot operations. Body condition scoring, castration, dehorning/parasite control. Necropsy, field pathology sampling. Feedlot B rotation is located in Nebraska. Students are required to fund travel expense. prereq: DVM 3rd or 4th yr student or instr consent

CVM 6798. Beef Production Systems Medicine: Feedlot C. (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer)
Beef cattle feedlot production, medicine, health management. Production systems. Receiving protocols, economics. Livestock selection/evaluation, health management, facility evaluation. Pre-conditioning, pre-immunization, environmental pollution monitoring, transportation/vaccine protocols, nutrition, respiratory diseases, epidemics/disease. Evaluation of small/large feedlot operations. Body condition scoring, castration, dehorning/parasite control. Necropsy, field pathology sampling. Feedlot C rotation is located in Canada. Students are required to fund travel expense. prereq: DVM 3rd or 4th yr student or instr consent

CVM 6799. Beef Productions Medicine: Feedlot D. (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer)
Beef cattle feedlot production, medicine, health management. Production systems. Receiving protocols, economics. Livestock selection/evaluation, health management, facility evaluation. Pre-conditioning, pre-immunization, environmental pollution monitoring, transportation/vaccine protocols, nutrition, respiratory diseases, epidemics/disease. Evaluation of small/large feedlot operations. Body condition scoring, castration, dehorning/parasite control. Necropsy, field pathology sampling. Feedlot D rotation is located in Nebraska. Students are required to fund travel expense. prereq: DVM 3rd or 4th yr student or instr consent

CVM 6800. Bovine Palpation. (1 cr.; S-N only; Every Fall)
Practice in diagnostic evaluation of bovine reproductive tract. prereq: DVM or instr consent

CVM 6801. Dairy Production Medicine. (2 cr.; A-F only; Every Spring)
Gives students the background necessary to promote animal welfare, prevent disease and assist clients in making decisions that enhance their farms productivity and financial well-being.

CVM 6802. Food Animal Disease and Diagnostics. (2 cr.; Student Option; Every Spring)
Two-week rotation. Food animal necropsies, diagnostic assays. prereq: 3rd or 4th yr DVM student or instr consent

CVM 6807. Food Animal Surgery & Anesthesia. (2 cr.; A-F only; Every Fall & Spring)
This course is designed to provide intensive training in ruminant surgery to senior students. The course is unusual in format from most veterinary curriculum offerings and provides an in-depth evaluation of food animal surgery principles as well as hands-on laboratory components to solidify understanding of the material.

CVM 6811. Overview of Bovine Theriogenology and Lameness (OBTL). (2 cr. [max 20 cr.]; A-F only; Every Fall, Spring & Summer)
This is a senior rotation that will focus on improving students' clinical skills in the examination of the bovine female. Students will participate during this rotation in routine veterinary (reproductive and lameness related) procedures provided by the instructors' dairies. Students will be taught topics related to diagnostics, treatment and management of reproductive and foot diseases of dairy cows, topics related to reproductive and lameness management of dairy herds, and on-farm data analysis related to reproductive and health performance. prereq: instr consent

CVM 6813. Miracle of Birth. (2 cr. [max 4 cr.]; A-F only; Every Fall & Summer)
Delivery of calves, lambs, and piglets at the Minnesota State Fair. Assist in public education about large animal veterinary medicine processes. Birthing and veterinary assistance of the birthing process. Media relations and interviews. Students work with large animal veterinarians, FFA students, and instructors in this rotation.

CVM 6817. Bovine Theriogenology & Lameness Advanced. (2 cr.; A-F only; Every Fall, Spring & Summer)
Rotation will build on bovine theriogenology and lameness overview and offer more advanced techniques for bovine-interested students.

CVM 6821. Dairy on Farm Clinical. (2 cr. [max 12 cr.]; A-F only; Every Fall, Spring & Summer)
Typical transition cow management, clinical veterinary care. Students assist in all aspects of day-to-day management of TMF. Fresh cow screening/therapies, calvings, routine animal management. Students live at TMF during rotation. prereq: 3rd or 4th yr DVM student or instr consent

CVM 6831. Overview of Dairy Production Medicine. (2 cr.; A-F only; Every Spring)
Gives students the background necessary to promote animal welfare, prevent disease and assist clients in making decisions that enhance their farms productivity and financial well-being.

CVM 6842. Swine Disease Diagnostics, Therapeutics, and Prevention. (2 cr.; max 4 cr.; Student Option; Every Fall & Spring)
Major diseases and high-health technologies. Field trips of high-/low-health farms, abattoir for slaughter check. Problem solving, discussion of on-farm disease cases. In-clinic diagnostic techniques. prereq: DVM 3rd or 4th yr or instr consent

CVM 6845. Swine Production Training (SPT). (2 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer)
Day-to-day management of modern swine farm. Students assist with all techniques, protocols, and practices encountered daily in swine unit, conduct any necessary necropsies or surgical techniques, investigate production/health problems. On final day of rotation, students lead herd visit, summarize findings with producer and course coordinator, and write a herd report. prereq: 3rd or 4th yr DVM or instr consent

CVM 6854. Introduction to Swine Health and Production. (2 cr. [max 12 cr.]; Student Option; Every Summer)
CVM 6856. Advanced Swine Health and Production. (2 cr. [max 12 cr.]; Student Option; Every Summer) Capstone course. Complex field problems. Students follow selected swine disease investigations, from farm through diagnostic lab and back, determine impact of specific swine diseases on productivity and cost of production, design a control program, and collect/submit quality samples to diagnostic lab. prereq: DVM 3rd or 4th yr or instr consent

CVM 6865. Introduction to Swine Production Medicine. (1 cr. [max 2 cr.]; A-F only; Every Spring) Contemporary approaches to swine practice. Swine production, disease diagnosis, control, treatment, eradication, prevention. prereq: DVM student or instr consent

CVM 6883. Raptor. (2 cr. [max 4 cr.]; Student Option; Every Fall, Spring & Summer) Students participate in all aspects of raptor medicine, surgery, and rehabilitation and gain avian experience. Conservation medicine. prereq: 6497, DVM 3rd or 4th yr or instr consent

CVM 6884. Poultry Medicine Clerkship (PMC). (2 cr. [max 8 cr.]; A-F only; Periodic Fall, Spring & Summer) Broiler, layer, and turkey industries, performance analysis, disease diagnosis, management techniques for prevention/ control of disease, food safety problems and diagnostic pathology in a laboratory setting. Classroom presentations, discussions, on-farm evaluations.

CVM 6900. Microscopic Anatomy I. (2 cr.; A-F only; Every Fall) Identification, description, and understanding of basic structure and elements of cells and basic tissues. Identify and describe structure and organization of organ systems presented.


CVM 6902. Veterinary Biochemistry, Nutrition & Genetics. (3 cr.; A-F only; Every Fall) Principles of biochemistry, genetics, nutrition. Background information/how it is used to understand animal health/disease. Examples reinforced with in-class/out-of-class problems.

CVM 6903. Anatomy I. (4 cr.; A-F only; Every Fall) Sequential integration of normal gross/radiographic anatomy of carnivore. Knowledge gained provides solid foundation for current/subsequent courses within veterinary professional curriculum.

CVM 6904. Clinical Skills I. (1 cr. [max 2 cr.]; S-N only; Every Fall) Introduction to small/large animal species. Fundamental clinical skills for small/large animal species. Proper physical exam, safe handling/restraint, behavior/animal safety, frequently used clinical skill procedures. Large animal practicum. prereq: 1st year clinical skills course


CVM 6906. Critical Scientific Reading. (1 cr. [max 2 cr.]; S-N only; Every Fall) Skill development in reading of scientific literature. Papers critiqued for experimental design, statistical analysis, validity of results, contributions to literature, merit of study conclusions. Major aim of the course is to prepare veterinary students to think scientifically, for multiple career pathways, and an increasingly important role for veterinarians in comparative medicine.

CVM 6907. Professional Development II. (1.5 cr.; S-N only; Every Spring) Develop knowledge/skills needed to be successful veterinarian in areas such as communication, ethics, clinical decision-making, medical record keeping. Lecture, hands-on experiences, small group/mentor group discussions. The course will provide an overview of One-Health, animal welfare, legislative/current issues, and field trips to visit animal production facilities.

CVM 6908. Anatomy II. (3 cr. [max 5 cr.]; A-F only; Every Spring) Sequential integration of normal gross/radiographic anatomy of ungulates. Knowledge gained will provide solid foundation for current/subsequent courses within veterinary professional curriculum.

CVM 6909. Clinical Skills II. (1 cr.; S-N only; Every Spring) Domestic animal behavior. Basic small animal handling/management skills. Introduction to hospital. Small-animal clerk duty is required.

CVM 6910. Physiology II. (5 cr.; A-F only; Every Spring) Anatomic strategies adopted by different animal species to achieve same/similar function. Important physiologic processes used by animals to maintain homeostasis. Neural, endocrine, paracrine regulation of organ systems. Intermediary metabolism.

CVM 6911. Immunology. (2 cr.; A-F only; Every Fall) This course is structured as an introductory and multidisciplinary unit consisting of a series of lectures to provide a basic understanding of the cells, molecules, and mechanisms of immunology against microbial pathogens and neoplasia, as well as immune-mediated pathologies such as allergies and autoimmunity.

CVM 6912. Basic Pathology. (2 cr.; A-F only; Every Spring) Mechanisms in reactions of cells/tissues to injury. Retrorgressive changes in cells, cell death, pigments, circulatory disturbances, inflammation, alterations of cell growth (including neoplasia). Applications to evaluation of gross/microscopic tissue alterations.


CVM 6914. Preventive Medicine. (4 cr.; A-F only; Every Fall & Spring) Concepts of preventive medicine. Information reinforced in other coursework. Short video lectures/notes on website for access throughout training.

CVM 6915. Clinical Pathology I. (2 cr.; A-F only; Every Fall) Normal/abnormal function of hematopoietic system. Pathophysiologic changes underlying serum biochemical abnormalities. Principles/clinical application of cytology as diagnostic tool. How clinical laboratory data is generated/interpreted.


CVM 6917. Agents of Disease II. (5 cr.; A-F only; Every Fall) This course is the second part of the Agents of Disease series dealing with diseases caused by infectious agents. This course extends the foundational information obtained on viruses, bacteria and parasites in Agents of Disease I, into understanding diseases caused by these agents in species of veterinary importance. In this course we will continue to integrate concepts on pathogenesis, life cycle, host response, diagnostic tests, and transmission of agents of diseases into developing solutions for diagnosis, prevention and control of infectious diseases in animals.
CVM 6918. Pharmacology I. (2 cr.; A-F only; Every Fall)
Principles of drug action, disposition, and clinical applications in animal patients. Provide a solid base of general knowledge of pharmacology that will be important for later coursework in veterinary medicine and future successful veterinary practice. Students completing this course should have developed an understanding of how drugs from several medicinal classes are processed by animals and how these drugs exert their beneficial and adverse effects in animals.

CVM 6919. Systemic Pathology. (5 cr. [max 10 cr.]; A-F only; Every Fall)
Basic mechanisms of disease in various organ systems. Organ response to injury. Describe or interpret lesions in order to formulate morphological diagnoses/differential diagnoses (etiology). Correlate clinical/laboratory findings with clinical signs or lesions that might occur.

CVM 6920. Clinical Pathology I. (2.5 cr.; A-F only; Every Fall)
Understand/explain normal/abnormal function of hematopoietic system. Principles/clinical application of cytology as diagnostic tool. How clinical laboratory data is generated/interpreted.

CVM 6921. Clinical Skills III. (2 cr.; S-N only; Every Fall)
Builds on a clinical application of first year clinical skills. Include 2-3 clinical skills labs throughout year. Hands on practical experience with live animals. Other options include VMC mini rotations, Humane Society visits, SIRVS, RAVS, Gelding Project, VIDA, VetTouch other student specific proposals.

CVM 6922. Clinical Epidemiology. (1.5 cr. [max 2 cr.]; A-F only; Every Fall)
This course introduces the concepts, principles, and applications of veterinary epidemiology. Veterinary epidemiology is the foundation of health management of animal populations, be they companion animals, livestock, or wild populations. Clinical epidemiology provides the basis for medical decision-making in clinical practice.

CVM 6923. Public Health and Community Practice. (2 cr.; A-F only; Every Fall)
Mixture of didactic classroom lectures/in-class discussions/case presentations to provide overview of common zoonotic agents/other veterinary public health issues. Emphasis on case-based public health situations.

CVM 6924. Small Animal Medicine I. (2 cr.; A-F only; Every Fall)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, management protocol of common/important hematologic, immunologic, infectious diseases of dogs/cats.

CVM 6925. Diagnostic Laboratory. (2 cr.; A-F only; Every Fall)
Laboratory experiences designed to help veterinary students practice common clinical tests, understand principles of various types of tests, gain better appreciation of test selection/interpretation. Urinalysis, hematology, serology, detection of parasitic/microbial agents of disease. This course represents an effort to collect the relevant clinical laboratory information needed by the practicing veterinarian.

CVM 6926. Small Animal Medicine II. (5 cr.; A-F only; Every Spring)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options and management protocols, and prognosis of urinary tract, gastrointestinal, dental and endocrine diseases of dogs and cats.

CVM 6927. Small Animal Surgery I. (3 cr.; A-F only; Every Spring)
Provide students with the basic knowledge and skills needed to evaluate and treat common small animal surgical diseases. Provide students with background knowledge, problem-solving, and technical skills that will be the basis for clinical rotations and initial years in practice.

CVM 6928. Large Animal Medicine I. (2 cr. [max 4 cr.]; A-F only; Every Fall)
This course will address the core medical problems of swine; multisystemic infectious diseases of horses and ruminants; and common medical disorders affecting the hematologic, immunologic, urinary, and gastrointestinal systems of horses, ruminants, and camelids. It will provide part of the large animal clinical content needed to pass the National Board Examination, as well as foundation knowledge for subsequent large animal elective courses.

CVM 6929. Large Animal Surgery I. (3 cr.; A-F only; Every Spring)
This class addresses common surgical conditions in large animal species (equine, bovine, camelid and small ruminants) related to wounds, gastrointestinal disorders and musculoskeletal disorders.

CVM 6931. Diseases of Zoo Animals and Exotic Pets. (1 cr.; S-N or Audit; Periodic Fall)
Diseases of and management procedures for zoo animals and exotic pets. Restraint procedures, medication, diagnosis. prereq: DVM or grad or instr consent

CVM 6932. Introduction to Non-Domestic Veterinary Medicine. (1 cr.; S-N only; Every Fall)
Professions, including zoo, rehabilitation, wildlife, and conservation medicine. Job activities/availability, preparation to obtain a position. Restraint, evaluation, treatment and management of non-domestic species. prereq: 1st yr DVM or instr consent

CVM 6933. Zoological Medicine (MNZM). (2 cr. [max 20 cr.]; Student Option; Every Fall, Spring & Summer)
Introduction to all aspects of health care of zoo animals. Housing, nutrition, preventative health programs. Students assist zoo veterinarians with immobilizations, examinations, necropsies, laboratory work, records keeping. prereq: DVM 3rd or 4th yr or instr consent

CVM 6934. Selected Topics in Zoo Animal Medicine. (2 cr. [max 10 cr.]; A-F only; Periodic Fall & Spring)
Year-long course. Expertise needed by a zoo veterinarian, applications to specific captive species. Manage an animal problem or animal group problem, develop diagnostic/management/therapeutic recommendations, research three topics on an assigned species, build reference materials for case care, present findings to keepers at a selected zoo, develop an item for public education. prereq: [DVM 1st or 2nd yr] or instr consent

CVM 6935. Veterinary Imaging I. (4 cr.; A-F only; Every Spring)
Introduction to radiographic imaging, foundational principles, imaging modalities, and musculoskeletal, general abdomen and alimentary tract systems. Interpretation of radiographic studies and clinical applications germane to common animal diseases. Lectures and exercises using a body systems approach to imaging of large/small animals.

CVM 6936. Microscopic Anatomy II. (2 cr.; A-F only; Every Spring)
Identification, description, and understanding of basic structure and elements of cells and basic tissues. Identify and describe structure and organization of organ systems presented.

CVM 6937. Pharmacology II. (2 cr.; A-F only; Every Spring)
This course covers principles and clinical practices of veterinary toxicology. Mechanisms of action, pharmacokinetics and therapeutic uses of drugs affecting various systems and organs. Basic pharmacodynamics and pharmacokinetic aspects of anti-bacterial, anti-fungal, anthelminthic and anti-neoplastic drugs, including drug mechanim and spectrum of action, side effects and toxicity, and modes of drug resistance that diminish clinical efficacy.

CVM 6938. Professional Development II. (1 cr. [max 2 cr.]; S-N only; Every Fall)
Integrates subjects in veterinary professional curriculum. Introduction to/practice of professional skills. Communication, ethics, teamwork, leadership. As a result of taking this course, students will be able to define medical professionalism, understand the concepts, organization, and hierarchy of problem oriented thinking by demonstrating problem definition and problem refinement. Students will identify, list and utilize resources available for answering clinical questions. Students will utilize clinical skills (history and physical exam) to assess individual or populations of animals in order to develop diagnostic and therapeutic plans. Students will effectively communicate problem oriented approach to colleagues in oral and written format. Students will effectively communicate the medical plan, treatment options, prognosis and cost of recommendations to owner.

CVM 6939. Non-Traditional Pet Care. (1 cr.; S-N only; Every Spring)
Introduction to the care and handling of a variety of small animals including reptiles, amphibians, rodents, rabbits and ferrets, seen by veterinarians in primary care practice. This course provides an overview of gross and radiographic anatomy, major infectious diseases and their management, and normal behavior in domestic environments.
CVM 6941. Clinical Skills IV. (2 cr.; S-N only; Every Spring)
Builds on clinical application of first/2nd year fall clinical skills. Includes clinical skills labs throughout year. Hands on practical experience with live animals. Other options include VMC mini rotations, Humane Society visits, SIRVS, RAVS, Gelding Project, VIDA, VetTouch other student specific proposals.

CVM 6942. Veterinary Clinical Pathology II. (3 cr.; A-F only; Every Spring)
Required readings, didactic classroom lectures, on-line tutorials, group discussions, homework to cover veterinary clinical pathology. Integration of all clinical pathology data available for patient with opportunity for students to distinguish diseases with similar clinical or clinic-pathologic findings.

CVM 6943. Avian Core. (2 cr.; A-F only; Every Spring)
This course will present information on birds. Successful completion will provide a firm foundation for more advanced avian studies such as companion bird medicine, poultry health, raptor rehabilitation and avian surgery. Through a blend of didactic lectures, hands-on laboratories, and student-driven inquiry, topics of ornithology, behavior, anatomy, physiology, production management, diseases and basic clinical procedures will be presented. Fundamentals of flock management and nutrition will be covered along with principles of biosecurity and recognition of diseases will be addressed.

CVM 6944. Small Animal Surgery II & Anesthesia. (3 cr.; A-F only; Every Fall)
This course will introduce the principles of small animal anesthesia, critical care, and will continue the principles of surgery from Surgery I (CVM 6927). The course will consist of lectures laboratories, and a case discussion session.

CVM 6945. Large Animal Medicine II. (3 cr.; A-F only; Every Fall)
Course addresses common medical disorders of the large animal neurological, muscular, cardiovascular, and respiratory systems, as well as core medical problems of swine. It will provide part of the large animal clinical content needed to pass the National Board Examination, as well as foundation knowledge for subsequent large animal elective courses.

CVM 6946. Large Animal Surgery II. (1.5 cr.; A-F only; Every Fall)
Course concentrates on the principles of anesthesia, identifying surgical conditions of the cardiopulmonary and urogenital systems, common urogenital surgeries and miscellaneous conditions of the head and tail. Species discussed include horses, cattle, small ruminants and pot-bellied pigs.

CVM 6947. Veterinary Imaging II. (2 cr.; A-F only; Every Fall)
Imaging of the thorax, urogenital tract, and spine. Emphasis on interpretation of radiographic studies and clinical applications germane to common animal diseases. Lectures and active learning exercises using a body systems approach to imaging (primarily radiographic) of small and large animals.

CVM 6949. Comparative Theriogenology. (3 cr.; A-F only; Every Fall)
This course develops a broad clinical knowledge of common reproductive management strategies and clinical conditions associated with reproduction in the major domestic species. It provides information and strategies for the conduct of breeding soundness examination and infertility work-ups in the male; estrous cycle characteristics, diagnostics and control in females; breeding management strategies, pregnancy diagnosis and management of gestation; investigation and control strategies for pregnancy loss; management of parturition and treatment of dystocia; normal post-partum changes and diseases of the peri-partum period and the pathophysiology and treatment of uterine infections. Material is presented in both a comparative and species specific manner.

CVM 6952. Clinical Skills V. (1 cr.; S-N only; Every Fall)
This course aims to build on the clinical application of the first two years clinical skills coursework including further development of physical examination competence and frequently used clinical skill procedures. The course will incorporate a variety of opportunities to practice clinical skills including 1-2 clinical skills labs in the fall, small and large animal hospital practicum and outside veterinary hospital visits. Other experiences that can be chosen include Humane Society visits, SIRVS, RAVS, Gelding Project, VIDA, VetTouch and other student specific proposals.

CVM 6953. Professional Development IV. (2.5 cr.; S-N only; Every Fall)
This class will prepare students for practice from both a legal and logistical perspective (Practice Management) and provide you with opportunities to hone your communication skills and thereby equip you to build your future relationships with your clients.

CVM 6954. Small Animal Medicine III. (5 cr.; A-F only; Every Fall)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options and management protocols, and prognosis of cardiopulmonary, neurologic and neoplastic diseases of dogs and cats.

CVM 6956. Small Animal Selective I. (4 cr.; A-F only; Every Spring)
This course is intended to integrate clinical core knowledge for small animal primary care. Included in this course are the entry level competencies for small animal care in the areas of preventive care, anesthesia, emergency medicine, cardiology, surgery, nutrition, dermatology and dentistry. Students will develop the skills and knowledge to maintain health, identify and treat or manage common small animal conditions.

CVM 6957. Small Animal Selective II. (4 cr.; A-F only; Every Spring)
Explore advanced content related to small animal practice. Specialties covered in this course include nutrition, dentistry, cardiology, anesthesia, surgery, oncology, ultrasound, and emergency and critical care. Develop the skills and knowledge to treat a variety of small animal diseases and conditions. Practice advanced dental and surgical skills in a laboratory setting.

CVM 6958. Small Animal Problems. (2 cr.; A-F only; Every Spring)
This course uses a mixture of didactic classroom mini-lecture and group discussion and case-based homework to cover a variety of problems encountered in small animal medicine. Problems may be ones listed as presenting complaints by owners of dogs and cats, problems found on physical examination, or laboratory abnormalities encountered in case evaluation. Emphasis will be placed on selection of laboratory tests, interpretation of results, and using results to guide development of a diagnostic and treatment plan for patients. The course will emphasize integration of information introduced in core companion animal systems courses with clinical pathology.

CVM 6959. Orientation to Clinical Rotations. (2.5 cr.; S-N only; Every Spring)
Provides students with an overview and exposure to various topics, issues, and procedures that will be encountered during their senior rotations. The goal of the Orientation to Clinical Rotations course is to facilitate student transition into clinics. The course will include didactic lectures, group exercises, and open discussions. Topics that will be covered include: CVM and VMC policies and procedures, patient flow, SOAPs, discharges, admissions, ICU/wards, patient care, UVIS, client communications, infection control, safety, pharmacy, licensure, and rotation.

CVM 6960. Equine Selective I. (2.5 cr.; A-F only; Every Spring)
The primary objective of this elective is to provide the opportunity for third year students interested in equine practice to expand their knowledge and clinical skills beyond core levels achieved in the preceding curriculum. This course includes content and skills that are considered entry level requirements for students who plan to provide clinical care for horses at any level in their practice after graduation. It is the minimum required for students with an interest in care of horses in a mixed animal practice setting and serves as a foundation for further learning and skill development provided in the Equine Selective II, as well as for the equine rotations for senior students.

CVM 6961. Equine Selective II. (3 cr.; A-F only; Every Spring)
This elective is designed to provide further opportunity for third year students focused on equine practice to expand their knowledge and skills beyond core levels achieved in the preceding curriculum and Equine Selective I. Content has been chosen to prepare the student for equine work on the large animal rotations and equine or mixed animal practice. Students will study equine disorders, diagnostic testing, anesthesia, and surgical techniques in greater detail through a combination of lectures.
and labs, and will practice working through clinical cases in a problem-based format. By the end of the course, students will have improved their general knowledge of equine medicine and practice; recognize common medical disorders; select initial diagnostic tests; be able to perform neurologic and urinary tract examinations; be able to perform upper airway endoscopy; be able to perform transtracheal wash and bronchoalveolar lavage procedures; and explain therapeutic options for common disorders.

CVM 6962. Equine Problems. (2 cr.; A-F only; Every Spring)
This course is intended for third year students in the veterinary medicine curriculum. Each two-hour class period will include a review of evidence-based medicine concepts integrated into the discussion or one or more cases during the class period. This course is designed to:

1) Enhance student knowledge of diagnosis, pathophysiology and treatment equine diseases; 2) allow students to develop critical clinical thinking and problem solving skills; 3) to demonstrate the use evidence based medicine in solving clinical problems; 4) to give students the tools necessary to become lifelong learners and stay current with advances in veterinary medicine after completion of veterinary school. Students will have the opportunity to create differential diagnosis lists for several common equine presenting complaints, review pertinent literature, and work through several real life cases throughout the semester. By the end of the semester students will be comfortable with the process of case work-up and will be prepared to implement this process during their clinical year.

CVM 6963. Food and Fiber Selective I: Food and Fiber Practice. (4 cr.; A-F only; Every Spring)
Introduction to food animal practice at any level from mixed practice with backyard producers to dedicated species practitioners. Course will cover principles common to all food animal species. Students will gain exposure to common house and production systems, approaches to treatment and management of common diseases as well as field anesthesia and surgery.

CVM 6964. Food & Fiber Selective II: Production Medicine. (4 cr.; A-F only; Every Spring)
The course will provide a detailed understanding of general principles of swine and ruminant health and production, analytical skills applied to production records and economics, and therapeutic and preventative decision-making for prevalent clinical diseases and syndromes in US swine and ruminant herds.

CVM 6966. Applied Small Ruminant and Camelid Practice. (1 cr.; A-F only; Every Spring)
This course will build upon previously taught core material focusing on diagnosing, treating, and preventing common problems seen in routine veterinary practice with sheep, goats, and camelds. This course will be a prerequisite for 4th year Small Ruminant and Doe/Kid rotations (unless instructor permission is given).

CVM 6967. Food and Fiber Animal Problems. (2 cr.; A-F only; Every Spring)
This course uses a mixture of classroom group discussion and case-based assignments to cover a variety of problems encountered in food animal production medicine. Problems may be ones listed as presenting complaints by owners/ producers of food animals (e.g. cattle, swine, small ruminants) problems found on physical examination/herd visits, or abnormalities encountered in case/records evaluation. Emphasis will be placed on applying an epidemiological approach for herd investigations, including records analysis, selection of laboratory tests and interpretation of results. Following diagnosis, students will formulate a plan for treating individual affected animals and develop a preventative health management plan for the herd, as applicable. The course will emphasize integration of information introduced in core food animal systems courses with clinical pathology.

CVM 6968. Obstetrics Lab. (0.5 cr.; S-N only; Every Spring)
This is a practical laboratory in which students will have the opportunity to practice obstetric procedures, including a full fetotomy, that were described in lecture during the fall semester Comparative Theriogenology course. Students will be grouped and each group will have two labs occurring on consecutive days; one for correction of dystocia and the second concentrating on fetotomy technique. Within each group, students will work in pairs. The lab uses late term fetuses, obtained from the slaughterhouse, that are placed in dummy cows. While late term fetuses removed from the uterus have less disease risk than dead calves, students are required to wear protective clothing at all times; including gloves (O8 sleeves and latex), boots, and coveralls. Face shield will be provided if needed. Students MUST be careful with hygiene during and after the labs (e.g., avoid touching the mouth with dirty hands during the lab and WASH HANDS AFTER THE LAB).

CVM 6969. Large Animal Medicine III. (4.5 cr.; A-F only; Every Fall)
Course addresses common medical disorders of the large animal neurological, muscular, cardiovascular, and respiratory systems, as well as core medical problems of swine. It will provide part of the large animal clinical content needed to pass the National Board Examination, as well as foundation knowledge for subsequent large animal elective courses.

CVM 6970. Professional Development V. (1 cr.; S-N only; Every Spring)
Practice of professional skills: communication, ethics, teamwork, and leadership. Students will be able to define medical professionalism, understand the concepts, organization, and hierarchy of problem oriented thinking by demonstrating problem definition and problem refinement. Students will identify, list, and utilize resources available for answering clinical questions, and utilize clinical skills (history and physical exam) to assess individual or populations of animals in order to develop diagnostic and therapeutic plans. Students will effectively communicate a problem-oriented approach to colleagues in oral and written format, as well as a medical plan, treatment options, prognosis, and cost of recommendations to owner.

CVM 6971. Dermatology. (2 cr.; A-F only; Every Spring)
Case-base discussion of common dermatological conditions that affect dogs and cats. Students work on clinical cases outside classroom. Cases are discussed in classroom.

CVM 6972. Ophthalmology. (1.5 cr.; A-F only; Every Fall)
Common procedures for evaluation, diagnosis, and treatment of eye disorders in domestic species.

CVM 6973. Behavior. (1 cr.; S-N only; Every Spring)
Introduction to abnormal and undesired animal behavior, diagnostic procedures, and behavioral and pharmacological modifications.

CVM 6974. Veterinary Toxicology. (2 cr.; A-F only; Every Fall)
Mechanisms by which common toxicants encountered in residential, natural, and agricultural or industrial settings exert their deleterious effects in animals. Approaches to treating common toxicoses arising from toxicant exposure.

CVM 6975. Mixed Animal Problems. (2 cr.; A-F only; Every Spring)
This course uses a mixture of didactic classroom mini-lecture and group discussion and case-based homework to cover a variety of problems encountered in small and large animal medicine and laboratory animal medicine.

CVM 6976. Small Ruminant Practice Elective. (1 cr. [max 2 cr.]; A-F only; Every Spring)
This course will build upon previously taught core FA material focusing on diagnosing, treating, and preventing common problems seen in routine veterinary practice with sheep and goats. This course will be a prerequisite for 4th year Small Ruminant and Doe/Kid rotations (unless instructor permission is given).

CVM 6977. Advanced Dairy Production Medicine I. (2 cr.; A-F only; Every Spring & Summer)
This rotation will give students the background necessary to provide production medicine related services. The concepts introduced in ODPM will used as a basis to explore topics further. This will allow participants to assist clients in making decisions that enhance their farms productivity, promote animal and financial well-being.

CVM 6978. Advanced Dairy Production Medicine II. (2 cr.; A-F only; Every Spring & Summer)
This rotation will give students the background necessary to provide production medicine related services. The concepts introduced in ODPM will used as a basis to explore topics further. This will allow participants to assist clients in making decisions that enhance their farms productivity, promote animal and financial well-being.
Further. This will allow participants to assist clients in making decisions that enhance their farms productivity, promote animal and financial well-being.

**CVM 6981. Clinical Correlations I.** (1 cr.; S-N only; Every Spring)

This course design follows principles of research in learning; prepares students for clinical work as well and what will be expected of them in senior year and, for most, in their career; and prepares students for life-long learning by requiring them to find resources.

**CVM 6982. Clinical Correlations II.** (1 cr.; S-N only; Every Spring)

This course design follows principles of research in learning; prepares students for clinical work as well and what will be expected of them in senior year and, for most, in their career; and prepares students for life-long learning by requiring them to find resources.

**CVM 6983. Study Strategies for Success.** (1 cr.; S-N only; Every Fall & Spring)

This elective course will provide students with information about how learning works and with training in the skills of metacognition to best permit them to develop successful study strategies. Specific skills addressed will include those for study preparation (time management, creating a study space, the role of external factors such as distractions, exercise, and sleep), reading to ensure understanding, review of writing skills, taking notes from readings and in lecture, active review to enhance retention, and test-taking strategies. The course will conclude with information about problem-solving and specific strategies for learning in a clinical environment.

**CVM 6984. Introduction to Laboratory Animal Medicine.** (1 cr.; A-F only; Every Spring)

Understand varying ethical perspectives on the use of animals as research subjects and identify the role and mechanism of regulatory oversight of animal research. Learn basic concepts related to care and husbandry of laboratory animal species and understand the unique anatomic, behavioral, and physiological aspects of common laboratory animal species and identify common clinical diseases of laboratory animals, including pathogenesis, diagnosis, and treatment.

**CVM 6985. PhD Project.** (2 cr. [max 12 cr.]; S-N only; Every Fall, Spring & Summer)

Preparation and research for PhD dissertation

**CVM 6986. MS Project.** (2 cr. [max 12 cr.]; S-N only; Every Fall, Spring & Summer)

Preparation and research for MS thesis

**CVM 6999. Directed Study for Out of Sync Student.** (0 cr.; No Grade Associated; Every Fall, Spring & Summer)

Directed study.

**Veterinary Medicine, Graduate (VMED)**

**VMED 5080. Problems in Veterinary Epidemiology and Public Health.** (1-3 cr.; A-F or Audit; Every Fall & Spring)

Individual study on problem of interest to epidemiology or public health student.

**VMED 5082. Diagnostic Epidemiology of Infectious Diseases.** (2 cr.; A-F only; Every Spring)

Theoretical principles, practical applications of diagnostic testing in populations. Examples related to infectious diseases in veterinary/human health. Basis of test performance, limitations, interpretations. prerequisite: Statistics course or instructor consent

**VMED 5090. Seminar: Veterinary Epidemiology.** (1 cr. [max 3 cr.]; S-N or Audit; Every Fall & Spring)

Each student leads at least one seminar. Reviews of current research, literature reviews, and technique development. Students and participating faculty participate in presentation, discussion, and administration of the seminars. prerequisite: Veterinary Medicine grad student

**VMED 5101. Molecular and Cellular Basis of Nanoparticle Toxicity.** (3 cr. [max 6 cr.]; A-F or Audit; Every Fall)

Use of nanotechnology in scientific research. Impact of nanomaterials on biological systems.

**VMED 5165. Surveillance of Foodborne Diseases and Food Safety Hazards.** (2 cr.; Student Option; Every Spring)

Principles/methods for surveillance of foodborne diseases. Investigation of outbreaks. Assessment of food safety hazards. Focuses on integration of epidemiologic/lab methods. prerequisite: [PHYS 5330, professional school or grad student)] or instructor consent

**VMED 5180. Ecology of Infectious Disease.** (3 cr.; Student Option; Every Fall)

How host, agent, environmental interactions influence transmission of infectious agents. Environmental dissemination, eradication/ control, evolution of virulence. Use of analytical/molecular tools.

**VMED 5181. Spatial Analysis in Infectious Disease Epidemiology.** (3 cr.; Student Option No Audit; Every Spring)


**VMED 5182. Molecular biology for the Public Health Professional.** (2 cr.; Student Option; Every Spring)

This course focuses on introducing students to molecular biology lab tools that are used to investigate infectious diseases in public health settings. The course combines laboratory sessions during which students will learn and run molecular assays with computer lab sessions during which students will analyze molecular data.

**VMED 5190. Seminar and Presentation Development.** (2 cr.; S-N only; Every Fall)

Skills needed to research, organize, develop, and deliver an oral scientific presentation or to assist in finding, compiling, and organizing information for presentations, theses, or papers suitable for publication. prerequisite: Grad student

**VMED 5193. Dairy Decision Making in a Financial Context for Veterinarians.** (3 cr.; A-F only; Every Fall)

Concepts/tools of economic analysis needed to support decision making on dairy farms, particularly as those decisions relate to health, disease impact, nutrition, general farm management. Prerequisite: Earned DVM, instructor consent.

**VMED 5210. Advanced Large Animal Physiology I.** (1-3 cr.; [max 6 cr.]; Student Option; Every Fall)

Review of large animal physiology at level needed for specialty board certification or beginning research. Students present topics in physiology and supplement reading with clinical case material or journal articles.

**VMED 5211. Advanced Large Animal Physiology II.** (1-3 cr.; A-F or Audit; Every Spring)

Large animal physiology for specialty board certification or beginning research. Students present topics in physiology and supplement reading with clinical case material or journal articles. prerequisite: instructor consent, 5210 recommended

**VMED 5232. Comparative Clinical Veterinary Dermatologic Pathology.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring)

Microscopic pathology of basic dermatologic reactions and of variable disease states. prerequisite: DVM degree or foreign equiv

**VMED 5240. Advanced Small Animal Pathobiology I.** (1 cr.; A-F only; Fall Even Year)

Biology, physiology, pathophysiology, and medicine of disciplines relevant to companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that can be translated into clinical research. Prerequisite: CVM grad student, [DVM or foreign equiv] degree.

**VMED 5241. Advanced Small Animal Pathobiology II.** (1 cr.; A-F only; Spring Even Year)

Overview of biology, physiology, pathophysiology, and medicine of disciplines. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prerequisite: CVM grad student, [DVM or foreign equiv] degree.

**VMED 5242. Advanced Small Animal Pathobiology III.** (1 cr.; A-F only; Fall Odd Year)

Overview of biology, physiology, pathophysiology, and medicine. Underlying pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prerequisite: CVM grad student, [DVM or foreign equiv] degree.

**VMED 5243. Advanced Small Animal Pathobiology IV.** (1 cr.; A-F only; Spring Odd Year)

Overview of biology, physiology, pathophysiology, and medicine. Underlying
pathogenesis/treatment of diseases of companion animals. Developing hypotheses that could be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5295. Problems in Large Animal Clinical Medicine/Surgery and Theriogenology. (1 cr. [max 3 cr.]; A-F or Audit; Every Fall & Spring) Hospital cases using standardized format, audiovisual aids. Review literature pertaining to case. One or two cases presented by enrolled participants per month. prereq: VMED grad student, possess DVM

VMED 5310. Topics in Veterinary Clinical Pathology. (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring) Modified rounds format. Cases from VMC used to explore cytology with associated chemistry/hematology data. Attendees clinicians can request lab topics for discussion. Past topics have included lab measurement of chemical analytes, test sensitivity or specificity (e.g., ethylene glycol test, FELV test), lab testing for infectious agents. prereq: Grad student in CVM

VMED 5319. Veterinary Gross Pathology. (1 cr. [max 3 cr.]; S-N only; Every Fall & Spring) Diagnostic gross lesions of tissues. Evaluating images from wide variety of animals submitted to lab. Mock cases use presentations, reviews on wide variety of diseases in domestic/non-domestic animals. Students present microscopic slide cases and prepare discussions about disease entities, differential diagnoses, and ancillary tests. prereq: Grad student in VMED or [CVM, [DVM degree or foreign equiv]] or instr consent

VMED 5320. Advanced Veterinary Systemic Pathology I. (3 cr.; A-F only; Fall Even Year) Students review/summarize topics in systemic pathology using veterinary pathology textbooks and relevant updates from pathology and veterinary medical journals. Diagnostic cases in alimentary, respiratory, urinary, cardiovascular, and hematopoietic system pathology. Students give 10-15 presentations with handouts for other students. prereq: Grad student in VMED or [CVM, [DVM degree or foreign equiv]] or instr consent

VMED 5330. Veterinary Descriptive Histopathology. (1 cr. [max 2 cr.]; Student Option; Every Fall & Spring) Weekly, one-hour microscopic slide presentations, reviews on wide variety of diseases in domestic/non-domestic animals. Students present microscopic slide cases and prepare discussions about disease entities, differential diagnoses, and ancillary tests. prereq: Grad student in VMED or [CVM, [DVM degree or foreign equiv]] or instr consent


VMED 5430. HIV/AIDS: Pathogenesis, Treatment, and Prevention. (1 cr.; Student Option; Every Fall) Exposure to pathogenesis, treatment, and prevention of HIV/AIDS from clinical faculty who are dealing with AIDS patients. Developing new questions and designing experiments that have greatest chance of translating to clinical setting. prereq: Grad student

VMED 5440. Using Risk Analysis Tools: Estimating Food Safety Risks on the Farm to Table Continuum. (2 cr. [max 3 cr.]; A-F only; Every Fall & Spring) This applications-based course will provide the necessary risk-based tools to evaluate and mitigate the microbial and chemical risks in a food production chain-from the farm until consumption. Students will follow the risk analysis process as an integral part of science-based decision-making to estimate and manage food safety risks. Students will apply different qualitative and quantitative tools by using a computer.

VMED 5442. Quantitative Methods for Population Health. (3 cr. [max 6 cr.]; Student Option No Audit; Every Spring) This course reviews the principles and application of advanced methods for analysis of population health data, with a focus on animal health and infectious diseases. Analytical techniques that will be taught and applied during the course include risk assessment, spatial analysis, disease modeling, and disease economics. prereq: basic statistics (PYHB4650 or equivalent) and basic epidemiology (VM6922 or PYHB341 or equivalent) or instructor approval

VMED 5492. Seminar: One Health and Infectious Diseases of Wildlife. (2 cr.; S-N only; Every Fall) The course will explore the applied concept of One Health and infectious diseases of wildlife in weekly case studies. In each case study, students will gain an understanding of system dynamics, infer the interplay between humans, animals and the environment in the context of a given wildlife disease, and confront current disease management practices and challenges for successfully mediating transmission and spread.

VMED 5496. Training in Swine Production and Management. (4 cr.; S-N only; Every Fall & Spring) Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs. prereq: VMED grad student or instr consent

VMED 5594. Research in Veterinary Medicine. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab, though research in field may also be included. prereq: Jr, instr consent

VMED 5599. Research in Veterinary Medicine. (1-4 cr. [max 8 cr.]; Student Option; Every Fall, Spring & Summer) Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab, though research in field may also be included. prereq: Jr, instr consent

VMED 5621. Principles of Veterinary Anesthesiology. (2 cr.; A-F only; Every Spring) In-depth training in principles of veterinary anesthesia. Lectures, anesthesia labs, presentations by students. prereq: VMED grad student, [DVM degree or foreign equiv], instr consent

VMED 5670. Bovine Surgery Practicum. (2 cr.; S-N only; Every Fall & Spring) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components. prereq: [VMED grad student, [DVM or equiv foreign degree]] or instr consent

VMED 5895. Veterinary Public Health Integrated Learning Experience. (1-3 cr.; S-N only; Every Fall, Spring & Summer) Part of the curriculum for the master's degree includes an opportunity for students to develop a written document detailing applications of public health practice. Completion of the ILE allows students to synthesize aspects of public health into a document that can be utilized by public health professionals.

VMED 5896. Veterinary Public Health Applied Practice Experience. (0.5-6 cr.; S-N only; Every Fall, Spring & Summer) The APEX, applied practice experience provides students an opportunity to learn first-hand about the organization, operations, and special activities of selected agencies, institutions and industries concerned with public health practice. This is a means of gaining additional insight into public health programs, personnel management, governmental relations, public relations, legislative support and, particularly, knowledge of special investigations or responses conducted by these organizations. Participation in the activities of public health practice programs internal to the University adds a dimension of experience to the curriculum that enriches the student's training and may be beneficial in seeking employment.

VMED 5910. Grant Writing: Winning Proposal? (2 cr.; Student Option; Every Spring) Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

VMED 5915. Essential Statistics for Life Sciences. (3 cr.; A-F or Audit; Every Fall) This course is a broad overview of the principles and methods of statistical analysis used in life sciences research, including biological, veterinary, and translational research, and provides the background a new researcher needs to understand and apply commonly used statistical methods and the preparation needed for more advanced coursework. Classes will include general instruction and background information, detailed examples of how to perform the analyses, with actual data sets, and discussion on how the topic has been applied in biological research, including reading and assessing papers in the field. Computing will be performed using the R software.
This course covers topics on the evaluation and assessment of the welfare of farmed animals. Literature review, discussions, and analyses are used to increase skills needed to evaluate methods for improving the welfare of farmed animals in various situations.

**VMED 8220. Advanced Nephrology/Urology Clinics.** (; 1-3 cr. ; Student Option; Every Fall & Spring)
Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center. prereq; instr consent

**VMED 8230. Medical Conference.** (; 1 cr. [max 2 cr.]; Student Option; Every Fall & Spring)
Participation in weekly conference about internal medical disorders. prereq; instr consent

**VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism.** (; 2-4 cr.; A-F or Audit; Every Fall & Spring)
Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats. prereq; instr consent

**VMED 8292. Journal Club: Large Animal Internal Medicine.** (; 1 cr. [max 3 cr.]; A-F or Audit; Periodic Fall & Spring)
Students/faculty keep abreast of current literature in large animal internal medicine. Students critically evaluate the literature. prereq; instr consent

**VMED 8293. Advanced Studies in Nephrology and Urology.** (; 1-3 cr.; A-F or Audit; Every Fall & Spring)
Studies of urinary tract disease with goal of generating new knowledge. prereq; instr consent

**VMED 8333. FTE: Master's.** (; 1 cr. [max 2 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Master's student, adviser and DGS consent

**VMED 8360. Evidence-based Medicine.** (2 cr.; A-F or Audit; Periodic Spring)
Concepts of evidence-based medicine with emphasis on veterinary clinical evidence will be presented. Clinical questions, development of study designs, identification of literature and assessment of the impact of the literature on clinical decisions. prereq; instr consent

**VMED 8392. Infectious Disease Journals: Critical Thinking.** (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)
A combination of literature review, group discussions and analyses are utilized to improve participants' capacity to critically evaluate scientific journal articles. Scientific research presentations will be led by students or faculty.

**VMED 8520. Advanced Immunology.** (; 2 cr.; Student Option; Every Spring)
Lectures and case presentations.

**VMED 8550. Veterinary Medicine Seminar.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring)
Seminar. Exposure to research activities of CMB and VMED students and faculty. Students prepare/present a 20 minute seminar on their original research. prereq; Grad student

**VMED 8560. Research and Literature Reports in Veterinary Medicine.** (1 cr. [max 2 cr.]; S-N only; Every Fall & Spring)
A combination of literature review, group discussions and analyses are utilized to improve participants' capacity to critically evaluate scientific journal articles. Scientific research presentations will be led by students or faculty.

**VMED 8592. Infectious Disease Journals: Critical Thinking.** (1 cr. [max 2 cr.]; A-F only; Every Fall & Spring)
This course is intended to discuss published papers, experimental methods, approaches, diseases and animal health problems with the goal of promoting critical thinking. Students will be responsible for identifying, reviewing and sharing relevant material as well as leading discussion of their assigned class meeting.

**VMED 8593. Advanced Veterinary Virology and Serology.** (; 3 cr.; Student Option; Every Fall & Spring)
Discussion and laboratory practice.

**VMED 8682. Advanced Large Animal Surgery.** (; 2 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring)
Surgery of various systems in large animals, with preoperative and postoperative evaluation and management. prereq; DVM or equiv degree, instr consent

**VMED 8684. Surgical Physiology.** (; 1-3 cr.; Student Option; Periodic Fall & Spring)
Discussions on pathophysiology of surgical diseases in dogs and cats.

**VMED 8685. Neurosurgery.** (; 2-3 cr.; A-F or Audit; Every Fall & Spring)
Advanced neurosurgical diseases of small animals amenable to surgical treatment.

**VMED 8686. Thoracic and Cardiovascular Surgery.** (; 2-4 cr.; A-F or Audit; Every Fall & Spring)
Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

**VMED 8693. Seminar: Large Animal Surgery.** (; 1 cr. [max 6 cr.]; A-F or Audit; Every Fall & Spring)
Discussion of current literature and surgery board preparation. prereq; DVM or equiv degree, instr consent

**VMED 8696. Research in Critical Care/Emergency Medicine.** (; 1-3 cr.; Student Option; Every Fall & Spring)
Special problems course. Controlled study; prospective and retrospective models of evaluation are defined, critiqued, and used for experimental design and data collection to
validate research methods. prereq: DVM or equiv degree

VMED 8777. Thesis Credits: Master’s. ( 1-18 cr. [max 50 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required [Plan A only]

VMED 8780. Advanced Avian Critical Care: Principles and Procedures. ( 2 cr.; A-F or Audit; Every Spring)
Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma. prereq: Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care

VMED 8781. Seminar: Advanced Veterinary Anesthesiology. ( 1-3 cr.; A-F or Audit; Every Fall)
Active interaction around topics of advanced anesthesiology in veterinary species. prereq: [(CVM 6321, CVM 6322) or equiv], grad student

VMED 8788. Seminar: Veterinary Critical Care/Emergency Medicine. ( 1 cr.; A-F or Audit; Every Fall & Spring)
Current topics. prereq: DVM or equiv degree

VMED 8793. Seminar: Veterinary Anesthesiology. ( 1-2 cr. [max 4 cr.]; A-F or Audit; Every Fall & Spring)
Discussion and presentations for veterinary anesthesiology and surgery residents and graduate students. prereq: [CVM 6321 or equiv], DVM degree

VMED 8796. Avian Anesthesia and Orthopedic Surgery. ( 1-3 cr.; A-F or Audit; Every Fall & Spring)
Current methods for anesthetizing raptors, psittacine birds, and waterfowl. Lecture and lab on current methods for avian fracture bone fixation. prereq: courses in vet anesthesia, vet small animal orthopedics

VMED 8888. Thesis Credit: Doctoral. (1-12 cr. [max 100 cr.]; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

VMED 8910. Statistical Principles of Research Design. (3 cr.; A-F or Audit; Every Spring)
This course is a broad overview of the principles and techniques of research design and methods used in veterinary and translational research, and provides the background a new researcher needs to understand the literature and make good decisions about what is appropriate for their research, prereq: entry level graduate stats course or equivalent

Vienna Executive MBA (VMBA)

VMBA 5700. Managerial Accounting. ( 4 cr.; A-F or Audit; Every Spring)

VMBA 5701. Data Analysis and Decision Making. ( 4 cr.; A-F or Audit; Every Spring & Summer)
Exploratory data analysis, basic inferential procedures, statistical process control, regression analysis, decision models.

VMBA 5702. Financial Management. ( 4 cr.; A-F or Audit; Every Spring & Summer)
Theory/practice of finance from an analytical approach. Students apply concepts of risk, return, valuation to decisions that a corporate financial officer or person engaged in small business must make about sources/uses of funds during changing financial markets.

VMBA 5703. Marketing Management. ( 4 cr.; A-F or Audit; Every Spring & Summer)
Developing/implementing most appropriate combination of variables to carry out a firm’s strategy in its target markets. Analytic perspectives, concepts, decision tools of marketing for product offering decisions, distribution channel decisions, pricing decisions, communication program decisions.

VMBA 5704. Managing People and Organizations. ( 4 cr.; A-F or Audit; Every Spring)
Theories/frameworks for analyzing behavior of individuals, groups, organization itself. Emphasizes making decisions, developing action plans. Concepts/principles associated with function of human resource management (e.g., personnel selection, reward/compensation, collective bargaining).

VMBA 5705. Operations Management. ( 4 cr.; A-F or Audit; Every Fall)
Operations management function in different types of organizations. Emphasizes productive, innovative, competitive operations. Concepts/principles related to management of quality/innovation within service/manufacturing organizations.

VMBA 5706. Business, Government, and Macroeconomics. ( 4 cr.; A-F or Audit; Every Fall)
Roles of government/business in society. Alternative systems of economics, political values. Social, political, economic, cultural conflicts affecting business sector.

VMBA 5707. Economics in Transition. (4 cr.; A-F or Audit; Every Fall)
Technological, political, and ethical forces that are shaping the competitive environment. Theoretical considerations. Business responses to specific issues. Projects/cases for companies in East Central Europe.

VMBA 5709. Info Tech Mgmt. (4 cr. [max 16 cr.]; A-F or Audit; Every Spring)
Various information technologies, their applications. Competitive advantages associated with information technology, organizational/managerial implications.

VMBA 5710. Advanced Financial Management for Global Markets. ( 4 cr.; A-F or Audit; Every Spring)
Advanced financial concepts for corporate financial decisions at executive level. Investment, firm financing, global markets.

VMBA 5711. Managing Globalization (Guangzhou). (4 cr.; A-F or Audit; Every Spring & Summer)

VMBA 5712. Strategies for a Global Company: an Integrative Perspective. (6 cr. [max 36 cr.]; A-F or Audit; Every Spring)
Multi-disciplinary perspectives from strategic marketing, corporate strategy, operations management. Involvement of faculty/corporate executives. Site visits to global companies, student projects. Capstone course.

VMBA 5713. Negotiations and Conflict Management. ( 4 cr.; A-F only; Every Spring)
Typical challenges faced when negotiating. Strategies for managing challenges and improving skills as a negotiator and conflict manager.

VMBA 5714. Financial Accounting. ( 4 cr.; A-F or Audit; Every Spring)

VMBA 5715. Corporate and Entrepreneurial Strategy. (4 cr.; A-F or Audit; Every Fall & Spring)
The objective of the course is to help develop analytic skills in the identification of key issues and in the formulation of appropriate strategies for firms, both established and entrepreneurial, facing complex business situations. We also examine the process through which strategic decisions are made and implemented and discuss how strategy is different in the age of the internet.

Warsaw Executive MBA (WMBA)

WMBA 5658. Financial Management. ( 4.5 cr.; A-F or Audit; Periodic Fall)

WMBA 5662. Macroeconomic Business Environment. ( 3 cr.; A-F or Audit; Every Spring)
Students apply methods of decision-making and of business/public policy analysis, in various real situations drawn from experience of developed market economies.
WRIT 5001. Introduction to Graduate Studies in Scientific and Technical Communication. (3 cr.; A-F only; Every Fall) History of technical communication. Different audiences, purposes, genres, and emerging trends. International/intercultural issues. Students participate within a community of technical communication professionals. prereq: Grad student or instr consent

WRIT 5051. Graduate Research Writing for International Students. (3 cr.; Student Option; Every Fall, Spring & Summer) Graduate-level writing techniques/formats for summaries, critiques, research, and abstracts. Persuasion, documentation, structure, grammar, vocabulary, field-specific requirements. Writing through several drafts, using mentor in specific field of study. Revising/editing to meet graduate standards. Discussions. prereq: Grad student

WRIT 5052. Graduate Research Presentations and Conference Writing for Non-Native Speakers of English. (3 cr.; Student Option; Every Fall & Spring) Practice in writing/presenting graduate-level research for conferences or professional seminars. Delivery of professional academic presentations to U.S. audiences. Conference abstract, paper, and poster presentation. Communication in research process. Students select topics from their own research/studies. Format, style, transitions, topic narrowing, non-verbal presentation skills. prereq: [Grad student, non-native speaker of English] or instr consent

WRIT 5112. Information Design: Theory and Practice. (3 cr.; A-F or Audit; Periodic Spring) This course examines how verbal, visual, data, and other forms of content can be designed and combined to create meaning, improve comprehension, and make information more usable. In particular, we will study the rhetorical roles visual elements play in print and digital communications, and how we as technical communicators can use visual means to reach audiences, convey information, and achieve rhetorical goals. We will read and discuss theory, practice, information design skills, and apply both to real communications projects suitable for inclusion in a professional portfolio. prereq: Grad student or instr consent

WRIT 5196. Internship in Scientific and Technical Communication. (3-6 cr.; S-N or Audit; Every Fall, Spring & Summer) Internship sites may include the University, industry, or government agencies. An internship proposal, progress report, internship journal (optional), and final report with a letter from the internship supervisor are required.

WRIT 5270. Special Topics. (WI; 3 cr. [max 9 cr.]; Student Option; Periodic Fall & Spring) Topics specified in Class Schedule.

WRIT 5291. Independent Study, Reading, and Research. (1-3 cr.; Student Option; Every Fall, Spring & Summer) Supervised reading/research on advanced projects not covered in regularly scheduled offerings. prereq: instr consent, dept consent

WRIT 5531. Introduction to Writing Theory and Pedagogy. (3 cr.; A-F or Audit; Every Fall) Pedagogical philosophy/methodology in composition, primarily first-year writing. Theories underlying teaching/tutoring with technology. prereq: Grad student

WRIT 5532. Writing Pedagogy Practicum. (1 cr. [max 3 cr.; S-N only; Every Spring]) Discussion/activities that support development of sound pedagogical practices. Practical details of classroom. Professionalization, theory/research. prereq: Grad student

WRIT 5561. Editing and Style for Technical Communicators. (3 cr.; A-F; Every Spring & Summer) Proofreading, copy-editing, comprehensive editing. Students primarily use electronic editing methods. Editor's responsibilities, relationship to writers, roles within an organization, style guides, ethical choices. Editing in global setting. Editing/style for visual design and online documents. prereq: [Grad student, knowledge of grammar/punctuation rules] or instr consent

WRIT 5570. Minnesota Writing Project Directed Studies. (1-3 cr. [max 9 cr.]; A-F or Audit; Every Summer) Guided individual research into current theories/practices of writing and writing pedagogy.
WRIT 5671. Visual Rhetoric. (3 cr.; A-F only; Every Spring)
Range/development of visuals, especially those in science/technology. Vocabulary for commenting on, criticizing, and creating visuals. prereq: Jr or br grad student

WRIT 5775. The Rhetorical Tradition: Classical Period. (3 cr.; A-F-only; Every Fall)
Rhetoric in the Classical world and recurring themes that constitute "the rhetorical tradition." Epistemological/ethical status and sociopolitical importance of ancient rhetorical training and discourse. Works by Isocrates, Plato, Aristotle, Cicero, Quintilian, and others. Prepares students for preliminary examinations/seminars in rhetoric.

WRIT 5776. The Rhetorical Tradition: Modern Era. (3 cr.; A-F or Audit; Periodic Spring)
Core works in modern/contemporary rhetorical theory. Twentieth-century revivals of and challenges to the Aristotelian rhetorical tradition. Units devoted to Enlightenment rhetorics; the New Rhetorics of I. A. Richards, Kenneth Burke, and Chaim Perelman; feminist rhetorical theory, historiography, and critique; deconstruction/post-structuralism. Prepares students for preliminary examinations/seminars in rhetoric.

WRIT 8011. Research Methods in Writing Studies and Technical Communication. (3 cr.; A-F or Audit; Periodic Fall)
Survey of quantitative/qualitative research methods. Theoretical perspectives that demonstrate/test analytical approaches to scientific/technological rhetoric. prereq: STC/RSTC grad student or instr consent

WRIT 8012. Applied Research Methods in Writing Studies and Technical Communication. (3 cr.; A-F or Audit; Every Fall & Spring)
Introduction to one or two quantitative or qualitative research methods in scientific/technical communication or rhetoric (e.g., ethnography, case studies, discourse analysis). prereq: [grad student] or instr consent

WRIT 8333. FTE: Master’s. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
Survey of qualitative research method in rhetoric. Topic announced in advance. prereq: Master's student, adviser and DGS consent

WRIT 8444. FTE: Doctoral. (1 cr.; No Grade Associated; Every Fall, Spring & Summer)
Introduction to field of rhetoric for doctoral students. prereq: Doctoral student, adviser and DGS consent

WRIT 8505. Professional Practice. (3 cr.; S-N only; Every Fall, Spring & Summer)
Supervised study, reading, or research on projects not covered in regularly scheduled offerings. prereq: instr consent

WRIT 8888. Thesis Credit: Doctoral. (1-24 cr.; Max 100 cr.)
Topics include literacy, genre, history of writing, narrative theory and practice, writing as textual practice. Topics vary. See the Class Schedule.

WRIT 8520. Seminar in Scientific and Technical Communication. (3 cr.; [max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Topics may include theories, landmark studies, history, gender, ethics. Topics vary. See the Class Schedule.

WRIT 8540. Seminar in Technical Communication and Composition Pedagogies. (3 cr.; [max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Topics may include theories of pedagogy or research studies that inform the classroom or workplace, social and ethical concerns, landmark studies, current controversies. Topics vary. See the Class Schedule.

WRIT 8550. Seminar in Technology, Culture, and Communication. (3 cr.; [max 12 cr.; A-F or Audit; Periodic Fall & Spring)
Topics may include computer-mediated communication, democracy/technology, controversies over digital communication, privacy/ethical issues, feminist theory and interactions of gender with science and technology, communication in legal or medical settings. Topics vary. See the Class Schedule.

WRIT 8560. Seminar in Writing Studies and Usability. (3 cr.; [max 12 cr.; A-F only; Every Fall & Spring)
Topics may include literacy, genre, history of writing, narrative theory and practice, writing as textual practice. Topics vary. See the Class Schedule.

WRIT 8666. Doctoral Pre-Thesis Credits. (1-6 cr.; [max 12 cr.; No Grade Associated; Every Fall, Spring & Summer)
Doctoral Pre-Thesis Credits prereq: Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; dept consent for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr

WRIT 8777. Thesis Credits: Master’s. (1-18 cr.; [max 50 cr.; No Grade Associated; Every Fall, Spring & Summer)
(No description) prereq: Max 18 cr per semester or summer; 10 cr total required (Plan A only)

WRIT 8792. Independent Study, Reading, and Research. (1-4 cr.; [max 12 cr.; S-N only; Every Fall, Spring & Summer)
Supervised study, reading, or research on projects not covered in regularly scheduled offerings. prereq: instr consent

WRIT 8794. Directed Research. (1-4 cr.; [max 12 cr.; S-N only; Every Fall, Spring & Summer)
Supervised research project. prereq: instr consent

WRIT 8888. Thesis Credit: Doctoral. (1-24 cr.; Max 100 cr.)
No Grade Associated; Every Fall, Spring & Summer
(No description) prereq: Max 18 cr per semester or summer; 24 cr required

YOST 5011. Youth Voices: The Fight for Social Change in Croatia. (3 cr.; A-F only; Periodic Summer)
This international immersion course explores the history, struggles, accomplishments, and experiences of Croatian young people who have engaged in social change efforts. Our focus will be on young people’s involvement in a diverse range of social change movements and how these emerged, how they worked, and what caused them to decline.

YOST 5030. Youth Voices: The Fight for Social Change in Croatia. (3 cr.; A-F only; Periodic Summer)
This international immersion course explores the history, struggles, accomplishments, and experiences of Croatian young people who have engaged in social change efforts. Our focus will be on young people’s involvement in a diverse range of social change movements and how these emerged, how they worked, and what caused them to decline.

YOST 5031. International Youthwork. (3 cr.; Student Option; Every Fall)
Lives of young people living outside the United States and of immigrants/refugees now resident in this country. Working with and on behalf of such groups. Socio-political analysis of globalization. Its impact on young people, youthwork, and youth policy worldwide. prereq: 2xx or instr consent

YOST 5032. Adolescent and Youth Development for Youthworkers. (4 cr.; Student Option; Every Fall & Spring)
Application of theory/research about children/adolescents. How findings/theories facilitate understanding of behavior. prereq: [1001 or 2001 or 2002W or 2101]. [Any Psych or CPsych course]

YOST 5234. Youth Agencies, Organizations, and Youth Service System. (3 cr.; Student Option; Every Spring)
Communities and governmental responses to young people as potential problems through agencies and programs and other organizational forms. Purpose, structure, and activities of such forms. How forms are/are not integrated into youth service systems. prereq: [Two soc/anth courses, work experience in [youth agency or org]] or instr consent

YOST 5235. Community Building, Civic Engagement, and Civic Youthwork. (4 cr.; Student Option; Every Spring)
Reciprocities between youth development and community development brought about by young people’s civic engagement. Individual, social, and political change by/for young people and their community. prereq: [2001, one basic course in Pol, one basic course in Soc] or instr consent

YOST 5240. Special Topics in Youth Studies. (2-8 cr.; [max 40 cr.]; Student Option; Every Fall, Spring & Summer)
In-depth investigation of one area of youth studies. Teaching procedure and approach determined by specific topic and student needs. Topic announced in advance. prereq: Two social sci courses, exper working with youth or instr consent

Courses listed in this catalog are current as of 2018-08-30. For up-to-date information, visit www.catalogs.umn.edu.
YOST 5291. Independent Study in Youth Studies. (1-8 cr. [max 16 cr.]; Student Option; Every Fall, Spring & Summer) Independent reading and/or research under faculty supervision.

YOST 5301. Communicating With Adolescents About Sexuality. (3 cr.; Student Option; Every Summer) How to communicate sensitively/effectively with adolescents and their concerned persons about sexuality in everyday life. Healthy sexual development (physical, emotional, ethical), sexual differences. Gender/body image, disease, sexual violence, intimacy, sex in cyberspace. Prereq: Upper div AdPy course, exper working with youth or instr consent

YOST 5314. Theatre Activities in Youthwork and Education. (2 cr.; Student Option; Every Spring) Using experiential learning and theater activities to enhance creativity and imagination of young workers and educators. Approaches to working with youth in school and agency settings. Application of experiential learning and improvisational theater theory/praxis. Prereq: 1001 or 2101

YOST 5315. Youthwork in Schools. (4 cr.; Student Option; Every Fall & Spring) Craft of youthwork as a framework to understand young people and a practice to enhance healthy development. How young people often make artificially/harmfully divide their lives into "school" and "not school." Prereq: Introductory course in education or instr consent

YOST 5316. Media & Youth: Learning, Teaching, and Doing. (2 cr.; Student Option; Every Spring) Youth are targets, producers, and consumers of a variety of media. This course is about understanding and learning to use a variety of these sources with young people to enhance their development and civic engagement. Prereq: 1001 or 2101 or instr consent

YOST 5319. Understanding Youth Subcultures. (3 cr.; Student Option; Every Summer) Young people's participation in and understanding of subcultures, life-styles, and event cultures. Place of these in young people's identity, friendship, and life chances. Prereq: 2001 or one course each in [Anth, Soc] or instr consent

YOST 5321. Work With Youth: Individual. (2 cr.; Student Option; Every Fall, Spring & Summer) Basic assumptions underlying individual work with youth. Special issues and concerns of adolescents and of persons who work with them, especially those who work with youth in one-to-one interactions. Prereq: 1001 or 2002W or instr consent

YOST 5322. Work With Youth: Families. (2 cr.; Student Option; Every Fall, Spring & Summer) Theories and techniques of working with youth and their families. Practical methods of structural change. Developing effective communication. Decision-making and problem-solving systems. Winning the family's cooperation. Role of professional in influencing healthy family development. Prereq: 1001 or 2002W or instr consent

YOST 5323. Work with Youth: Groups. (2 cr.; Student Option; Every Fall & Summer) Social group work. Adolescent group needs and associations. Group process. Working with diverse groups of youth in community, in group living situations, and in group therapy. Prereq: 1001 or 2002W or instr consent


YOST 5402. Youth Policy: Enhancing Healthy Development in Everyday Life. (4 cr.; Student Option; Periodic Fall & Spring) Youth policy as formulated in response to youth issues, problems, and community and public concerns. Policy as political response to youth panics, as indirect youthwork, and as a community's moral compact with its young people. Perspectives are explored specific to student interests. Prereq: 2001, one course each in [FSoS, PolSci, Soc] or instr consent

YOST 5450. Ways of Knowing in Youth Development Leadership: Using Research and Evaluation to Support Community. (3 cr.; A-F only; Every Fall) This course aims to stimulate students to think critically about youth development and youth work through exploring different ways of knowing. These paradigms each construct different understandings of young people and offer evidence to support diverse youth development practice and programs. Students will leave with a broad perspective of how youth development and youth work empirical evidence is constructed and used to support healthy youth development.

YOST 5452. Everyday Lives of Youth. (3 cr.; A-F or Audit; Every Fall) Youth as idea/lived-reality in scholarship, public discourse, and professional practice. Building practice of work or on behalf of youth.

YOST 5454. Experiential Learning: Pedagogy for Community and Classroom. (3 cr.; Student Option; Every Fall & Spring) Relationship between experience and learning in community and school settings. Emphasizes intentional application of experiential learning theory/practice to educational program development.

YOST 5456. Organizational Approaches to Youth Development. (3 cr.; A-F or Audit; Every Fall) Historical contexts, theoretical frameworks, organizational practices, and public policies that shape nonformal educational experiences of youth in community-based or school-linked settings.

YOST 5598. Community: Context for Youth Development Leadership. (3 cr.; A-F or Audit; Every Spring) Issues/policies in family, school, and community that drive the professional practice of community-based youth work. Practical projects explore what it means to be local, to build social capital for youth, and to involve youth in community change.

YOST 5960. Seminar in Youth Development Leadership. (1 cr. [max 4 cr.]; S-N or Audit; Every Fall, Spring & Summer) Group study of topics/issues. Course proposal, educational program development. Students participate in co-created learning experience with a group of peers. Four-course sequence. Prereq: YDL student or instr consent

YOST 5962. Leadership Field Experience: Youth Development. (4 cr.; S-N only; Every Fall, Spring & Summer) Demonstration of leadership in practice. Project on youth, experiential pedagogy, and community/program settings. Focuses on public policy, advocacy, evaluation, pedagogical issues, program design, curriculum development, or applied research. Prereq: YDL student
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Academic Calendars: Twin Cities, Crookston, Morris, Rochester

POLICY STATEMENT

Academic calendars will be established at least four years in advance so that students may plan their schedules and University units may plan events. Revisions to approved calendars must be made no less than two years before the date the calendar goes into effect.

A. Fall and Spring Semesters

1. There will be two semesters, each of which will include a minimum of 70 days of instructions, a maximum of 75 days of instruction, and approximately one week of final examinations (including Saturdays but not Sundays).
2. For the fall semester, the exam period will end no later than December 23.
3. Colleges and campuses may authorize courses shorter or longer than the semester, subject to the approval of appropriate college or academic unit curriculum review committees.
4. Professional schools are permitted to have calendars that vary from the requirements of this policy.

B. Summer Term

1. Departments may schedule a three-week May session following the end of the spring semester and before the summer session. No department will be obligated to offer courses or academic work during this three-week session.
2. There will be a standard eight-week summer session. No department will be obligated to offer courses or academic work during this eight-week session. Departments and programs may deliver courses over either shorter or longer periods of time and with starting and ending dates that differ from the standard eight-week and May sessions.

C. Revisions of Calendars

All calendars and any subsequent revisions or exceptions must be approved by the Faculty Senate.

Exclusions

This policy is not applicable to the Duluth campus.

REASON FOR POLICY
Establishing an academic calendar at least four years in advance allows students to plan their degree programs and enables University units to schedule events at times that do not conflict with other key activities.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. Can each of the campus set its own academic calendar?
   Yes, each campus is responsible for setting its own academic calendar. The Faculty Senate approves the University of Minnesota, Morris and University of Minnesota, Twin Cities calendars. The University of Minnesota, Duluth and University of Minnesota, Crookston calendars are transmitted to the University Senate for information only. The University of Minnesota, Rochester follows the Twin Cities academic calendar.

2. Can instructors assign work to students prior to the beginning of the academic term?
   No. Instructors cannot assign work until the term starts.

3. Does the University of Minnesota hold regularly scheduled classes the day before a holiday?
   Yes, scheduled classes, including evening classes, are held the day before a holiday. For example, classes are held the Wednesday evening before the Thanksgiving holiday. Refer to the current academic calendar for University holidays.

CONTACTS

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<th>Subject</th>
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</tbody>
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DEFINITIONS

There are no definitions associated with this policy.

RESPONSIBILITIES
Office of the Registrar
Submits the academic calendar proposal annually to the Faculty Senate.

Faculty Senate
Reviews and approves final University calendar.

RELATED INFORMATION

Campus Calendar Information
Each campus publishes dates and deadlines on their One Stop website.

- Twin Cities
- Crookston
- Morris
- Duluth
- Rochester

HISTORY

Amended:
December 2009 - Policy now applies to the Crookston campus.

Effective:
April 2009

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Departments, colleges, and campuses have the authority to establish, change, and discontinue academic plans and sub-plans that appear on official University transcripts, subject to appropriate consultation with other units and subject to the final approval of the Board of Regents. (See Administrative Policy: Adding, Changing or Discontinuing Academic Plans).

Establishing and changing academic plan requirements

1. Academic units (departments, colleges, and campuses) have the authority to establish their curricula and the requirements, including prerequisite courses, for academic plans, subject to the final authority of the Board of Regents. Academic plans include:
   - undergraduate degrees,
   - graduate degrees;
   - professional degrees;
   - majors;
   - minors;
   - undergraduate certificates; and
   - post-baccalaureate certificates.

2. Academic units have the authority to add to or remove courses, including prerequisite courses, from academic plans. The additions or deletions of courses from the academic plan requirements must be in accordance with Board of Regents policies and in compliance with rules established by the college and campus.

3. Changes to academic plans must have an effective date, based on the start of an academic term (e.g., fall semester 2018). Changes to requirements may not be made in the middle of an academic term. Changes to academic plans should be announced far enough in advance so that students, including continuing students and prospective first-year and prospective transfer students, can plan accordingly.

4. Students must follow the requirements of the academic plan in effect during the term in which they entered the plan. Academic units may offer the choice of moving to the new requirements to currently enrolled students who have already been admitted to an existing academic plan. However, the academic unit cannot mandate a new requirement of students who are currently enrolled in the plan without having sought and received prior approval of the dean of the college or the appropriate official on a campus.
5. Academic units must clearly communicate their policies and decisions regarding new or revised requirements for academic plans to prospective and current students. This includes changes to a major, minor, or certificate program, including changes in required prerequisites.

Expiration of old credits

To ensure that students receiving a degree or certificate will be up-to-date in the discipline, an academic unit (a department or comparable unit) may decide not to accept course work towards satisfying requirements for the major, minor, or certificate if the course was taken too long ago.

Students returning from an approved leave of absence are subject to the specific conditions/requirements identified in Administrative Policy: Leave of Absence and Readmission for Undergraduates: Twin Cities, Crookston, Morris, Rochester.

Exclusions

This policy is not applicable to the Duluth campus.

REASON FOR POLICY

Departments, colleges and campuses are best suited to determine curricula and requirements for majors and minors, for graduate and professional degrees, and to add or remove course offerings. It is in students' best interests if changes in requirements do not occur frequently or arbitrarily, and students are provided with advance notice of such changes.

This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. What is a change in major requirements?
   The academic department(s) responsible for a major may add, delete, or modify the published degree requirements for a major in that department. As examples, required courses may be added or deleted, or changed; admissions requirements for a major may be changed.

2. What are some examples of the levels of academic unit authority?
   A department, or a group of departments working collaboratively, has the authority to establish the course requirements for a major, minor, or certificate program, including prerequisite requirements; for example, the particular courses required to receive an M.A. degree in History.
   
   A college has the authority to establish college-wide requirements for particular types of academic programs, for example, a second language requirement for a B.A. degree granted within that college.
   
   A campus has the authority to establish campus-wide requirements for groups of academic programs. Some examples are a first-year writing requirement for all undergraduate degrees, the minimum number of credits required for a baccalaureate degree, and a minimum GPA requirement for graduation.
3. How does expiration of old credits show on a student's transcript?

"Expiration of old credit" refers to coursework a student has completed too long ago for that subject matter to be current in the discipline. The academic unit may determine that the student must take additional, current coursework in that subject matter in order to fulfill the requirements for an academic program. The prior credits are not removed from the student's transcript; however, they do not count toward satisfying requirements for the particular major, minor, or certificate.

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## DEFINITIONS

**Academic Program**
Undergraduate, graduate, and professional degrees, majors, minors, and certificates that appear on official University transcripts.

**Academic Major**
A student's main field of specialization during the student's undergraduate or graduate studies. The major is recorded on the student's transcript.

**Academic Minor**
A student's declared secondary field of study or specialization during the student's undergraduate or graduate studies. A minor typically consists of a set of courses that meet specified guidelines and is designed to allow a sub-major concentration in an academic discipline or in a specific area in or across disciplines. The minor is recorded on the student's transcript.

**Certificate**
A particular set of courses or coursework that typically addresses new knowledge or practice areas emerging from technological, social, or economic changes to which particular professions or occupations must adjust. The certificate is recorded on the student's transcript.

**Curriculum**
The set of courses offered by a unit.

## RESPONSIBILITIES

**Academic Department(s) Responsible for the Academic Program**
- Maintain complete, up-to-date descriptions of the requirements for its academic programs, including all prerequisite courses
- Determine requirements for admission to particular academic programs/plans.
- Maintain up-to-date curricular offerings, regularly scheduled, in order to allow students to make timely progress toward completing an academic program.
- Provide full and timely information regarding course content and scheduling.
- Clear students for graduation, certifying that they have met the requirements for the major, minor, or certificate.
- Review and provide final approval for requests for waivers of particular requirements for the major, minor, or certificate.
College/Campus
- Maintain up-to-date descriptions of the collegiate and campus requirements for academic programs within that college and campus.
- Review and provide final approval for requests for waivers of particular academic program requirements at the college/campus level.

Executive Vice President and Provost
- Review and recommend approval of academic proposals for Board of Regents consideration and final action.

Board of Regents
- Review and provide final approval of proposals for new, changed, or discontinued academic programs/plans.

RELATED INFORMATION
- Administrative Policy: [Adding, Changing or Discontinuing Academic Plans](#)
- Administrative Policy: [Leave of Absence and Readmission for Undergraduates: Twin Cities, Crookston, Morris, Rochester](#)
- [Higher Learning Commission, Criteria and Requirements for Accreditation](#)

HISTORY

Amended:
June 2014 - Comprehensive Review, Major Revision: 1. Defines "academic plan" to include majors, minors, and certificates (i.e., to include all academic plans that are documented on the transcript). Certificates were not included in the past, as their requirements were not formally documented in PCAS until two years ago. 2. Provides examples of levels of academic units authority in FAQ #5, to clarify for advisors and faculty who has authority over a particular requirement. 3. Includes a definition of a certificate, consistent with the definitions in other policies 4. Outlines the responsibilities at the department/program level, college/campus level, SVPP level, and Regents level. 5. Aligns with Administrative Policy: Adding, Changing or Discontinuing Academic Plans.

Amended:
September 2014 - Clarifications related to Higher Learning Commission accreditation requirements.

Amended:
August 2010 - Added questions 2-4 to Frequently Asked Questions.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009
POLICY STATEMENT

Each campus will develop and maintain processes for the good faith review and resolution of student academic complaints that will:

- encourage informal resolution of alleged violations at the lowest unit level;
- allow for a formal resolution mechanism if not resolved informally; and
- provide for appeal to a final decision maker.

The final decision following appeal is not appealable further within the University.

Scope

Student academic complaints are brought by students regarding the University’s provision of education and academic services affecting their role as students and must be based on a claimed violation of a University rule, policy, or established practice.

Student academic complaints do not include student complaints regarding:

- their University employment
- disciplinary action under Board of Regents Policy: Student Conduct Code
- grades
- University admission decisions

Relief Available

Resolution of complaints under this policy may include student reinstatement or other corrective action for the benefit of the student, including refunds, but may not award monetary damages, or direct disciplinary action against any employee of the University.

This policy does not limit the University’s right to change rules, policies, or practices related to the provision of academic services and education.

REASON FOR POLICY

To implement Board of Regents Policy: Conflict Resolution Process for Student Academic Complaints, and to comply with law, including Title IX. This policy provides a framework for resolving student academic complaints that is simple and fair and allows for both informal and formal resolution of conflicts. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.
PROCEDURES

- **UMC Student Academic Grievance Procedures**
- **Conflict Resolution Process for Student Academic Complaints: Twin Cities**
- **Duluth: Student Academic Complaint Resolution**
- **Morris: Student Academic Grievance Procedure (see page 44)**
- **Rochester: Grievance Procedures**

FORMS/INSTRUCTIONS

- **UM 1698 - Student Academic Complaint** [um1698.doc]

APPENDICES

- **Guidelines for Colleges: Hearings Under the Conflict Resolution Process for Student Academic Complaints: Twin Cities**

FREQUENTLY ASKED QUESTIONS

1. **I am a student with a complaint, and I don't know where to direct it. Where can I get information and advice?**
   The University of Minnesota takes student complaints and grievances seriously and has processes in place to ensure that complaints and addressed appropriately and in a timely manner. Helpful resources and information about the channels for student complaints are provided on the [One Stop student services web site](#).

2. **I don't agree with the grade I received from my instructor. Is there anything I can do?**
   While grades are not subject to complaint, you are entitled to an explanation for the grade assigned. If you are not able to get an explanation for the grade from your instructor, consult the appropriate director for undergraduate students or department chair. Students also may wish to seek assistance from the **Student Conflict Resolution Office**. An instructor's judgment in assigning a grade is not a subject for a formal hearing, and can only be reviewed through these informal processes.

3. **I have been dismissed by my college for academic reasons. What steps can I take to challenge the dismissal? What is my enrollment status while the dispute is pending?**
   If your college or program has an appeal process for dismissals, you must follow that process before filing a student academic complaint. Your enrollment continues while the appeal is pending. If your appeal is denied, your enrollment ends and you may file a student academic complaint at that point. If your academic complaint is successful, you then would be reinstated as a student.

4. **A student has a complaint about sexual harassment by a University employee. Where should the student go?**
   A student with a complaint of sexual harassment by a University employee (1) can seek assistance from the campus equal opportunity office (see Administrative Policy: **Sexual Harassment, Sexual Assault, Stalking and Relationship Violence**) or (2) can bring a student academic complaint under this policy and procedure, where applicable. If the student chooses the latter, the University will provide training for resolving the complaint under this procedure to all administrators and other staff who are authorized to investigate or resolve student complaints of sexual harassment. Colleges can contact the Office of General Counsel (612-624-4100) or the campus's equal opportunity office to arrange the training.

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<tr>
<td>Primary Contact(s)</td>
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</tr>
</tbody>
</table>

**DEFINITIONS**

**Student Academic Complaint**
Complaints brought by students regarding the University's provision of academic services and education affecting their role as students.

**Sexual Harassment**
Unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature when (1) submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or academic advancement in any University activity or program; (2) submission to or rejection of such conduct by an individual is used as the basis of employment or academic decisions affecting this individual in any University activity or program; or (3) such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive work or academic environment in any University activity of program.

**RESPONSIBILITIES**

**Academic Complaint Officer**
Comply with the Conflict Resolution Process for Student Academic Complaints procedures.

**Chancellor**
Ensure that campus has processes consistent with policy.

**College**
Schedule a hearing should the Academic Complaint Officer refer the matter to a College Hearing Panel.

**Office of the General Counsel**
Provide legal advice to the University and provide legal representation to the University respondent when the student is represented by a lawyer.

**Executive Vice President and Provost**
Ensure that campus has processes consistent with policy.

**RELATED INFORMATION**

- Board of Regents Policy: [Conflict Resolution Process for Student Academic Complaints](#)
- [Higher Learning Commission, Criteria and Requirements for Accreditation](#)

**HISTORY**

Amended:
August 2014 - Comprehensive Review. Minor Revision. Edits were made to clarify existing procedures and action steps.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

The University establishes minimum admission requirements for master’s and doctoral degrees. Colleges and graduate programs may set additional or more stringent requirements (e.g., an undergraduate GPA standard). Colleges and graduate programs must publish and maintain their admission requirements.

Graduate programs make all admission decisions. All applicants must be informed of admission decisions. The central graduate admissions system is used to deliver the official confirmation of admission decisions to applicants on behalf of the graduate program.

I. General Admission Requirements for Degree Seeking Students

a. Applicants must hold a bachelor’s degree from a regionally accredited U.S. college or university or a comparable degree from a recognized college or university in another country by the time of their matriculation in their graduate program.

i. Students may be admitted and may matriculate in a graduate program at the discretion of the program while simultaneously completing their baccalaureate work, with the program’s permission, if they have no more than seven semester credits or two courses remaining to complete their bachelor’s degree.

If the student does not complete the work for the baccalaureate degree by the end of the first term of enrollment in the graduate program, a hold is placed on the student’s graduate registration until the graduate program determines that the student has completed the baccalaureate degree.

At the discretion of the program, current University students in officially approved integrated bachelor’s/master’s degree programs may be admitted to the master’s program prior to the award of the bachelor’s degree if allowed under the admission requirements of the integrated program.

b. International applicants must meet the minimum standards for English language proficiency of the University as maintained and published by the central graduate admissions office. Colleges and programs may set higher minimum standards for English language proficiency.

c. Applicants must provide unofficial transcripts from all post-secondary institutions attended. If they are admitted, applicants must provide official transcripts before they register and enroll at the University.

d. Applicants may be admitted on a trial basis, contingent upon satisfying specific requirements. Graduate programs that choose to admit applicants on a trial basis must ensure that these requirements are communicated in the notification of admission. A timeframe for satisfying the requirements must be specified. If the specified requirements are not satisfied before the expiration of the timeframe, the student may be terminated from the program.

II. Admission for Graduate Professional Development

Colleges and graduate programs may offer admission for Graduate Professional Development to applicants who wish to enroll in a graduate program but who may not wish to complete a graduate degree. Applicants for Graduate Professional Development must apply and be admitted to the college and program in which they plan to pursue
coursework. Applicants for Graduate Professional Development must meet the admission requirements specified in I.a, b, c, and d.

III. Concurrent or Sequential Graduate Degrees
Applicants who wish to pursue degrees concurrently in different graduate programs and/or different colleges must apply and be admitted to each college and program in which they plan to pursue a degree.
Applicants who have already been awarded a University graduate degree or a post-baccalaureate certificate and are seeking to obtain an additional degree must apply and meet the admissions criteria for their new graduate program and/or degree objective.

IV. Deferred Admission
Admitted applicants may request, from the graduate program, a deferral of their admission to graduate study for up to one full academic year without re-applying. If the deferral is approved and matriculation does not occur within the one-year period, the applicant must re-apply.

V. Acceptance of Financial Support
In the event that a college or graduate program offers an applicant admitted for fall semester financial support, the student may not be compelled by the college or graduate program to accept the financial support offer prior to April 15 of the year of admission. [Council of Graduate Schools’ Resolution Regarding Graduate Scholars, Fellows, Trainees, and Assistants]

VI. University Employees
In order to protect against potential conflict of interest, University employees holding academic appointments above the rank of instructor or research fellow must obtain permission from their college and supervisor or department chair to accept an offer of admission to pursue a University master’s or doctoral degree in the same field, or a closely related field, in which they are also employed.

VII. Exceptions
b. Programs may request from their collegiate dean or unit’s chief academic officer (or designee), an exception to the requirement that admitted students hold a U.S. Bachelor’s or comparable degree.
c. Programs may request from their collegiate dean or unit’s chief academic officer (or designee) an exception to the required use of the University’s central graduate admissions application system for admission, readmission, and changes to master’s and doctoral degree objectives.

REASON FOR POLICY
The University’s admission standards are highly selective and competitive, and reflect the institution’s identity as a leading public and land grant research university. Decisions on admission should ensure that students admitted to a program have appropriate preparation for graduate work in a particular discipline and at the intended degree level.

PROCEDURES

- Use of the Central Graduate Admissions Application System

FORMS/INSTRUCTIONS

- UM 1770 - Request for Exception: Admitting Students Who Do Not Hold a U.S. Bachelor’s or Comparable Degree um1770.docx
- UM 1768 - Request for Exception: Use of the University’s Central Graduate Admission Application System for Admission, Readmission and Changes to Master’s or Doctoral Degree Objectives um1768.docx
- University of Minnesota Central Graduate Admission Application System
APPENDICES

- Template Form: Request for Academic Employee to Accept Admission to a University Master’s or Doctoral Program

FREQUENTLY ASKED QUESTIONS

- Admission for Master's and Doctoral Degrees FAQ

CONTACTS

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DEFINITIONS

Recognized college or university
A college or university in another country that is comparable to a regionally accredited U.S. college or university. This information is available through the University’s central graduate admissions office.

RESPONSIBILITIES

Colleges
- Publish and maintain admission requirements.
- Ensure that all information relevant to enrollment (e.g., legal, terms of financial support, if awarded) is communicated to the student in the collegiate confirmation of admission.
- Review letters generated by the University’s central graduate admission application system and letters sent by graduate programs to ensure conformity with collegiate policy and University policy governing financial support.
- Request exceptions from the Executive Vice President and Provost (or designee) to the requirement to use the University’s central graduate admission application system.

Programs/Departments
- Publish and maintain admission requirements.
- Provide timely communication with applicants throughout the admissions process.
- Request exceptions from their collegiate dean, or the unit’s chief academic officer (or designee) to the requirement that applicants hold a bachelor’s degree from a regionally accredited U.S. college or university or an equivalent degree from a recognized college or university in another country.
- Request from their collegiate dean, or unit’s chief academic officer (or designee) an exception to the required use of the University’s central graduate admissions application system for admission, readmission, and changes to master’s and doctoral degree objectives.

Central Graduate Admissions Office
- Authenticate and review domestic and international transcripts and credentials.
- Advise programs on comparability of non-U.S. colleges and universities with regionally accredited U.S. colleges and universities.
- Advise programs regarding admission of students not meeting the University’s minimum standards for English language proficiency.
- Issue the official confirmation of admission decisions on behalf of the program using the central graduate admissions application system.
- Issue the student visa form I-20.
- Create the official University student record for admitted applicants.

RELATED INFORMATION

- Council of Graduate Schools' Resolution Regarding Graduate Scholars, Fellows, Trainees, and Assistants
- English Language Proficiency Information
- Office of Human Resources Academic Job Codes and Titles

HISTORY

Amended:
June 2017 - Comprehensive Review, Minor Revision. 1. Clarifies the language specifying the role of colleges, programs, and central graduate admissions system in making admission decisions. 2. Specifies the standards for minimum English language proficiency for international applicants. 3. Clarifies the requirements for admission without a baccalaureate degree to specify access for all applicants, not just U of MN undergraduates, and associated completion timeline for outstanding requirements. 4. Specifies the responsibilities related to conditional admission programs, and clarifies "admitted on a trial basis" language.

Effective:
May 2012 - New Policy, Comprehensive Review.
POLICY STATEMENT

The proposed revision of this policy has completed it’s 30­day review and the policy owner is currently considering the feedback received to determine what changes should be made to the proposed version.

This policy governs the application of graduate credit to satisfy the requirements for the following degrees:

- Master’s Plan A degrees
- Master’s Plan B degrees
- Master’s Plan C degrees
- Doctoral degrees

1. Applying credits from a baccalaureate degree
Graduate credits taken before the award of a baccalaureate degree may not be counted toward a graduate degree.

2. Credits-in-common between University graduate degrees
   a. A maximum of eight graduate course credits may be counted in common between two University master's degrees.
   b. Approved graduate course credits may be counted in common between a University doctoral and master’s degree in the same program.
   c. Plan A thesis (xxxx8777) and doctoral degree thesis (xxxx8888) credits in the same program:
      - Can be counted toward either the Plan A master's or the doctoral degree thesis credit requirement, but not both.
      - may be used to meet the Plan B master's project credit requirement.
   d. Plan B Project credits may count only toward the Plan B master’s degree requirements.

3. Transferring graduate course credits from outside the University
Graduate course credits earned at other accredited institutions may be transferred to master’s or doctoral degree plans subject to approval by the University graduate program and the limits described below. In the case of a transfer from a non­United States institution, graduate course credits to be transferred must have been earned in a program judged by the University graduate program to be comparable to a graduate degree program of a regionally accredited institution in the United States. Transfer of thesis credits is not allowed.
   - For master’s degrees – A minimum of 60% of total course credits (not including thesis credits) required for a specific master’s degree must be taken at the University. Transferred credits can include a maximum of 12
graduate course credits taken as non-degree seeking or non-admitted status. Transfer of thesis credits is not allowed.

- **For doctoral degrees** – Individual programs may determine, on a case-by-case basis, how many transfer course credits doctoral students may apply toward their degree requirement. However, doctoral students must take a minimum of 12 course credits at the University. Transferred credits can include a maximum of 12 graduate course credits taken as non-degree seeking or non-admitted status. Transfer of thesis credits is not allowed.

### 4. Applying graduate credits across University graduate programs

a. Graduate course credits earned while enrolled in one University graduate program may be applied to another University graduate program.

   - The number of graduate course credits applied is determined by the graduate program to which the student is applying.
   - Earned master’s thesis credits (8777) and doctorate thesis credits (8888) in one University graduate program cannot be applied toward the thesis credit requirement for another University graduate program.

b. A maximum of 12 graduate course credits from other University registration categories, such as non-degree seeking or non-admitted students, may be considered for transfer once the student is admitted and enrolled in a graduate program.

c. Graduate programs may accept University 4000-level course credits as graduate courses. A maximum of nine 4000-level course credits may be used to satisfy the doctoral or master’s course credit requirement, but graduate programs may impose a lower maximum.

### Exceptions

For approved joint or dual degree programs, items 1, 2a, and 2b do not apply. Such programs may formulate more specific requirements to regulate instances of courses-in-common arising as a result of the special nature of joint/dual degree curricula.

### REASON FOR POLICY

This policy provides the framework for applying graduate credits toward degree requirements under various scenarios. Graduate programs have the authority to accept or reject any graduate course credits that can be applied to a student's current degree plan.

### PROCEDURES

There are no procedures associated with this policy.

### FORMS/INSTRUCTIONS

To apply graduate credits from another college or university to a University graduate degree, use the form and follow the procedures specified by your college. For students in programs formerly in the Graduate School, use the Degree Program Form and follow the instructions included on the form.

*(Note: The development of automated procedures to replace the Graduate School Degree Program Form is ongoing. Until students, faculty, and staff are notified that any new procedures are in place, students will continue to use the existing form.)*

### APPENDICES

There are no appendices associated with this policy.
FREQUENTLY ASKED QUESTIONS

- Application of Graduate Credits to Degree Requirements FAQ

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<tbody>
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<td>University of Minnesota - Duluth Questions</td>
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</tr>
</tbody>
</table>

DEFINITIONS

**Master’s Plan A**
Master's degree programs that require a thesis for degree completion

**Master’s Plan B**
Master's degree programs that substitute additional coursework and special projects for the thesis

**Master’s Plan C**
Master's degree programs that are coursework only which provide an alternative structure for degree completion, such as a culminating experience in the form of a capstone course and/or paper

**Plan B Project Credits**
Credits taken by the students in relation to their Plan B project as part of the degree requirements

RESPONSIBILITIES

There are no specified responsibilities associated with this policy.

RELATED INFORMATION

There is no related information associated with this policy.

HISTORY

**Effective:**
September 2011 - New Policy. Comprehensive Review. Addresses the handling of credit transfers and credits-in-common. Specifies that graduate programs may allow up to a maximum of nine 4000-level course credits, unless the specific graduate program imposes a lower maximum. Allows for Plan A thesis credits to count toward the doctoral degree in the same field if the thesis credits were not applied to the master's degree. Continues to limit the number of credits for the master's and doctoral degrees that may be taken as a non-degree or non-admitted student. Stipulates a minimum number of course credits that doctoral students must take at the University.

University Policy Program
140 McNamara Alumni Center, Minneapolis, MN 55455 - P: 612-624-8081
policy@umn.edu

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

1. Every graduate program must have a Director of Graduate Studies, appointed by the collegiate dean on the Twin Cities campus or chief academic officer (or designee) on a system campus after consultation with program faculty. For All-University programs, a Director of Graduate Studies must be provided on each campus on which a program is offered.

2. A tenured or tenure-track faculty member with an earned doctorate or designated equivalent in an appropriate field from an accredited institution is eligible to serve as Director of Graduate Studies or co-Director of Graduate Studies.
   a. Collegiate deans/chief academic officers or their designated representatives at the collegiate level may, with the approval of the Provost, assign the role of Director of Graduate Studies (or co-Director of Graduate Studies) to an individual who is not otherwise eligible under this standard. The Provost may delegate the approval responsibility to the Vice Provost and Dean of Graduate Education.

3. Collegiate units may develop additional criteria consistent with this policy.

4. Each college must have a set of publicly available written statements regarding the position of Director of Graduate Studies, which will include:
   a. a description of the director's responsibilities and reporting lines;
   b. the standards for selection and evaluation of the director;
   c. the process for selecting the director and approving the appointment, including effective involvement of program faculty; and
   d. the process for removing a director, including consultation with program faculty where appropriate.

5. All programs not housed within a single collegiate unit must specify in the program's Memorandum of Understanding which collegiate dean will appoint the Director of Graduate Studies (or co-Director of Graduate Studies) and what process will be used to nominate program faculty for the position.

Exceptions

REASON FOR POLICY

A faculty Director of Graduate Studies represents the program to faculty governance bodies, takes a leadership role in maintaining program quality and effectiveness, and communicates with collegiate deans and/or the Graduate School about the program's larger concerns.
PROCEDURES
There are no procedures associated with this policy.

FORMS/INSTRUCTIONS
- UM 1762 - Request to Appoint Director of Graduate Studies Who is Not a Tenured or Tenure-Track Faculty Member

APPENDICES
- Director of Graduate Studies Handbook: Suggested Components
- Typical Roles and Responsibilities of the Director of Graduate Studies

FREQUENTLY ASKED QUESTIONS
1. Is a faculty member who earned a Ph.D. degree at a non-U.S. university that is judged to be equivalent to an accredited institution in the U.S. eligible to serve as a DGS?
   Yes.
2. Do minor-only programs require a DGS?
   Yes. The requirements for DGS pertain to both degree-granting programs and free-standing minors.

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<td>612-625-2815</td>
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</tbody>
</table>

DEFINITIONS

All-University Programs
Programs that have been approved by the Board of Regents for joint offering by two or more campuses. Such programs have substantial involvement from all participating campuses in such matters as oversight and administration, recruitment and admission of students, course development and course offering, faculty and student participation, commitment of financial resources, student funding opportunities and related student support, and other aspects of the academic program operation.

RESPONSIBILITIES

Collegiate Units
Provide orientation for new Directors of Graduate Studies, where possible. Develop a set of publicly available written statements regarding the position of the Director of Graduate Studies as outlined in policy item 4. Develop a plan to ensure that the responsibilities of Directors of Graduate Studies are being covered for the entire calendar year.

Collegiate Deans
Appoint Director of Graduate Studies after consultation with program faculty. Appoint an acting DGS, in consultation with program faculty, to cover an absence or temporary vacancy.
Director of Graduate Studies (DGS)
Serves as the coordinator of graduate studies within a program. Together with the graduate program faculty and department and collegiate leadership, the DGS shares responsibility for guiding and improving graduate education within the program(s) under the DGS's jurisdiction. The DGS is the liaison among the graduate students, program faculty, and the college and Graduate School administrations. DGS is also responsible for understanding and complying with University and collegiate policies that govern or have an impact on the graduate program and its students.

RELATED INFORMATION

There is no related information associated with this policy.

HISTORY

Amended:
February 2016 - Comprehensive Review, Minor Revision. Specifies that the provost may delegate approval responsibility. Expanded on the responsibilities for the collegiate units. Minor clarifications to the policy.

Amended:
April 2012 - Policy now applies University Wide (there is no longer an exclusion for the Duluth campus).

Effective:
September 2011 - New Policy, Comprehensive Review. Requires every graduate program to have a director of graduate studies (DGS). Continues the requirement that only tenured or tenure-track faculty are eligible to serve as a DGS, unless an exception by the Provost or designate has been granted.
POLICY STATEMENT

The University may grant undergraduate, graduate and professional degrees posthumously. If a college determines that a deceased student has completed sufficient coursework to be awarded a degree, the college (Twin Cities only) or chief academic officer (or designee) on each system campus has the authority to grant the degree posthumously. Graduate students must have completed enough work toward the thesis or dissertation, if required for the degree.

REASON FOR POLICY

To recognize the academic achievement of students who have died, and to empower colleges and Vice Chancellors to award degrees posthumously where the student has completed enough of the planned degree program.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

There are no FAQs associated with this policy.
## CONTACTS

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</tr>
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</table>

## DEFINITIONS

**Posthumous:**
Following or occurring after one's death.

## RESPONSIBILITIES

**Registrar**
- Notify departments and colleges of this policy.
- Establish individual campus procedures for recording the posthumous degree.
- Post the degree to the student's record.
- Work with the department or college to facilitate appropriate presentation of the degree at the next commencement ceremony or presentation to the student's family in an appropriate setting.

**College (Twin Cities)**
- In consultation with the academic department of the degree, determine if posthumous degree should be awarded.
- Notify the Office of the Registrar of posthumous degree granting for diploma. Send a copy of the request and approval to the Registrar, and place a copy in the student's file.
- Contact the Office of the Registrar to determine the correct information for posting the degree and issuing the diploma.
- Facilitate appropriate presentation of the degree
- As a courtesy, notify the Executive Vice President and Provost of the awarding of the posthumous degree.

**Collegiate Office, (Crookston, Duluth, Morris & Rochester)**
- In consultation with the academic department of the degree, make a request of the campus Chief Academic Officer that the degree be awarded.

**Chief Academic Officer (Crookston, Duluth, Morris & Rochester)**
- In consultation with the college requesting the posthumous degree, determine if posthumous degree should be awarded.
- Notify the Office of the Registrar of posthumous degree granting for diploma. Send a copy of the request and approval to the Registrar, and place a copy in the student's file.
- Contact the Office of the Registrar to determine the correct information for posting the degree and issuing the diploma.
RELATED INFORMATION

There is no related information associated with this policy.

HISTORY

Amended:
March 2016 - Comprehensive Review, Minor Revision. Administrative Procedure: Requesting a Posthumous Degree incorporated into the Responsibilities section of the policy. Minor wording changes to Statement and Reason.

Reviewed:
September 2011 - Comprehensive Review.

Amended:
April 2008 - Updated contacts section. Added definitions for "Posthumous" and "Eligible Student". "Vice Chancellor for Academic Affairs" changed to "Chief academic officer" in responsibilities section. Additional edits made to clarify policy, but not to change meaning.

Effective:
June 2003
POLICY STATEMENT

Each campus is responsible for establishing a standard class schedule and class period in order to maximize classroom utilization and student access to courses. These standards apply to courses that are scheduled during an academic term. Academic terms are defined by the academic calendars set for each campus.

A. Standards for Class Schedules

1. Each campus of the University must adopt a standard class schedule with an appropriate change period between classes. Although the practice is discouraged, start times and/or class periods that vary from the standard schedule are permitted, subject to campus procedures for approval of such variances.

2. Departments are encouraged to schedule classes so that classroom space is used to the maximum extent practicable while ensuring that students have reasonable access to courses.

3. Classes may not be held on official University holidays except with the approval of the appropriate dean.

4. Class schedules, and information on non-conforming classes, will be reported annually to the Senate Committee on Educational Policy by the office on the campus responsible for class scheduling.

B. Twin Cities Campus Standard Schedule and Class Periods

1. Monday - Friday Standard Class Periods
   
   There are three standard class periods, described below and set out in the table following:

   a. The standard "A" class is 50 minutes, with a 15-minute change period between classes. The first class of the day starts at 08:00 on the Minneapolis campus and at 08:30 on the St. Paul campus. Classes meeting for two or more periods (such as labs), must start and end according to this schedule.

   b. The standard "B" class is 75 minutes, with a 15-minute change period between classes. The first class of the day starts at 08:15 on the Minneapolis campus and at 08:45 on the St. Paul campus. Such classes will be scheduled only on Tuesdays and Thursdays.

   c. The standard "C" class is 75 minutes, with a 15-minute change period between classes. The first class of the day starts at 08:15 on the Minneapolis campus and at 08:45 on the St. Paul campus. Such classes will only be scheduled Monday/Wednesday, Wednesday/Friday, or Monday/Friday.

2. Classes designed exclusively for graduate and/or post-baccalaureate professional students on the Twin Cities campus are exempt from the scheduling requirements in this policy, if held in a room under the control of the department. Clinically based Academic Health Center (AHC) courses in AHC rooms may be
scheduled at non-standard times on the Twin Cities campus. Departments should schedule classes so that students have reasonable access to courses inside and outside the department.

3. **Distribution of meeting times**
   Colleges must distribute classes evenly throughout the day. Non-compliant colleges must change class meeting times to meet distribution requirements.

4. **Distribution of meeting patterns**
   Colleges are permitted to schedule a maximum of 50% of their classes using a Tuesday/Thursday meeting pattern, with the remaining classes using a combination of Monday/Wednesday/Friday meeting patterns. Non-compliant colleges must change class meeting times to meet distribution requirements.

5. **Distribution of enrollments**
   Colleges must distribute enrollments throughout the day (i.e., across class hours) and throughout the week (i.e., day patterns).

6. **Distribution calculations**
   Distributions are calculated by summing the number of minutes for each meeting pattern occurring in a standard "A" class meeting time on each weekday, Monday through Friday. Colleges are permitted to schedule up to 3% of departmental classes during any individual time period (e.g., period VII on Thursday or period II on Monday) on any given weekday. Meeting patterns for combined sections are calculated once and are attributed to the parent section's department.

7. **Standard Class Meeting Times**

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<th>Minneapolis Campus</th>
<th>St. Paul Campus</th>
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<tbody>
<tr>
<td></td>
<td>A Times (M T W Th F)</td>
<td>B Times (T Th only)</td>
</tr>
<tr>
<td>I</td>
<td>08:00 - 08:50</td>
<td>08:15 - 09:30</td>
</tr>
<tr>
<td>II</td>
<td>09:05 - 09:55</td>
<td>09:45 - 11:00</td>
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<tr>
<td>III</td>
<td>10:10 - 11:00</td>
<td>11:15 - 12:30</td>
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<tr>
<td>VII</td>
<td>14:30 - 15:20</td>
<td>15:45 - 16:25</td>
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<tr>
<td>VIII</td>
<td>15:35 - 16:25</td>
<td>16:00 - 17:15</td>
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<tr>
<td>IX</td>
<td>16:40 - 17:30</td>
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</table>

8. Colleges are permitted to request classes during non-standard times. These requests must be approved by the college associate dean and the Office of Classroom Management; in case of a disagreement, final authority to grant a variance rests with the Executive Vice President and Provost's office.

9. **Standard Scheduling Rules for Classes Carrying 1-5 Credits.**
The following rules do not apply to the length of labs, film classes, performing arts classes, or specialized class components, but such classes must begin according to the schedule in Section 1. Neither these rules nor those in Section 1 apply to courses administered online or directed study, directed readings, or directed research courses, but these courses must comply with Administrative Policy: Expected Student Academic Work per Credit.

One Credit Classes
- Meet for one standard hour per week, begin at a standard "A" class meeting time, and meet for one class period.
- Meet twice per week, and follow the rules for two-credit classes; or
- Meet three times per week, and follow the rules for three-credit classes.

Two Credit Classes
- Meet twice per week, begin at a standard "A" class meeting time, and meet for one class period, or
- Meet once per week, begin at a standard "A" class meeting time, and last two class periods.

Three Credit Classes
- Meet three times per week on MWF, begin at a standard "A" class meeting time, and meet for one class period; or
- Meet twice per week, use the standard "B" class meeting times, and meet on Tuesdays and Thursdays only; or
- Meet twice per week, use the "C" class meeting times, and meet on MW, WF, MF only; or
- Meet once per week, use the standard "A" start time, and meet on F.

Four Credit Classes
- Meet four times per week, begin at a standard "A" class meeting time, or
- Meet twice per week for two hours, begin at a standard "A" time, and last two class periods; or
- For lecture/laboratory or lecture/discussion courses with three hours of lecture time, the lecture component follows the schedule for three-credit courses and the discussion component follows the schedule for one-credit classes.

Five Credit Classes
- Meet five times per week, begin at a standard "A" class meeting time, meet for one class period, and meet MTWThF.
- For lecture/laboratory or lecture/discussion courses with three hours of lecture time, the lecture component follows the schedule for three-credit courses. For lecture/laboratory or lecture/discussion courses with four hours of lecture time, the lecture component follows the schedule for four-credit courses and the discussion component follows the corresponding one- or two-credit schedule.

Summer Term (May session plus first and second summer session).
Classes may meet during the May session, first or second summer session, or may extend across two or all three sessions. Class period duration in the May and summer sessions is at the discretion of the department offering the class, in consultation with the Office of Classroom Management. The first class hour will begin at 08:00 on the Minneapolis campus and at 08:30 on the St. Paul campus.

**REASON FOR POLICY**

Standard class scheduling allows for maximum access to class offerings for students and facilitates the most efficient use of classrooms.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**
There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. Are campuses allowed to set their own class schedule and passing times?
   Yes, each campus of the University (e.g. University of Minnesota, Crookston; University of Minnesota, Morris; University of Minnesota, Rochester; University of Minnesota, Twin Cities) is permitted to set the appropriate class schedule and passing times for its institution.

2. What is a centrally-scheduled classroom versus a departmentally-controlled classroom (Twin Cities)?
   Centrally-scheduled classrooms at the University of Minnesota, Twin Cities are operated, maintained and scheduled through the Office of Classroom Management. Departmentally-scheduled classrooms are operated, maintained and scheduled through the individual departments that control them.

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DEFINITIONS

First and Second Summer Session
The University of Minnesota academic calendar includes Fall Semester, Spring Semester, May Session and Summer Session. Summer Session is typically divided into two time periods, although some classes may span both summer sessions. Classes are offered each of these terms although the duration of the term can vary. See the Academic Calendar of the appropriate campus for exact dates of the terms in a particular calendar year.

May Session
The University of Minnesota academic calendar includes Fall Semester, Spring Semester, May Session and Summer Session. May session classes occur between the end of spring semester and the beginning of summer session.

RESPONSIBILITIES

Departments (Twin Cities)
- Follow the established campus standard schedule and class periods.
- Distribute meeting times and patterns, and enrollment.

Office of Classroom Management (Twin Cities)
- Establish campus standard schedule and class period times.
- Monitor and report use of time distributions and variations from standard schedule.
Office of the Executive Vice President and Provost

Consider a request for variance from the standard class schedule when it is necessary, and if agreement about scheduling has not been reached at a lower level.

RELATED INFORMATION

- Educational Policy: Instructional Time per Course Credit
- Educational Policy: Expected Student Academic Work per Credit: Twin Cities, Morris, Rochester
- Educational Policy: Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Morris, Rochester
- University of Minnesota, Twin Cities Academic Calendar

HISTORY

Amended
May 2011 - Comprehensive Review: Requires colleges to distribute classes evenly throughout the day; Requires colleges to distribute enrollment, as well as classes, throughout the day and throughout the week; Eliminates the 60/40 guidelines of not scheduling more than 60% of the classes during peak hours. Adds two new meeting patterns to the standard class times.

Amended
April 2010 - Added an additional approval step if a faculty member wants to schedule a class on an official University Holiday.

Amended:
December 2009 - This policy now applies to Crookston.

Effective:
April 2009

University Policy Program
140 McNamara Alumni Center, Minneapolis, MN 55455 - P: 612-624-8081
policy@umn.edu

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

1. Enrollment limits for course sections
   Departments or programs may set minimum and maximum enrollment limits for any course or any section of a course. Enrollment limits are subject to review by the dean.

2. Cancellation of low-enrollment courses
   a. Each campus and college must maintain a policy regarding the cancellation of low-enrollment courses or sections. These policies may differ across colleges and may allow variations by department. Any such policy must, at a minimum, take into account (1) the effect of cancellation of a course or courses on student academic progress and graduation, (2) the need for a course to contribute to appropriate program breadth and curriculum, and (3) commitments made to instructors that a course would be offered.
   b. Courses may not be cancelled after the fifth day of classes for that term.

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY

Maximum efficiency and optimal learning occurs within an enrollment range: it is not feasible or educationally sound to teach certain courses if enrollments are either too small or too large. Departments must be able to cancel a course if it is too under-prescribed to warrant offering it, as well as to limit the enrollment to maximize learning. Students need adequate time to select a replacement course if a course is cancelled.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS
There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

Where can college guidelines on canceling low enrollment courses be found?
Each college of the University of Minnesota, Twin Cities should have its guidelines for canceling low enrollment courses on its website. Policies for the University of Minnesota, Morris and the University of Minnesota, Rochester can be obtained in the Office of the Vice Chancellor for Academic Affairs.

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DEFINITIONS

Enrollment limits (maximum or minimum)
The minimum or maximum number of students allowed in a course; the minimum informs when a course may be cancelled and the maximum informs when a course is considered closed to additional enrollments.

RESPONSIBILITIES

Departments (Twin Cities)
- Establish minimum and maximum course limits.
- Proactively monitor course enrollments so as to cancel courses as early as possible so students can still register for additional course(s) without needed permission to do so.

RELATED INFORMATION

There is no related information for this policy.

HISTORY

Amended:
December 2009 - Policy now applies to Crookston.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

The primary purpose of the course numbering system is to help students select and sequence courses. Consistent use of the course numbering system also helps those who view a student’s transcript identify the level of courses that appear on the transcript.

1. Departments and colleges must use 4-digit course numbers using the system in the Appendix to this policy.
2. Students should use the course numbering system to assist in selecting courses to advance them toward their degree.
3. Use of 4xxx Courses in Graduate Programs: Graduate programs may accept University 4xxx-level course credits as graduate courses. A maximum of nine credits of 4xxx-level course work may be used to satisfy the doctoral or master’s course credit requirement, but individual graduate programs may impose a lower maximum. A graduate program may restrict the use of 4xxx courses in the program (e.g., by stipulating that only certain 4xxx courses may be counted). A graduate program has the authority to establish its curricula and the requirements for its academic programs.
4. 6xxx and 7xxx Courses: 6xxx and 7xxx courses are to be used primarily for post-baccalaureate professional programs (e.g., D.D.S., J.D.). It is at the discretion of a graduate program whether it will accept University 6xxx- and 7xxx-level course credits as satisfying degree requirements. Similarly, it is at the discretion of a professional program whether it will accept University 5xxx- and 8xxx-level course credits as satisfying degree requirements. Those departments or programs offering courses for degrees that span graduate and professional education may determine how to best number courses in their curriculum.
5. Alphabetic Suffixes: No alphabetic suffixes other than those already in place at the time this policy is adopted (April 2009) may be used (see the FAQ).
6. Graduate programs must use the standard numbering conventions for all thesis credit courses (see Appendix).
7. Graduate programs will use the all-University numbering conventions for other kinds of courses (see Appendix for xx91 – xx98 courses).
8. Thesis credit courses (see Appendix) and xx91 – xx98 are examples of courses that students may repeat for credit.
9. Use of a zero as the last digit of a course number should be reserved for other kinds of courses that may be repeated for credit (e.g., "topics" courses).
**Exclusions**
This policy is not applicable to the Duluth campus.

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**REASON FOR POLICY**

Minnesota law requires the University to have a course numbering convention to distinguish remedial, lower division, upper division, and graduate level coursework. Consistent use of the course numbering system helps students select and sequence their courses and helps those who view a student’s transcript to identify the level of courses that appear on the transcript.

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**PROCEDURES**

There are no procedures associated with this policy.

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**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

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**APPENDICES**

- [Course Numbering System](#)

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**FREQUENTLY ASKED QUESTIONS**

**What are suffixes and how can they be used?**
Suffixes help identify certain characteristics of courses. Currently three suffixes are used: W (for writing intensive courses); H (for honors courses); and V (for courses that are both honors and writing intensive).

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**DEFINITIONS**

**Directed Research**
An opportunity in which a student designs and carries out a research project under the direction of a faculty member. Directed research may be taken for variable credit and special permission is needed for enrollment.

**Directed Study**
A course in which a student designs and carries out an independent project under the direction of a faculty member. Directed study courses may be taken for variable credit and special permission is needed for enrollment.

**Independent Study**

A course in which a student enrolls in an established course but studies independently under an instructor’s guidance rather than attending class. Independent study courses may be taken for variable credit and special permission is needed for enrollment.

**Remedial**

Remedial courses are intended to correct or improve deficient skills and knowledge in a specific subject. 0xxx courses are remedial courses that do not carry credit.

**RESPONSIBILITIES**

There are no specified responsibilities associated with this policy.

**RELATED INFORMATION**

- Administrative Policy: [Academic Unit Authority over the Curriculum and Major](#)
- Administrative Policy: [Application of Graduate Credits to Degree Requirements](#)

**HISTORY**

**Amended:**
May 2016 - Comprehensive Review. Minor Revision. Language now aligns with Administrative Policy: [Application of Graduate Credits to Degree Requirements](#). Removes language that pertained to the old Graduate School structure.

December 2009 - Policy now applies to Crookston.

**Effective:**
April 2009
POLICY STATEMENT

This policy governs the credit requirements for the following degrees:

- Master’s Plan A degrees
- Master’s Plan B degrees
- Master’s Plan C degrees
- Doctoral degrees

Credit requirements for master’s degrees

1. Master’s degrees must consist of the following minimum credits:
   a. Plan A degrees: 10 master’s thesis credits (xxxx8777) and a minimum of 20 graduate-level course credits.
   b. Plan B degrees: a minimum of 30 graduate-level course credits, including Plan B Project credits as defined by each program and approved by the college.
   c. Plan C degrees: a minimum of 30 graduate-level course credits.

2. No collegiate unit or program may require more than:
   a. 36 credits with a combination of course and thesis for a master’s Plan A
   b. 36 credits with a combination of course and Plan B project credits for a master’s Plan B, and
   c. 48 course credits for a master’s Plan C.

3. Master’s thesis credits (xxxx8777) may be taken for the master’s Plan A at any time during a student’s degree program.

4. A minimum of 6 graduate-level course credits is required for a master’s level minor.

Credit requirements for doctoral degrees

1. Doctoral degrees must consist of a minimum of 48 credits: a minimum of 24 graduate-level course credits and a minimum of 24 doctoral thesis credits (xxxx888).

2. No collegiate unit or program may require more than 72 credits with a combination of course and doctoral thesis credits (xxxx8888) for the completion of the doctoral degree.

3. Programs have the discretion, with college approval, to determine when it is academically appropriate for students to take doctoral thesis credits (xxxx8888).

4. A minimum of 12 graduate-level course credits is required for a doctoral level minor.
Exceptions
Collegiate deans or the appropriate campus Vice Chancellor may request exceptions from the Executive Vice President and Provost to items 1b and 2b based on accreditation requirements, national standards of the field, interdisciplinary nature of the program or similar arguments. Collegiate deans or the appropriate campus Vice Chancellor may petition the Provost for an exception to the 24 doctoral thesis-credit (xxxx8888) minimum in item 2a on behalf of doctoral programs that do not require dissertations. The petition should show that the exception conforms to national standards in the field and that appropriate additional credits (course credits, internships, project credits, etc.) will replace the 24 doctoral thesis credits (xxxx8888).

REASON FOR POLICY

This policy establishes the minimum and maximum credit requirements for Master’s Plan A, B, and C degrees and for Doctoral degrees. It provides a framework for curriculum development that balances coursework, research training, and independent scholarly work.

PROCEDURES

- Early Doctoral Thesis Credit Registration Option

FORMS/INSTRUCTIONS

- UM 1760 - Request for Exception to the Maximum Requirements for Master's and Doctoral Degrees

APPENDICES

- Implementation of Doctoral Thesis Credit Policy

FREQUENTLY ASKED QUESTIONS

- Credit Requirements for Master’s and Doctoral Degrees FAQ

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<td>218-726-8891</td>
<td><a href="mailto:elbrown@d.umn.edu">elbrown@d.umn.edu</a></td>
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</table>

DEFINITIONS

Graduate-level Course Credits
Graduate-level course credits That are primarily numbered as 5xxx or above, excluding thesis credits. Graduate programs may choose to allow 4xxx-level course credits to be applied toward a graduate degree, up to the limit specified in Administrative Policy: Application of Graduate Credits to Degree Requirements.
Plan B Project Credits
Credits taken by the students in relation to their Plan B project as part of the degree requirements.

Thesis Credits
Credits taken by students in relation to their research work as part of the degree requirements. These include: xxxx-8777 (master's thesis credits) and xxxx-888 (doctoral thesis credits).

RESPONSIBILITIES

Colleges and Programs
Restructure program requirements to conform to this policy by the effective date. Request exceptions from the Executive Vice President and Provost to items 1b and 2b based on accreditation requirements, national standards of the field, interdisciplinary nature of the program or similar arguments.

RELATED INFORMATION

There is no Related Information associated with this policy.

HISTORY

Amended:
June 2015 - Comprehensive Review, Minor Revision: The changes provide greater clarity around the specific type of credits. Removed the effective date of the policy statement, which was inserted when this policy was first created.

Effective:
September 2011 - New Policy, Comprehensive Review. Establishes the minimum and maximum credit requirements for Master's Plan A, B, and C degrees and for Doctoral degrees. Provides a framework for curriculum development that balances coursework, research training, and independent scholarly work. Eliminates the requirement for outside coursework in view of the trend towards interdisciplinary curricula within many programs. Programs are given the option to require a minor or supporting program where warranted by educational objectives. Outlines a process by which collegiate deans may request exceptions.
POLICY STATEMENT

Directed study, directed readings, and directed research courses are opportunities for students to work individually with a faculty member and to earn credit for individually designed content.

1. Departments, colleges and campuses who wish to offer these types of courses must specify:
   a. the levels for these directed courses within their curricula;
   b. the criteria for registration for these courses; and
   c. the criteria that are used to determine who is eligible to teach these courses.

2. Colleges and campuses must establish and publish procedures for registration in directed study, directed research, and directed readings courses.

3. The instructor of a course and the student must have a written contract in place that specifies the student’s responsibilities for the courses and the name of the instructor who is responsible for turning in the student’s grade for the course, as part of the enrollment in the course. Instructors must provide a copy of the contract to the academic department in which the registration for the course occurs.

4. These courses do not require a syllabus.

5. The instructor must set the number of credits for these courses in accordance with the provisions of Administrative Policy: Expected Student Academic Work per Credit: Twin Cities, Crookston, Morris, Rochester so that the academic workload requirements are in conformance (generally 3 hours of work per week per credit for undergraduate students and more than that for graduate and professional students).

6. Programs may limit the number of directed study, directed readings, and directed studies courses a student may take per term.

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY
Uniformity of expectations across directed study, readings and research opportunities is in the best interest of students, faculty and staff.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

There are no FAQs associated with this policy.

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Directed Study
A course in which a student designs and carries out an independent project under the direction of a faculty member. Directed study courses may be taken for variable credit and special permission is needed for enrollment.

Directed Readings
A course in which a student designs an area of study under the direction of a faculty member. Directed readings may be taken for variable credit and special permission is needed for enrollment.

RESPONSIBILITIES
Instructor

- Review and approve the contract a student has created for a courseruse. Work with the student to revise the contract, as needed, before approval.
- Supervise the student’s work in such a course.
- Submit final grade at the end of the course.

Student

- Obtain permission to enroll in the course and register for the course.
- Complete the responsibilities of the course, as specified in the contract.
- Maintain regular contact with the instructor.

Academic Unit

- Maintain records of such courses, including the individual contracts for each occurrence.
- Maintain oversight of curriculum and instructor workload.

RELATED INFORMATION

- Administrative Policy: Expected Student Academic Work per Credit: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Academic Unit Authority Over the Curriculum and the Major: Twin Cities, Crookston, Morris, Rochester

HISTORY

Amended: October 2015 - Comprehensive Review, Major Revision. 1. Requires instructors to file a copy of the contract associated with these courses, to be on file in the academic department offering the course. 2. Requires departments, colleges, and campuses to specify the criteria for both eligibility and registration into these courses. 3. Allows departments to establish limits to the number of these types of courses that a student may take. 4. Specifies the responsibilities for the instructor, student, and academic unit.

Amended: December 2009 - Policy now applies to Crookston.

Effective: April 2009

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

This policy sets the standards for the doctoral final oral examination and the submission of the final copy of the doctoral dissertation for the completion of the doctoral degree.

I. The Doctoral Final Oral Examination

a. The doctoral final oral committee must consist of at least four members, including the advisor(s). All members of the committee and the candidate must participate in the final oral examination. Committee members and/or the student may participate remotely as long as all conditions for remote participation in the examination are met.
   i. At least three members (including the advisor) must be from the student's major field.
   ii. At least one member must represent a field outside the major. If the student has declared a minor, the outside member, or one of the outside members, must represent the minor field.
   iii. Members cannot satisfy the requirement with respect to more than one field.
   iv. The chair of the committee must not be the candidate's advisor or co-advisor.
   v. At least two members of the committee must be tenured or tenure-track University faculty members who hold earned doctorate degrees or designated equivalents in appropriate fields from an accredited institution. At least one of the committee members must be a tenured University faculty member.
   vi. Collegiate deans or their designated representatives at the collegiate level must verify eligibility and approve the members of the final oral examination committee.

b. Thesis Reviewers for final oral examination:
   i. A minimum of 2 major field reviewers and 1 minor/outside reviewer are required. In the case of multiple minors, there must be a reviewer for each minor.
   ii. Advisor(s) and co-advisor(s) must serve as reviewers.
   iii. Students must provide reviewers with a copy of the dissertation at least 14 days before the scheduled date of the doctoral final oral examination.
   iv. Every designated reviewer on the doctoral dissertation reviewer's report must certify that the dissertation is ready for defense before the doctoral final oral examination may take place.

c. The doctoral final oral examination must include:
   i. A public presentation of the candidate’s dissertation to the doctoral final oral examination committee and the invited scholarly community.
   ii. A closed session (open only to the doctoral final oral examination committee and the candidate) immediately following the public presentation.

d. To be recommended for the award of the doctoral degree, all committee members, or all committee members save one, must vote that the student has passed the doctoral final oral examination.
e. Students are not allowed to retake the final oral examination.

II. Submission of final copy of the doctoral dissertation

a. Committee members must notify the candidate in writing of all required revisions to the doctoral dissertation as well as specifying a time limit for the submission of the revised doctoral dissertation within seven (7) days of the final oral examination.

b. All students who complete a doctoral dissertation must file a digital copy of the dissertation with the University in accordance with University standards. Students may choose whether or not to request an embargo of the publication of the dissertation for a limited period of time.

Exceptions

Doctoral programs with approved completion requirements that do not include a final oral examination are exempt from I.

Doctoral programs with approved completion requirements that do not include a doctoral dissertation are exempt from II.

Effective Date

This policy applies to all students admitted after January 1, 2013. Students who matriculated before January 1, 2013 may choose to continue under the policies in effect when they initially matriculated in their graduate program.

This policy does not apply to the J.D., M.D., Pharm.D., D.V.M., D.D.S, L.L.M degrees.

REASON FOR POLICY

This policy establishes uniform standards for the doctoral final oral examination; defines timely submission of copies of the dissertation for University archives, and supports Board of Regents Policy: Openness in Research which covers public dissemination of University-sponsored research.

PROCEDURES

- Canceling or Recessing the Doctoral Preliminary and/or Master's or Doctoral Final Oral Examination
- Degree Completion Procedures

FORMS/INSTRUCTIONS

- Doctoral Graduation Packet Request
- Thesis or Dissertation Hold Request

APPENDICES

- Degree Completion Steps: Doctor of Audiology
- Degree Completion Steps: Doctor of Musical Arts
- Degree Completion Steps: Doctor of Philosophy, Doctor of Education
- Mutual Roles and Responsibilities for Faculty and Graduate Students: Guidelines
- Required Conditions and Best Practices for Remote Participation in Graduate Examinations
- Typical Roles and Responsibilities of the Director of Graduate Studies
- Thesis Formatting and Submission Guidelines

FREQUENTLY ASKED QUESTIONS
CONTACTS

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<tbody>
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</tr>
</tbody>
</table>

DEFINITIONS

There are no definitions associated with this policy.

RESPONSIBILITIES

Graduate School

• Provide guidelines for formatting and submitting the dissertation, to include not only current instructions for electronic formatting and filing but also guidelines governing the use of already published material in the dissertation. Guidelines should take account of possible copyright issues.

Collegiate Units

• Approve and archive in the system of record committee membership (including any subsequent changes to an approved committee).
• Approve and record the specific procedures used by programs for administering and grading the doctoral preliminary and final examinations.
• Maintain and publish any additional collegiate-level publishing standards or guidelines (e.g., stylistic conventions based on discipline, language of the thesis).

Programs

• Provide program-specific information in the graduate handbook
• Maintain and publish any additional program-level publishing standards or guidelines (e.g., stylistic conventions based on discipline, language of the thesis).
• Review and approve committee membership (including any subsequent changes to an approved committee); route program-approved requests to the collegiate unit for approval.

Students

• Must meet all standards for the doctoral final oral examination
• Must meet the formatting requirements for the submission of the final doctoral dissertation.
• Must meet all requirements for completing the doctoral degree.

RELATED INFORMATION

• Administrative Policy: Eligibility to Serve on Graduate Examination Committees
• Administrative Policy: Doctoral Degree: Performance Standards and Progress
• Administrative Policy: Admission for Master’s and Doctoral Degrees
• Administrative Policy: Readmission or Changes to Master’s or Doctoral Degree Objectives
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

This policy sets minimum standards for doctoral students to maintain academic good standing and satisfactory progress in their degree programs, and establishes requirements and procedures for the administration and evaluation of doctoral written and oral preliminary examinations. Programs and collegiate units may have additional and/or more stringent requirements.

I. Requirements Upon Matriculation

a. Students are responsible for knowing all program requirements of their doctoral program when they matriculate.

b. Upon matriculation, programs must:
   i. Provide each student a current graduate program handbook, specifying the program’s requirements and policies governing successful degree completion.
   ii. Assign each student a temporary advisor.

II. Progress Review

a. Annual Review
   i. Programs must have a procedure to review the progress of each doctoral student at least once a year and must provide the results to the student in writing.

b. Degree Plan
   i. Doctoral students must have an approved degree plan on file with their collegiate unit prior to taking the preliminary oral exam. It is recommended that the degree plan be filed a minimum of three months prior to the exam date.
   ii. If a student intends to complete a minor, the minor must be declared on the degree plan prior to taking the preliminary oral exam.
   iii. The degree plan must be centrally archived in the system of record.

III. Performance Standards

a. Continuous Enrollment Students are required to enroll every semester (fall and spring) from the time of matriculation until degree conferral except for cases with an approved Leave of Absence on the student’s record.

b. Time Limit for Earning the Doctoral Degree All requirements for the doctoral degree must be completed and the degree awarded within eight calendar years after initial enrollment to the graduate program or the more restrictive time frame specified by the program.
i. Students who are unable to complete the degree within the time limits described above may, with the approval of their advisor/s and program DGS, petition the program and collegiate unit for one extension of up to 24 months. Students must submit the petition for an extension prior to the end of the term in which the time limit will expire.

- If a petition is approved, the student is notified in writing of the expectations for progress and of the expected timeline for completion and award of degree.
- If the petition is denied, the student is notified in writing that the student will be terminated from the doctoral program.

ii. Under extraordinary circumstances, students may file a second petition for an additional extension of up to 24 months; however such petitions after the initial extension must be reviewed and approved by the student's advisor/s, program DGS, and Vice Provost and Dean of Graduate Education. Students must submit the petition for an extension prior to the end of the term in which the initial extension will expire.

a. If a petition is approved, the student is notified in writing of the expectations for progress and of the expected timeline for completion and award of degree

b. If the petition is denied, the student is notified in writing that the student will be terminated from the doctoral program

iii. Students who have been terminated under such circumstances may apply for readmission to the program; however, readmission is not guaranteed.

c. **Minimum Grade Requirements** To remain in good academic standing students must meet the minimum GPA requirement specified by the graduate program or 3.000 (on a 4.000 scale) for courses being applied toward program requirements, whichever is higher. Students who have filed a doctoral degree plan must maintain a 3.000 GPA for courses included on the degree plan. Only courses with grades of A, B, C (including C-) and S may be counted toward the degree. Students who fall below the program’s minimum GPA requirement may be terminated from the program.

d. **S/N grades for courses** A minimum of 2/3 of the course credits included on a degree plan must be taken A/F.

### IV. Doctoral Preliminary Written and Oral Examinations

a. Every doctoral student must pass a written examination in the major field.

i. Students must be notified in writing whether or not they have passed the written examination requirement(s).

ii. Programs must record whether the student has met the written examination requirement(s) in the central system of record. Students who are reported to have failed to meet the written examination requirement(s) will be terminated from the doctoral program.

b. Every doctoral student must pass a preliminary oral examination in the major field. The preliminary oral examination is conducted as a closed examination, attended by only the student and the examining committee.

i. The oral examination may not take place before the program has certified that the candidate has passed all written examination requirement(s).

ii. The doctoral preliminary oral examination will be graded either pass, pass with reservations, or fail.

iii. If a student fails the exam, the student may retake the examination once, if all committee members, or all committee members save one, approve this option on the Doctoral Preliminary Oral Examination form.

iv. The second attempt to pass the preliminary oral examination must use the same committee members unless an extraordinary or emergency situation necessitates a substitution.

v. If the committee does not approve a retake, or if the student fails the second attempt, the student will be terminated from the doctoral program.

c. The doctoral preliminary oral committee must consist of at least four members, including the student’s advisor/s. All members appointed to the committee must meet the minimum standards established by the program and college. All members of the committee and the candidate must participate in the preliminary oral examination. Committee members and/or the student may participate remotely as long as all conditions for remote participation in the examination are met.

i. At least three members (including the advisor) must be from the student's major field.

ii. At least one member must represent a field outside the major. If the student has declared a minor, the outside member, or one of the outside members, must represent the minor field.

iii. Members cannot satisfy the requirement with respect to more than one field.
d. Collegiate deans or their designated representatives at the collegiate level must verify eligibility and approve the members of the preliminary oral examination committee.

e. Voting Requirements for the Doctoral Preliminary Oral Examination:

a. At the end of the closed examination, the candidate is excused from the room and an independent, non-binding vote is taken before discussion of the examination begins. This initial non-binding vote is intended to represent the independent assessment of each committee member of the student’s performance free from undue influence of other committee members. Following discussion, a final vote is taken and is recorded on the examination form.

b. The outcome of the preliminary oral examination is recorded in one of three ways: pass, pass with reservations, or fail. The voting proportions necessary to pass the exam are shown in the table below:

<table>
<thead>
<tr>
<th>Number of committee members</th>
<th>Minimum number of votes needed to pass (A vote to pass with reservations constitutes a passing vote)*</th>
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<tbody>
<tr>
<td>Four</td>
<td>Three</td>
</tr>
<tr>
<td>Five</td>
<td>Four</td>
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<td>Six</td>
<td>Four</td>
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<td>Seven</td>
<td>Five</td>
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</table>

*The outcome is recorded as “pass with reservations” in situations where to achieve the minimum number of votes to reach a verdict of pass, any vote of pass with reservations is included. For example, on a four-person committee, if there is one “pass with reservations” vote and three pass votes, the result is pass. If there is one “pass with reservations” vote, one fail, and two pass votes, the result is pass with reservations.

c. Students who do not earn the minimum number of passing votes fail the examination. A vote to pass the student with reservations still constitutes a passing vote.

Exceptions

Programs with a distinctive student population or approved joint-degree programs may request a program-wide exception to the eight-year time limit for earning the doctoral degree.

Doctoral programs with approved degree performance standards and progress requirements that do not require preliminary written and oral examinations are exempt from IV.

This policy does not apply to the J.D., M.D., Pharm.D., D.V.M., D.D.S, L.L.M. degrees.

Effective Date

This policy applies to all students admitted after January 1, 2013. Students who matriculated before January 1, 2013 may choose to continue under the policies in effect when they initially matriculated in their graduate program.

REASON FOR POLICY

This policy creates the framework for communications to students about degree requirements and degree progress expectations; sets minimum standards for satisfactory progress in doctoral programs; establishes standards and procedures for administering and grading doctoral written and oral preliminary examinations. This policy establishes uniform procedures for doctoral preliminary examinations.

The policy also assists the student and advisor in planning for timely completion of program requirements, provides timely evaluations to students as they proceed through program; alerts student and advisors to problems, and provides the opportunity to develop best approaches for addressing those problems; and creates a clear record in cases where a program decides to terminate student from the doctoral program.

PROCEDURES

- Canceling or Recessing the Doctoral Preliminary and/or Master’s or Doctoral Final Oral Examination
FORMS/INSTRUCTIONS

- UM 1776 - Doctoral Degree: Program-Wide Exception to the Maximum Time Limit
- UM 1777 - Doctoral Degree: Request for Extension to the Maximum Time Limit
- OTR 198 - Graduate Degree Plan

APPENDICES

- Academic Freedom and Responsibility
- Annual Graduate Student Reviews: Guidelines
- Graduate Program Student Handbook: Guidelines
- Mutual Roles and Responsibilities for Faculty and Graduate Students: Guidelines
- Required Conditions and Best Practices for Remote Participation in Graduate Examinations
- Responsible Conduct of Research and Ethical Teaching and Scholarship
- Typical Roles and Responsibilities of the Director of Graduate Studies

FREQUENTLY ASKED QUESTIONS

- Doctoral Degree: Performance Standards and Progress FAQ

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DEFINITIONS

**Good standing/good academic standing**
Students remain in good standing if they: (a) make timely progress towards degree completion as required by the program and by this policy; (b) maintain a GPA at or above the minimum set by the program and by this policy; and (c) pass all appropriate examinations within the time frame specified by the program.

RESPONSIBILITIES

**Collegiate Units**
- Ensure appropriate review of coursework on the degree plan (including any subsequent changes to an approved degree plan).
- Approve committee membership (including any subsequent changes to an approved committee).
- Approve the specific procedures used by programs for administering and evaluating the doctoral preliminary and final examinations.
• Review and approve program-wide requests for exceptions to the time limit for completing the doctoral degree.
• Review and approve student requests for extensions to the time limit for completing the doctoral degree.

Departments/Programs

• Clearly state the program requirements for maintaining good standing in the Graduate Program Handbook, even if they are identical to the requirements in this policy.
• Establish procedures to review all doctoral students at least once a year and provide the results in writing to the students.
• Review and approve the coursework on the student's degree plan (including any subsequent changes to an approved degree plan).
• Review and approve committee membership (including any subsequent changes to an approved committee); route program-approved requests to the collegiate unit for approval.
• The DGS is responsible for ensuring that each doctoral student receives training appropriate to the discipline in the responsible conduct of research and ethical teaching and scholarship.
• Review and approve requests for extensions to the time limit for completing the doctoral degree; notify students in writing of the decision and subsequent actions (i.e., expectations for progress and for the month/year of degree conferral or termination from the program upon expiration of the limit).

Students

• Must know all program requirements when matriculated.
• If program requirements change, students may elect to continue under the requirements in effect when they matriculated, provided they have remained in good standing.
• Must obtain the required approvals and file the degree plan with the program and collegiate unit.
• Must initiate the request for an extension to the maximum time limit for completing the doctoral degree, obtain the approval of their advisor/s and program DGS, and submit their request by the deadline.

RELATED INFORMATION

• Administrative Policy: Admission for Master's and Doctoral Degrees
• Administrative Policy: Eligibility to Serve on Graduate Examination Committees
• Administrative Policy: Doctoral Degree: Completion
• Administrative Policy: Leave of Absence and Reinstatement from a Leave: Graduate Students
• Administrative Policy: Readmission or Changes to Master's or Doctoral Degree Objectives

HISTORY

Amended:
June 2017 - Comprehensive Review, Minor Revision. 1) Rewrote introduction to clarify the goal of the policy and distinguish from unrelated policies, 2) Added Leave of Absence language, 3) Clarified language related to conditions that necessarily result in discontinuation from program, 3) Clarified language regarding grading requirements for preliminary examination, removing pass with reservations when recording the final result of the prelim exam, 4) moved language on voting requirements for the prelim from an appendix to the body of the policy. Changes in policy respond to need for greater clarity on policy intent on the part of affected constituencies and enhanced consistency in policy implementation across programs.

Effective:
July 2012 - New Policy, Comprehensive Review. 1. Changes the beginning and ending points for calculating time to degree. Time is currently measured from the conclusion of the oral prelims, to defense of the thesis. This policy measures time to degree from enrollment in the doctoral program to the point at which the degree is awarded. 2. Establishes a minimum GPA for students to remain in good standing (3.0 for doctoral students.) 3. Extends applicability of policy requirements to programs not formerly under the aegis of the Graduate School.
investigate the matter, or submit a report to UReport.
POLICY STATEMENT

General Provisions
The principal criterion for the choice of any required materials for a course or program should be that the materials are the most appropriate for the purpose. The instructor who has been assigned responsibility for the course or program, in most cases, identifies what materials are required for the course. The process for selecting course materials must avoid conflict of interest or the appearance of conflict of interest.

Generally, no member of the instructional staff of the University may personally profit from the assignment of materials, or assignment of the venue of purchase of materials, to students in classes or any other instructional setting at the University. If the faculty member responsible for a course or program judges that the best materials available for use with the course are materials whose sale will provide them personal income, the faculty member must receive approval from the head of the academic unit.

Review and Approval
The instructional staff member must justify the requirement to use the materials in the course in their request for approval to the head of the academic unit.

The head of the academic unit should judge the request solely on the academic merit of the materials. The decision to approve the request should typically include a consultative step with faculty peers knowledgeable about the use of the materials. If the head of the academic unit is also involved in the use of these materials, the dean of the college must give the written approval.

The approval, if given, will apply to all offerings of the course for which the affected individual is responsible during the twelve-month period following the approval date.

If the individual wishes to assign the same materials, or other materials created by that individual for courses occurring after the twelve-month period lapses, a new request for approval must be submitted to the head of the academic unit.

Documentation
The unit must retain the request and the subsequent decision, as well as file a copy of the record of the approval with the dean of the college.

Exclusions
This policy is not applicable to the Duluth campus.
**REASON FOR POLICY**

To manage conflict of interest concerns, persons teaching courses may not by themselves make the decision to assign course materials for which they could personally earn a profit. Requiring approval from a higher level provides appropriate internal controls.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

**APPENDICES**

There are no appendices associated with this policy.

**FREQUENTLY ASKED QUESTIONS**

1. What is meant by ‘materials’?
   Materials refers to anything that may have been developed by or be the intellectual property of an instructor, including but not limited to textbooks, reading packets or materials, models, computer programs, artwork, etc.

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**DEFINITIONS**

**Instructional Staff**
Faculty, including adjunct faculty; graduate teaching assistants; and all other individuals assigned to provide instruction in a course.

**RESPONSIBILITIES**

**Instructional staff**
Identify materials required for the course.
Submit a formal request to the department head, requesting permission use any materials in the course from which the individual will personally profit. Provide justification for the selection of those materials as part of the request.

**Academic Unit Head**
- Review the academic merit of the materials, and consult with faculty peers.
- Provide a formal response to the request.
- Retain a copy of the record of the decision in the academic unit files.
- File a copy of the decision with the collegiate dean’s office.
- Monitor compliance and provide information about this policy to instructional staff.

**Academic Dean**
Review and render decisions on requests, if the individual providing the instruction in the course is an academic department head.

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**RELATED INFORMATION**

Administrative Policy: *Individual Conflicts of Interest*

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**HISTORY**

**Amended**
February 2016 - Comprehensive Review. Minor Revision. Changes clarifies the documentation expectations when approval is given to use materials in a course that were created by that instructor, and specifies that a one-up approval is required when the head of the administrative unit is involved in the use of the materials.

**Amended:**
December 2009 - Policy now applies to Crookston.

**Effective:**
April 2009
POLICY STATEMENT

This policy governs who is eligible to serve on master's final examination committees and doctoral preliminary oral and final oral examination committees in the following roles:

- Advisor
- Chair
- Committee member
- Reviewer

I. Eligibility to Serve on Graduate Examination Committees

a. Any University tenured or tenure-track faculty member who holds an earned doctorate or designated equivalent in an appropriate field from an accredited institution is eligible to serve in any role on master's final, doctoral preliminary oral, and doctoral final oral examination committees.

b. Other University faculty (including adjunct, term, or contract faculty) who hold an earned doctorate or designated equivalent in an appropriate field from an accredited institution but who do not hold a tenured or tenure-track appointment are eligible to serve in any role on master's final, doctoral preliminary oral, and doctoral final oral examination committees.

c. Emeritus faculty and tenured or non-tenured faculty who have left the University are eligible to continue with all examination committee assignments that were approved and active at the time of their departure, if the faculty member and the student both agree to the continuation in writing.

d. Academic staff who hold an earned doctorate or designated equivalent in an appropriate field from an accredited institution but who do not hold any faculty appointment (tenured, tenure-track, adjunct, term, or contract) are eligible to serve in any role on master's final examination committees. They are also eligible to serve on doctoral preliminary oral and doctoral final oral examination committees except in the roles of advisor or chair.

e. Experts outside of the University who do not hold any faculty appointments (adjunct, term, or contract) at the University are eligible to serve on master's final examination committees, doctoral preliminary oral and doctoral final oral examination committees except in the roles of advisor or chair. All appointments of outside experts to graduate examination committees must be reviewed at the collegiate level according to a review process and criteria specified by the collegiate unit.

f. Individuals having a nonacademic relationship with the student are not eligible to serve on that student's examination committee.

g. Individuals working toward a graduate degree at the University are not eligible to serve on any examination committees unless an exception has been granted by the Vice Provost and Dean of Graduate...
II. Assignment of Graduate Examination Committee Roles

a. Graduate programs must assign roles to individuals serving on graduate examination committees subject to collegiate level approval according to a review process and criteria specified by the collegiate unit.

b. Collegiate deans or their designated representatives must review for approval all assignments as advisor.

III. Exceptions


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REASON FOR POLICY

To ensure quality, consistency, and fairness in standards and practices for final examinations of master’s candidates and preliminary and final examinations of doctoral candidates.

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PROCEDURES

There are no procedures associated with this policy.

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FORMS/INSTRUCTIONS

There are no forms associated with this policy.

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APPENDICES

- Table for Eligibility to Serve on Graduate Examination Committees

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FREQUENTLY ASKED QUESTIONS

- Eligibility to Serve on Graduate Examination Committees FAQ

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<td><a href="mailto:starry@umn.edu">starry@umn.edu</a></td>
</tr>
</tbody>
</table>

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DEFINITIONS

**Designated equivalent**
A terminal post-baccalaureate degree qualifying the recipient to teach at the university level in their field. Example: MFA.

**Nonacademic relationship**
A personal relationship OR a financial relationship not connected with the student's academic program.
RESPONSIBILITIES

Collegiate Units
- Maintain a set of publicly available standards, processes, and forms for appointments to all roles on graduate examination committees with special attention to requirements for advisors and for chairs of the doctoral examination committees.
- Review and approve all assignments as adviser (including co-advisors).
- Review and approve all examination committee assignments.

Graduate Programs
- Programs are responsible for maintaining a current list of individuals with Graduate Education Responsibilities (GER) and updating the Faculty Role List Database.

RELATED INFORMATION

- Administrative Policy: Master's Degree: Performance Standards and Progress
- Administrative Policy: Master's Degree: Completion
- Administrative Policy: Doctoral Degree: Performance Standards and Progress
- Administrative Policy: Doctoral Degree: Completion

HISTORY

Amended:
Comprehensive Review, Minor Revision: 1. Revised the title of the policy to reflect its purpose more clearly. 2. Clarified the goal of this policy relative to other related policies and moved elements of the policy into related policies. 3. Simplified and organized the criteria with regards to the roles on each type of committee and the criteria to be eligible to serve in each role. Created an appendix table to summarize the policy. 4. Reviewed the roles of outside experts as advisors and chairs of graduate examination committees. 5. Discussed development of a policy with regards to reinstating a “Graduate Faculty” at the central level.

Effective:
February 2011

University Policy Program
140 McNamara Alumni Center, Minneapolis, MN 55455 - P: 612-624-8081
policy@umn.edu

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
Enrolling in Overlapping or Back-to-back Classes: Twin Cities, Crookston, Morris, Rochester

**POLICY STATEMENT**

Enrolling in overlapping classes is prohibited so students can actually attend the classes in which they enroll. For Twin Cities campus students, back-to-back classes with insufficient travel time may lead them to consistently arrive late or to depart early, which can disrupt a class and cause the student to miss instruction. Students are responsible for planning a schedule that allows enough time for travel between classes. Instructors may accommodate student-scheduling problems but are not required to do so.

1. **Overlapping class times**
   a. Classes that have any common meeting time are considered to be overlapping.
   b. Students are not permitted to register for classes that overlap unless they successfully petition for permission to do so.
   c. Petitions for overrides for such conflicts require the approval of all instructors involved. The decision to approve or disapprove such a petition for override is discretionary with each instructor involved, but petitions should be granted only under extenuating circumstances.

2. **Enrollment in back-to-back classes** [Twin Cities only]
   a. Students should not enroll in back-to-back classes when (1) the amount of time available for travel is less than 15 minutes (when both are on either the Minneapolis or St. Paul campus), or (2) the amount of time available to travel between two classes (when one is on the Minneapolis campus and the other on the St. Paul campus) is less than 30 minutes.
   b. Petitions for protection from penalties for such conflicts require the approval of all instructors involved and will be approved only under extenuating circumstances. The decision to approve or disapprove such a petition for override is discretionary with each instructor involved.
   c. If the student's petition has not been approved, instructors have the authority to penalize students who consistently arrive late or depart early from a class.

**Exclusions**

This policy is not applicable to the Duluth campus.

**REASON FOR POLICY**

Students consistently arriving late for a class or departing early can disrupt the teaching and learning process. Instructors must understand that they may accommodate student-scheduling problems but are not required to do so.
PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

- OTR024 - Class Time Conflict Approval (electronic) (Restricted Access)
  - Online Class Time Approval (login required)

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. How do students obtain permission to enroll in back-to-back courses?
   Students who wish to enroll in back-to-back courses (or those with overlapping times) must complete the "Course Time Conflict Approval" form. Completing the form requires the signature of both instructors involved in a course time conflict. Without written permission, students will not be allowed to register for courses that are separated by less than one minute or overlap in the time they are offered. Verbal permission will not allow the student to register.

CONTACTS

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<td>Susan Van Voorhis</td>
<td>612-624-1111</td>
<td><a href="mailto:vanvo002@umn.edu">vanvo002@umn.edu</a></td>
</tr>
<tr>
<td>Twin Cities Campus Procedures</td>
<td>Stacey Tidball</td>
<td>612-626-0075</td>
<td><a href="mailto:tidball@umn.edu">tidball@umn.edu</a></td>
</tr>
<tr>
<td>Crookston Campus</td>
<td>Ken Myers</td>
<td>218-281-8200</td>
<td><a href="mailto:kmyers@crk.umn.edu">kmyers@crk.umn.edu</a></td>
</tr>
<tr>
<td>Morris Campus</td>
<td>Judy Korn</td>
<td>320-589-6011</td>
<td><a href="mailto:kornjr@morris.umn.edu">kornjr@morris.umn.edu</a></td>
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<tr>
<td>Rochester Campus</td>
<td>Diane Douglas</td>
<td>507-258-8008</td>
<td><a href="mailto:douglasd@r.umn.edu">douglasd@r.umn.edu</a></td>
</tr>
</tbody>
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DEFINITIONS

There are no definitions associated with this policy.

RESPONSIBILITIES

There are no specific responsibilities associated with this policy.

RELATED INFORMATION
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.

**HISTORY**

**Amended:**
December 2009 - Policy now applies to Crookston.

**Effective:**
April 2009
POLICY STATEMENT

1. Departments and colleges should be selective in determining prerequisites for courses. Prerequisites should not be set for a course except in progressive, sequence courses or where departments can clearly demonstrate that a student will not be able to complete the course successfully without first completing the prerequisite course work.

2. Where prerequisites have been set, catalogues and course materials must list them and advise students to take only those courses for which the prerequisites have been met.

3. Where prerequisites have been set, instructors may require that any student who has not taken the specified prerequisites for the course must withdraw. Instructors may, however, grant permission, on an individual basis, for a student to take a course without having taken the prerequisite(s).

4. When a student successfully completes a prerequisite course after successfully completing a subsequent course that required the prerequisite, credit for the prerequisite course will be granted. Colleges and departments, at their discretion, may also allow students to receive credit by examination for the prerequisite course.

Exclusions
This policy is not applicable to the Duluth campuses.

REASON FOR POLICY

Prerequisites inform students that, in order to be successful in a particular course, they must enter the course already having attained specific knowledge as a necessary background. Prerequisites provide a process for directing students to courses for which the students are adequately prepared. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

PROCEDURES

There are no procedures related to this policy.
FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices related to this policy.

FREQUENTLY ASKED QUESTIONS

There is no FAQ related to this policy.

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DEFINITIONS

Prerequisite
A course that is a necessary requirement before subsequent advanced courses.

RESPONSIBILITIES

There are no specified responsibilities related to this policy.

RELATED INFORMATION

- Higher Learning Commission, Criteria and Requirements for Accreditation

HISTORY

Amended:  
September 2014 - Clarifications related to Higher Learning Commission accreditation requirements

Amended:  
December 2009 - Policy now applies to Crookston.

Effective:  
April 2009
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Evaluation of teaching provides information (1) to help improve teaching, (2) to be used for faculty tenure decisions and salary and promotion decisions based on merit, and (3) to assist students in course selection. The methods used are:

- Student ratings of teaching
- Peer evaluations

A. General Provisions for Evaluation of Teaching

1. All instructors, regardless of their academic rank or tenure status, will have their teaching performance evaluated.
2. The process for evaluating teaching used in tenure and promotion decisions must follow Board of Regents Policy: Faculty Tenure.
3. Student rating data, including the response rates for the data, may be used in personnel decisions for faculty and instructional staff whose salary is fully or partially based on teaching, (e.g., merit and salary reviews, promotion, tenure for tenure-track faculty).
   - The results must be shared with the instructor being reviewed.
   - Only those individuals who are responsible for decisions on reappointment, promotion, tenure, and salary adjustments may have access to information about a specific instructor.
   - Instructors are allowed to respond to student rating results by adding written comments to their files that are communicated to individuals responsible for personnel decisions.
4. When used for salary, promotion, and tenure decisions, information from student ratings should be used in conjunction with other relevant metrics to assess instructional effectiveness.
5. The academic unit must maintain a record of the instructor's contributions to teaching, including cumulative summaries of student ratings of the instructor's courses. Units must protect the materials as private data.
6. To assist students in course selection, students may view Student Rating of Teaching responses that pertain to a course and not to a specific individual. (This provision does not apply to the Crookston campus)
7. Student rating data should be used with other types of information to identify instructors who deserve rewards as well as instructors who may need assistance in improving their classroom effectiveness. When used for salary, promotion, and tenure decisions, these data should be used in conjunction with other relevant metrics.
8. Custom Items
Colleges and departments may, after consultation with, and approval from, the vice provost for faculty and academic affairs, add custom items to the Student Rating of Teaching form. If custom items are added by a department or college, that unit will make available to instructors a written policy that defines which data from the custom items will be used (1) for improvement of teaching, (2) for personnel decisions, and (3) for improving courses or programs.
- Data used solely for teaching improvement will be provided only to the instructor.
- Data to be used for personnel decisions will be available to individuals charged with reviewing instructor performance.
- Data to be used for course and program improvement will be available to curriculum committees and similar bodies only in aggregated form and will not be identified with individual instructors. In all instances, the data will be provided to the instructor.

B. Student Rating of Teaching Form and Requirements
1. Every course with a University course number will be rated by the use of student rating forms every time it is offered, except that thesis-only credits, directed or independent study, and internships will not be rated using such forms. For courses with one instructor but multiple components (e.g., lab, lecture, recitation, etc.), departments have the discretion to evaluate the components separately. For courses with multiple components, each taught by a different instructor, each component should be evaluated separately.
2. The standard student rating form (see Appendix X) will be used except that:
   - In courses with more than two instructors, departments and/or colleges that wish to use alternative evaluation procedures must seek written approval from the Senate Committee on Educational Policy (SCEP).
   - Academic units in which student evaluation procedures must meet national accreditation standards may use alternative evaluation procedures with written approval from SCEP.
3. All students present when the evaluation is conducted, or all students enrolled in online courses, must be provided the student rating form. Completed forms will be submitted anonymously. Students, regardless of the rating protocol or method used, have the option to:
   a. opt-out of responding to one or more questions on the form; or
   b. opt-out of completing the entire student rating form.
4. Instructors may not be present when the evaluations are completed and collected. Instructors may only see the completed forms after their grades have been turned in.
5. Students who have withdrawn from the course may not participate in the rating of that course.
6. The dean or chancellor of each college or campus, in consultation with the faculty, will determine whether and how written comments on student evaluation forms may be used in personnel decisions. In units where all written comments on students’ ratings of teaching are sent to the chair and/or to reviewing bodies and are included in the file, unfairly prejudicial comments will be withheld from the file upon request of the instructor concerned and accordingly will not be part of annual or other reviews. The decision whether particular comments are unfairly prejudicial will be made by the chair, a senior faculty member designated through a process determined by the department, or a standing or ad-hoc committee. This provision is intended to cover offensive, racist, sexist, homophobic, and other personal comments, and is not intended to exclude from the file negative comments directly related to the course.
7. The original completed student-rating forms will be returned to the instructor with any student demographic information removed. Information from electronic forms will be made available to the instructor.

C. Peer Evaluation of Teaching
Peer review should include assessment of the instructor’s knowledge of the subject matter, general contributions to departmental teaching efforts, and any other teaching contributions. (see Appendix for best practice guidelines.)
1. Peer review process.
   a. Every academic unit should have a documented process for peer review of every instructor’s teaching efforts and contributions to teaching, both for purposes of promotion decisions and for teaching-based salary increases. The academic unit should evaluate instructors in ways appropriate to the discipline, and include consideration of activities outside the classroom such as facilitating student research, advising students, and other activities related to students’ educational programs.
The peer-review process must include consideration of any additional materials identified by the instructor as relevant to the evaluation. Instructors are encouraged to prepare and regularly update a teaching portfolio that contains materials that will be considered during their evaluation.

2. Faculty peer review.
   a. Faculty peers are responsible for evaluating teaching conducted by tenured and tenure-track faculty as outlined in Board of Regents Policy: Faculty Tenure, Administrative Policy: Faculty Compensation, and Administrative Procedure: Reviewing Candidates for Tenure and/or Promotion: Tenure-Track and Tenured Faculty.
   b. Both faculty and instructional staff may participate in the evaluation of instructors who are not tenure-track or tenured faculty.

Exclusions
This policy is not applicable to the Duluth campus.
Course-related SRT results from the Crookston campus will not be released to students.

REASON FOR POLICY
This policy establishes standards and processes for evaluating teaching: peer review and student rating of teaching for the campuses of Morris, Rochester, and the Twin Cities.
It is essential to ensuring quality of instruction and providing feedback to instructors and supervisors.

PROCEDURES
- Using Paper and Online Forms to Conduct Student Ratings

FORMS/INSTRUCTIONS
- UM 1811 - Student Rating of Teaching
Original forms (not photocopies) are required for processing. Please see your department contact or the Office of Measurement Services for forms.

APPENDICES
- Peer Review of Teaching: Best Practices

FREQUENTLY ASKED QUESTIONS
1. Are there costs associated with administering custom items on a form?
   Units should consult the Office of Measurement Services to inquire about costs associated with administering a custom form or adding custom items on the Student Rating of Teaching form.

2. Can instructors administer additional evaluation items?
   Instructors are encouraged to conduct early- and mid-semester course assessments for the purpose of receiving feedback about student learning during the term. Instructors may ask students to answer supplemental questions in the open-ended section of the standard rating form, on a separate sheet, or online. See http://z.umn.edu/earlyterm for more information about early- and mid-semester course assessments.

CONTACTS
### DEFINITIONS

There are no definitions associated with this policy.

### RESPONSIBILITIES

**Executive Vice President and Provost**
- Convey to colleges the importance of teaching in decisions regarding promotion, tenure, and merit-pay increases.
- Consult with colleges regarding custom items and exceptions to the policy.

**Deans**
- Convey the importance of teaching in decisions regarding promotion, tenure, and merit-pay increases.
- Consult with college governing bodies regarding the use of written comments in personnel decisions.

**Department Heads**
- Convey to instructors the importance of teaching in decisions regarding promotion, tenure, and merit-pay increases.
- Ensure that evaluation of teaching takes place in the unit.
- Decide whether particular written comments are unfairly prejudicial.

### RELATED INFORMATION

- Board of Regents Policy: [Faculty Tenure](#)
- Administrative Policy: [Faculty Compensation](#)
- Administrative Procedure: [Procedures for Reviewing Candidates for Tenure and/or Promotion: Tenure-Track and Tenured Faculty](#)
- [Peer Review of Teaching material](#)

### HISTORY

**Amended:**
November 2015 - Policy now applies to Crookston - with minor exception: Course-related SRT results from the Crookston campus will not be released to students.

**Amended:**
January 2015 - Comprehensive Review. Minor Revision. Key policy changes: 1. Meets the student requests for information that may aid in course selection by releasing course related information from the Student Rating Tool that does not violate Minnesota State Data Privacy law. 2. Eliminates unnecessary language related to policy compliance. 3. Revises the language regarding the authority to decide whether written comments may be used for personnel decisions.
Amended:
December 2014 - 1. Meets the student requests for information that may aid in course selection by releasing course related information from the Student Rating Tool that does not violate Minnesota State Data Privacy law. 2. Eliminates unnecessary language related to policy compliance. 3. Revises the language regarding the authority to decide whether written comments may be used for personnel decisions.

Effective:
April 2009

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Workload expectations in this policy are an estimate of the amount of work needed for an average student to earn an average grade. Course grades are based on the quality of the work submitted, not on hours of effort (as provided in Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester). Workload expectations per credit do not vary with the method of delivery of the course or the length of the academic term.

A. Undergraduate Courses

1. Student workload expectations per undergraduate credit. For fall or spring semester, one credit represents, for the average University undergraduate student, three hours of academic work per week (including lectures, laboratories, recitations, discussion groups, field work, study, and so on), averaged over the semester, in order to complete the work of the course to achieve an average grade. One credit equals 42 to 45 hours of work over the course of the semester (1 credit x 3 hours of work per week x 14 or 15 weeks in a semester equals 42 to 45 hours of academic work). Thus, enrollment for 15 credits in a semester represents approximately 45 hours of work per week, on average, over the course of the semester.

2. Exceptions to undergraduate workload standard. Professional norms and the nature of the academic work may necessitate spending more than three hours of work per week on average. For example, clinical experiences, some laboratory work, and some studio activities may require more than an average three hours per week. Demands on the student in excess of the average of three hours per credit per week are permissible with college approval and with appropriate notification to the student of the amount of work expected for the course or educational experience (e.g., in class schedules, bulletins, or syllabi).

3. Student workload statement required for undergraduate courses. All proposals for undergraduate courses must include a student workload statement demonstrating how the course conforms to the student workload expectations in sections (a) and (b). College and campus curriculum committees and other approving bodies (e.g., the Council on Liberal Education) must consider the student workload statement in reaching a decision on whether to approve a proposed course.

B. Graduate School and Professional School Courses

It is expected that the academic work required of Graduate School and professional school students will exceed three hours per credit per week.

C. All Courses
1. For courses using one course number that enroll both undergraduate and graduate/professional students, workload expectations may be different for the two.
2. When a course is offered at two levels (e.g., 1xxx/3xxx or 3xxx/5xxx), workload expectations will differ for the students enrolled at different levels.
3. Instructional units should periodically review course syllabi to determine whether the number of course credits is appropriate for the expected student workload.

**Exclusions**

This policy is not applicable to the Duluth campus.

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**REASON FOR POLICY**

Information on workload expectations assists students in understanding the necessary time to allocate for their courses. Outlining workload expectations also allows for greater consistency across the curriculum, as well as identifies areas where the expectations are not necessarily applicable due to the nature of the course being taught. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

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**PROCEDURES**

There are no procedures related to this policy.

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**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

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**APPENDICES**

There are no appendices related to this policy.

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**FREQUENTLY ASKED QUESTIONS**

1. **Do the student workload expectations per undergraduate credit apply to courses that are scheduled in academic terms other than the standard semester?**
   Yes. The expectation of academic work per credit established for semesters applies to all academic terms. Courses scheduled during the May session, summer session, and any other special terms have the same expectations for student workload per credit as for courses held during the typical semester. For example, a one-credit course represents approximately 42 to 45 hours of academic work, regardless of the length of the academic term.

2. **Do the student workload expectations per undergraduate credit apply to all courses, including online and distance education courses?**
   Yes. The workload expectations per credit are the same, regardless of the method of delivery of the course (for example, online, interactive video, correspondence, classroom, or a combination of delivery methods).

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DEFINITIONS

Average grade
According to the policy on Grading and Transcripts, an average grade (C) represents achievement that meets the course requirements in every aspect.

RESPONSIBILITIES

There are no specific responsibilities related to this policy.

RELATED INFORMATION

- Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester
- Higher Learning Commission, Criteria and Requirements for Accreditation

HISTORY

Amended:
September 2014 - Clarifications related to Higher Learning Commission accreditation requirements

Amended:
September 2011 - Comprehensive Review. Minor clarifications made to Policy Statement including that workload expectations per credit do not vary with the method of delivery of the course or the length of the academic term and added Frequently Asked Questions section.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009

The University of Minnesota expectations for workload per credit were first adopted by the Faculty Senate on February 16, 1922.
POLICY STATEMENT

By the start of the term, every department must identify, for each course offering, the instructor responsible for the course.

1. Instructor responsibility
   a. The instructor who is in overall charge of a course offering is accountable for all grades given to students. Responsibility for grading or evaluating student work in a course may be assigned to a teaching assistant or grader but ultimate responsibility remains with the instructor for the course. All individuals who grade or evaluate student work in a course must have a formal affiliation with the course (e.g., as instructor of record, teaching assistant, paid grader).
   b. Instructors in charge of a course with multiple sections or laboratories must take reasonable steps to ensure that grading across sections or laboratories is consistent.
   c. If the instructor in charge of a course has left the institution or is no longer available, the department or academic unit has the authority to handle grades and grade changes for the course. The department or academic unit should assign a regular faculty member to be accountable for grades after the course has ended.
   d. Students in every course must be clearly informed via the syllabus or class schedule of who is ultimately responsible for assigning grades in the course.

2. Student questions about grades
   a. Students have the right to request and receive an explanation for a grade during and after the course but have no right to challenge the academic merits of any grade.
   b. Students may seek an explanation for a grade until the end of the following semester (not including summer session). The instructor is obligated to provide an explanation for a grade within a reasonable time if a request is made by the end of the following semester. The instructor is not obligated to reconsider the grade.
   c. If a student does not receive an explanation for a grade from the instructor within a reasonable time of making a request, the student may consult the director of undergraduate studies, director of graduate studies, or department chair for assistance in obtaining an explanation. Students also may seek assistance from the campus student conflict resolution office.

Exclusions
This policy is not applicable to the Duluth campus.
REASON FOR POLICY

This policy clarifies both the accountability and responsibility for assigning grades; and for responding to requests for explanations about the grades.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

There is no FAQ associated with this policy.

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DEFINITIONS

Explanation of a grade
The criteria used to formulate a grade, not an automatic change of grade.

RESPONSIBILITIES

Department
Identify an instructor for each course offering by the start of the term.

Instructor

- Inform students in class who is ultimately responsible for assigning a grade.
- Respond to grade inquiries and provide explanations upon request.
RELATED INFORMATION

There is no related information associated with this policy.

HISTORY

Amended:
November 2017 - 1. Minor edits to clarify what happens when an instructor leaves or is no longer available.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
A. Establishment and Use of University Grading Systems

1. There are two distinct grading systems on each campus of the University, A-B-C-D-F (with pluses and minuses as permitted by this policy) and S-N. The S-N system is a self-contained alternative to the A-F system and the two may not be combined for a particular student in a particular course. Students may receive grades or symbols only from the grading system under which they have registered for a course. This policy does not require any instructor to use pluses and minuses.

2. There are, in addition, registration symbols identified and described in this policy that carry neither grade nor credit.

3. No campus, college, or program is required to offer a course on the S-N grading system.

4. Any unit may choose to limit grades in a particular course to the A-F or the S-N system.

5. When both grading systems are available to a student, the student must declare a choice of system as part of the initial registration for the course. The choice may not be changed after the end of the second week of classes (the first week in summer sessions).

6. Except as provided in this policy in Sections A (7) and F (12), no college may use any grading systems other than the ones established by this policy.

7. The Law School and the Medical School are exempt from the provisions of this policy, but will report their grading systems, and any changes therein, to the Faculty Senate. Any other units that believe that the national norms of their profession require a different grading system may make application to the Senate Committee on Educational Policy for an exemption from this policy. The Faculty Senate must approve all such exemptions.

8. The No Grade (NG) grading basis is used for certain graduate-level registrations as determined by the Graduate School.

B. Permanent Grades for Academic Work for Credit

1. The list below identifies the possible permanent grades that can be given for any course for which credit is to be awarded. These grades will be entered on a student's official transcript and, for an A, B, C, or D with permitted pluses and minuses, carry the indicated grade points. (Except for the Law School, the University does not award A+ grades, nor are D- grades permitted). The S grade will not carry grade points but the credits will count toward the student's degree program if allowed by the college, campus, or program.
A 4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements
A- 3.667
B+ 3.333
B 3.000 - Represents achievement that is significantly above the level necessary to meet course requirements
B- 2.667
C+ 2.333
C 2.000 - Represents achievement that meets the course requirements in every respect
C- 1.667
D+ 1.333
D 1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S Represents achievement that is satisfactory, which is equivalent to a C- or better.

2. These definitions apply to grades awarded to students who are not enrolled in graduate, post-baccalaureate, and professional programs, but the grade points are the same no matter the level or course of enrollment.

3. Instructors are permitted to hold graduate and undergraduate students who are in the same class to different standards of academic performance and accomplishment. The syllabus must make clear what the different standards will be for the different groups of students who may be enrolled in the class.

4. These are the general University standards. In connection with all symbols of achievement instructors will define for a class, at one of its earliest meetings and as explicitly as possible, the performance that will be necessary to earn each.

C. Permanent Grades for Academic Work for which No Credit is Given

1. There are two permanent grades given for a course for which no credit is to be awarded. These grades will be entered on a student's official transcript.

- F “0” Represents failure and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see Section D). The F carries 0 grade points and the credits for the course do not count toward any academic degree program. The credit hours for the course will count in the grade point average.
- N Represents no credit and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see Section C). The N carries no grade points and the credits for the course do not count toward any academic degree program. The credit hours for the course do not count in the grade point average.

2. a. Scholastic dishonesty. Scholastic dishonesty in any portion of the academic work for a course will be grounds for awarding a grade of F or N for the entire course, at the discretion of the instructor. This provision allows instructors to award an F or an N to a student when scholastic dishonesty is discovered; it does not require an instructor to do so. Students who enroll for a course on the A-F grading system will receive an F if such grade is warranted; students who enroll for a course on the S-N system will receive an N if such grade is warranted. (See Board of Regents Policy: Student Conduct Code for a definition of scholastic dishonesty.)

b. If the instructor determines that a grade of F or N for the course should be awarded to a student because of scholastic dishonesty, the student cannot withdraw to avoid the F or N. If the student withdrew from the course before the scholastic dishonesty was discovered or before the instructor concluded that there was scholastic dishonesty, and the instructor (or the appropriate hearing body if the student requests a hearing) determines that the student should receive the F or the N, the student will be re-registered for the course and the F and N grade will be entered on the transcripts.

D. Incompletes

1. There will be a symbol I (incomplete) awarded to indicate that the work of the course has not been completed. The I will be assigned at the discretion of the instructor when, due to extraordinary circumstances (as determined by the instructor), the student who has successfully completed a substantial portion of the course's work with a passing grade was prevented from completing the work of the course on time.
2. The assignment of an I requires a written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements. In no event may any such written agreement allow a period of longer than one year to complete the course requirements (except as provided in section D (8)).

3. Work to make up an I must be submitted within one year of the last day of final examinations of the term in which the I was given for all students except graduate and professional students. If not submitted by that time, the I will automatically change to an F (if the student was registered on the A-F system) or an N (if the student was registered on the S-N system) for the course. If an I changes automatically to an F or an N, the instructor has the discretion to reinstate the I for one additional year only.

4. For graduate and professional students, an I remains on the transcript until changed by the instructor or department.

5. When an I is changed to another symbol, the I is removed from the record. Once an I has become an F or an N, under the provisions of the preceding paragraph, it may subsequently be converted to any other grade, upon petition by the instructor (or the department if the instructor is unavailable) to the college.

6. A student does not need to be registered at the University in order to complete the work necessary to convert an I to a grade with credit in the time and manner previously agreed upon between the student and the instructor. The instructor is expected to turn in the new grade within four weeks of the date the work was submitted by the student. (Depending on the timing of when the work is turned in and the ability of the instructor to award a grade, an F or an N may appear temporarily on the transcript.) Students who have received an I in a course are not allowed to sit in on the class again (that is, without registering for it) to complete the grade.

7. If a student graduates with an I on the transcript, the I will remain permanently an I. A student may petition the college, within a year of graduation, to complete the work in the course and receive a grade. The degree GPA is frozen upon graduation but the cumulative GPA will reflect the change in GPA if a student chooses to complete the work and change the I to a grade within a year of graduation.

8. When students are called to active military duty, and reach agreement with their instructor(s) to take an incomplete, they will have up to one calendar year following their discharge from active duty to complete their incomplete(s).

9. Receipt of an I in a course does not create an entitlement for a student to take the course a second time.

E. Other Transcript Symbols

1. Auditing a course.
   a. There will be a symbol V, visitor, indicating registration as an auditor or visitor, which will carry no credit and no grade.
   b. Students auditing a course are required to pay full tuition but do not take exams and are not required to do homework. An auditor is entered on the class roster (grade report), is counted as filling a seat in a controlled entry course, and is counted in an instructor's student contact hours.
   c. Students may not sit in on a course without registering for it.
   d. A student will be allowed to take a previously audited class for a grade.

2. Withdrawing from a course.
   a. There will be a symbol W, withdrawal, entered upon a student's record when the student officially withdraws from a course in accordance with procedures established by the student's college or campus. The W will be entered on the transcript irrespective of the student's academic standing in that course if the student withdraws from the course during the third through eighth week of class (Crookston) or the third through tenth week of class (Morris, Rochester, Twin Cities) or during the second or third weeks of summer sessions.
   b. If a student officially withdraws from a course during the first two weeks of classes, there will be no record of that course registration entered on the student's transcript.
   c. One-time late withdrawal: Each student may, once during an undergraduate enrollment, withdraw from a course without college approval, and receive the transcript symbol W, after the deadline for withdrawal and at any time up to and including the last day of instruction for that course. A student may not withdraw after completing the final examination or equivalent for a course.
   d. Except as provided in the preceding section, withdrawal after the deadlines will require approval of the college and may not be granted solely because a student is failing the course; there must be extenuating non-academic circumstances justifying late withdrawal.

3. Continuation course. There will be a symbol X, indicating a student may continue in a continuation course in which a grade cannot be determined until the full sequence of courses is completed. The instructor will submit a grade for each X when the student has completed the sequence.
4. **Course in progress.** There will be a symbol K, assigned by an instructor to indicate the course is still in progress and that a grade cannot be assigned at the present time.

5. **No grade reported.** There will be a symbol NR, administratively assigned to indicate that a grade was not reported for the course. The NR does not carry any GPA points.

F. Other Provisions

1. **Zero-credit courses.** Courses that carry zero credits do not count in either term or cumulative grade point averages. Such courses carry normal tuition and fee charges.

2. All grades for academic work are based on the quality of the work submitted, not on hours of effort. Instructors have the responsibility and authority to determine how final grades are assigned, including, in classes where they use numeric scores, the method that will be used to translate numeric scores into letter grades. (Examples: the instructor may decide that 90% equals an A, 80% a B, and so on, or the instructor may decide that the top 10% of the scores will receive an A, the next 20% a B, and so on.)

3. **Counting credits toward a University degree.**
   a. A course that carries University credit toward a degree in one department or college must carry University credit in all other departments and colleges.
   b. A department or college has discretion to decide whether a course completed in another unit will count towards the specific college or department/program/major requirements.

4. When a student graduates, no further changes to the student's transcript will be made (to that portion of the transcript related to the program from which the student graduated) except as expressly allowed under the provisions of this policy.

5. **Releasing transcripts.** The University's official transcript, the chronological record of the student's enrollment and academic performance, will be released by the University only at the request of the student or in accord with state or federal statutes.

6. **Repeating courses.**
   a. An undergraduate student may repeat a course only once (except as noted in section 6(c)). The college offering the course may grant an exception to this provision. [Morris only] Students who receive a grade of S or C or higher may repeat a course only if space permits.
   b. When a student repeats a course before receiving the degree, (a) both grades for the course will appear on the official transcript, (b) the course credits may not be counted more than once toward degree and program requirements, and (c) only the last enrollment for the course will count in the student's grade point average.
   c. Provisions 6 (a) and (b) of this policy will not apply to courses (1) using the same number but where students study different content each term of enrollment and (2) to courses designated as "repetition allowed."
   d. If an undergraduate student repeats a course after the degree has been awarded, the original course grade will not be excluded from the degree GPA nor will the new grade be included in the degree GPA.
   e. Bracketing is the practice of not including a course in the calculation of a student's GPA and not counting the course as satisfying any degree requirements, including electives, because a student has repeated a course. When a student repeats a course, all prior attempts are bracketed and only the most recent attempt counts (except as provided in 6 (c)). No department or college may bracket the courses of another department or college for any reason other than course repetition. An F may not be bracketed with an N. A University course may not be bracketed with a course taken at another institution. The Graduate School does not bracket courses.
   f. When a student enrolled in the Graduate School repeats a course, provisions 6(a) and (b) apply, but all grades for the course will be counted in the student's grade point average.

7. **Grade point average.** Every student will have calculated, both at the end of each grading period (quarter or semester) and cumulatively, a grade point average, which will be the ratio of grade points earned divided by the number of credits attempted with grades of A-F (including pluses and minuses). Both the term and cumulative grade point average will appear on each student's record.

8. **Final grade due date.** Final grades will be submitted to the Registrar no later than three business days after the last day of the final examination period.

9. This policy may be modified from time to time but existing transcripts will not be modified when there are changes in policy. Changes to the grading and transcript policy will be reflected on the legend on the back of the official transcript.

10. **Compiling and reporting grading data.**
    a. Data on the mean grade point average by designator and course level, on the percentage of As awarded by course level, and on overall collegiate grade point averages will be prepared for grades
awarded each Fall Semester. Data should be reported for all undergraduate students. Cells in the tables with fewer than 10 grades should be suppressed, in order to protect the privacy of students, but the numbers should be included in the totals.

b. The Office of Institutional Research will produce the required tables and provide them to the chair of the Senate Committee on Educational Policy and to the Office of the Executive Vice President and Provost.

c. The data tables and graphs required in 10 (a) and (b) will be reported annually to the Faculty Senate. These data should also be provided to all deans and department heads and made available to faculty and students.

11. All colleges and campuses will publish each term a dean's list, consisting of students who achieved a 3.666 GPA or higher and who completed a minimum of 12 credits on the A-F grading system. There will be a transcript notation for each term that a student achieves the dean's list. Students who have chosen to suppress all their public information (which includes academic awards and honors) will not be included on the published dean's list.

12. Alternative grading systems.
   a. Only the Senate Committee on Educational Policy will have the authority to grant to individual colleges or campuses permission to use alternative grading methods outside the provisions of this official University system, for a specified period (but no longer than five years), and only for the purpose of experimenting with a new grading system for possible system-wide adoption. Such permission may be granted if the proposal does not interfere significantly with the registration options of students from other colleges, campuses, and programs. Such alternative systems will be reported for information to the University Senate as soon as permitted and, after the specified period, will be re-evaluated, either to be discontinued, or with University Senate approval on recommendation from the Senate Committee on Educational policy, made part of the system-wide policy. Except for the provisions of this section 6, no college or program may use any grading system except for the one contained in this policy.

   b. Because alternative grading systems, once used, must be maintained by the University forever afterward (to preserve the integrity of the transcripts), the Senate Committee on Educational Policy will rarely grant permission for alternative grading systems. It will consider doing so only when (1) those who propose it can make a persuasive case that the alternative is a more accurate and effective way to measure and record student academic performance, and (2) there is strong reason to believe that the proposal will be useful to all colleges and campuses of the University (except the Law School and Medical School).

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY

A standard grading system establishes a common understanding of the meaning of grades and promotes uniformity in assigning them. Defining grades and their associated meaning (grade points and assessment of achievement) allows for comparison and for computation of the term and cumulative grade point average.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

- ADV 110 - Incomplete Grade Contract

(Restricted Access)
APPENDICES

- Scholastic Committee Guidelines: Petition guidelines for undergraduate students enrolling in a course a third time
- Student Guidelines: Petition guidelines for undergraduate students enrolling in a course a third time

FREQUENTLY ASKED QUESTIONS

- Grading and Transcripts FAQ

CONTACTS

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</tbody>
</table>

DEFINITIONS

Major/program requirements
Program requirements include those determined as the requirements to complete a major or minor in a department. Program requirements must be completed in addition to the other requirements for a degree (e.g. liberal education requirements).

Scholastic Dishonesty
Plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

RESPONSIBILITIES

Office of the Registrar
Maintain the transcript

Instructor
Submit final grades within three working days of the last day of final exams.

RELATED INFORMATION

- Board of Regents Policy: Conflict Resolution Process for Student Academic Complaints
- Board of Regents Policy: Student Conduct Code
- Administrative Policy: Credit and Grade Point Requirements for an Undergraduate (Baccalaureate) Degree: Twin Cities, Morris, Rochester
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

This policy guides academic units in scheduling the instructional time for a specified number of course credits. Instructional time expectations per credit do not vary with the method(s) of delivery of the course or with the length of the academic term.

1. For all enrollment periods and for all courses, the hours of instructional time for a course must equal at least the number of credits for the course times the number of weeks the course is offered during the full academic term.

2. Instructional time is defined for these purposes as instruction by the instructor(s) assigned to the class as scheduled by the academic department. Instructional time does not include office hours or casual or informal time spent with students.

3. Course proposals must include information regarding instructional time. Proposals must provide significant evidence to justify a schedule that includes fewer total instructional hours than the standard defined in paragraph (1.). Instructional hours of all types equal to or in excess of the standard defined in paragraph (1.) need not be justified.

4. When reviewing a course proposal, college and campus curriculum committees and other approving bodies (e.g., the Council on Liberal Education) must consider the instructional hours in reaching a decision on whether to approve a proposed course; such bodies should normally reject course proposals that have fewer instructional hours than the standard defined in paragraph (1.), barring significant evidence that reduced instructional contact hours are appropriate. In their review, these bodies will also take into consideration the method(s) of delivery of the course (e.g., traditional classroom setting, various distance education delivery methods).

5. Courses for individualized instruction such as directed study, directed readings, and directed research, which require a written contract outlining the responsibilities of the student for the course, are explicitly exempted from this standard, and may have fewer instructional hours per week than the standard.

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY

Instructional time per course credit is defined to provide a consistent minimum expectation for students and faculty. Students and faculty should know in general what time commitment is involved for a specified number of course

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**Policy Contact(s):** Jennifer Reckner

**Date Revised:** Apr 1, 2016

**Effective Date:** Apr 15, 2009

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**Table:**

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<th>Policy Owner(s):</th>
<th>Policy contact(s):</th>
<th>Date Revised:</th>
</tr>
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<tbody>
<tr>
<td>Executive Vice President and Provost</td>
<td>Vice Provost and Dean of Undergraduate Education</td>
<td>Jennifer Reckner</td>
<td>Apr 1, 2016</td>
</tr>
</tbody>
</table>

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**Reason for Policy:**

Instructional time per course credit is defined to provide a consistent minimum expectation for students and faculty. Students and faculty should know in general what time commitment is involved for a specified number of course.
This policy implements criteria and requirements for accreditation established by the Higher Learning Commission and compliance with the federal definition of a "credit hour" for financial aid eligibility.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

**APPENDICES**

There are no appendices associated with this policy.

**FREQUENTLY ASKED QUESTIONS**

- *Instructional Time per Course Credit FAQ*

**CONTACTS**

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</table>

**DEFINITIONS**

**Instructional time**
Scheduled instruction/teaching by an individual appointed for that purpose.

**RESPONSIBILITIES**

**Collegiate and campus curriculum committees**
Review proposed courses in light of conformance with policy; assess the appropriateness of proposed instructional hours. When proposed instructional hours vary from the standard, assess the type of course, and the proposed delivery method.

**Academic Departments**
Follow the established policy for instructional time per course credit when scheduling courses.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Graduate students are expected to maintain active status through continuous registration from the time they matriculate until they graduate. Students who are not able to maintain active status are strongly encouraged to consult with their Director of Graduate Studies, advisor, and relevant offices to determine whether requesting a leave of absence is the most appropriate course of action. Students who do not have an approved leave of absence and are not continuously enrolled may experience negative consequences related to academic, visa, financial aid, and other student issues.

1. Students who experience circumstances that prevent them from maintaining active student status will ordinarily be granted college approval for a leave of absence upon request. Students must complete a leave of absence form that specifies the term(s) and year(s) of the leave.

2. An approved leave of absence may not exceed two academic years.

3. Students who do not obtain a college-approved leave of absence prior to interrupting their enrollment (excluding summer) may be terminated from their graduate program or held to new requirements if they are subsequently readmitted.

4. Students granted a leave of absence may not use University facilities or services available only to registered students.

5. The term(s) and year(s) of an approved leave of absence will not be counted toward time to degree.

6. Students who obtain a college-approved leave of absence in accordance with this policy are eligible for reinstatement provided they enroll no later than the term immediately following the expiration of the leave (excluding summer). Colleges may specify reasonable conditions for reinstatement to active status, whether the student returns early or at the expiration of the leave. Colleges may deny reinstatement to active status based on crimes or other serious misconduct occurring during the leave that would have been grounds for suspension or expulsion had the student engaged in the conduct while enrolled (see Board of Regents Policy: Student Conduct Code).

7. Students whose leave of absence has expired and who have not yet registered for the following term (excluding summer) will be placed on inactive status. Students who are placed on inactive status must apply for readmission.

8. Collegiate units may develop additional rules governing leaves of absence, as long as they are consistent with this policy.

Documentation
Each college must establish and publicize its process for implementing this policy and must inform all entering students about it.
REASON FOR POLICY

Students may need to interrupt their enrollment for reasons they cannot control. Allowing students to take a leave of absence provides students the opportunity to return to the University under the rules and policies in effect when they left and without affecting their time to degree. It also allows the University the opportunity to counsel students about actions they must take to be reinstated upon the expiration of the leave.

PROCEDURES

- [Guide to Leave of Absence](#)

FORMS/INSTRUCTIONS

- [UM 1759 - Leave of Absence Reinstatement Request: Graduate Students (Twin Cities, Duluth, Rochester)](#)
- [UM 1758 - Leave of Absence Request - Graduate Students: Twin Cities, Duluth, Rochester](#)

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

- [Leave of Absence Reinstatement FAQ](#)

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</tbody>
</table>

DEFINITIONS

Continuous registration
Registration for every fall and spring semester. Required to maintain active status.

Graduate students
Students enrolled in post baccalaureate degree programs with the exception of “first professional” degrees. (The first professional degrees are: the J.D., M.D., Pharm.D., D.V.M., D.D.S, and L.L.M. degrees.)

Active status
Graduate students who register every fall and every spring (i.e., continuously registered) are considered active.

Inactive status
Graduate students who do not register every fall and spring and who have not been granted a formal leave of absence by their college will be placed on inactive status.
Leave of absence
Refers to a process by which students obtain college approval to leave the University for a specified period of time (i.e., not register for fall/spring term[s]), but for no longer than two academic years.

Matriculate
Individually matriculate upon their first registration as an admitted graduate student at the University.

Reinstatement
The process required for returning to the University after an approved leave of absence. Students with a college-approved leave of absence are eligible for reinstatement if they notify their college via the appropriate reinstatement form prior to the term in which they intend to enroll, they enroll no later than the term immediately following the expired leave (excluding summer), and they return to the same major and degree objective.

Readmission
The process of reapplication to the University for admission. Readmission is required following a break in enrollment without an approved leave of absence, as well as after failure to return by the term immediately following an approved leave of absence (excluding summer).

RESPONSIBILITIES

College
- Establish and publicize leave of absence policy and ensure that students are informed throughout their academic careers of the policy and consequences of inactive status.
- Inform students of potential conditions that may be imposed upon reinstatement at the end of an approved leave of absence.
- Help students who are pursuing degrees in multiple colleges to connect with each college to ensure coordinated leave of absence requests.
- Help reinstate students at the end of an approved leave of absence.
- Enter the necessary information into PeopleSoft related to effect start - and return - leave of absence dates for each degree being pursued by the student.
- Discontinue students from the degree(s) they are pursuing in the event that students do not request reinstatement prior to the approved term/year, or if upon reinstatement, fail to register for the approved term/year.

Graduate student
- Talk with their advisor and Director of Graduate Studies for each degree they are pursuing, and other relevant offices (e.g., International Student and Scholar Services, Office of Student Finance, Graduate Assistant Employment).
- Submit the Leave of Absence Form for Graduate Students when planning a leave of absence. Submit the Application for Reinstatement for Graduate Students prior to intended term of return. Students pursuing degrees in more than one college must submit the Leave of Absence and Reinstatement forms with each college.

RELATED INFORMATION

- Board of Regents Policy: [Student Conduct Code](#)
- Administrative Policy: [Family and Medical – FMLA Leave](#)
- Administrative Policy: [Grading and Transcripts](#)
- Administrative Policy: [Military, Court Appearance, or Civic Duty Leaves](#)
- Administrative Policy: [Parental Leave for Academic Employees](#)
- Boynton Health Service
- Disability Resource Center
- Graduate Assistant Employment
- International Student and Scholar Services
- Office of Student Health Benefits
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.

Effective:
August 2011 - New Policy, Comprehensive Review: Establishes a formal leave of absence for graduate students who need to interrupt their enrollment for reasons they cannot control such as illness, family emergencies, etc. This policy parallels a similar policy already in effect for undergraduate students. Allows students to return to the University under the rules and policies in effect when they left. Aligns with best practice at peer institutions.
**POLICY STATEMENT**

Instructors and academic units are responsible for maintaining records of student work and grade books, as follows:

1. Instructors and academic units should either return submitted student work to the student, or retain it for 30 days after grades for the class are posted to the student's transcript. This provides students the opportunity to retrieve or review their work, as appropriate.

2. After 30 days, any retained student work may be discarded securely (following applicable University document-destruction procedures).

3. A student may request that retained student work be retained until 30 days into the next semester (not including summer, so a request in the spring would require a unit to hold the work until 30 days into the following fall semester). A student must make this request to the instructor no later than the last day of instruction for the class.

4. Instructors must follow FERPA, Minnesota Government Data Practices Act (MGDPA) and University policy in retaining and returning student work. For example, student work may not be left in hallways or other public places where anyone may see it.

5. Academic units must retain grade books or their equivalents for a minimum of one year or, if a grade is appealed, until the end of the appeal. Instructors leaving the University must give all grading records to the department.

6. Academic units must also be aware of and follow Administrative Policy: Managing University Records Retention.

**Exclusions**

This policy is not applicable to the Duluth Campus.

**REASON FOR POLICY**

To comply with state and federal law regarding data privacy and to establish a reasonable time period after the end of a term during which students are able to retrieve or view their work while recognizing the physical storage space limitations in units.
PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. Does this policy apply to online classes or student work submitted electronically?
   Yes. Work may be returned electronically or stored electronically to meet the requirements of this policy.

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DEFINITIONS

Student Work
Materials a student has submitted for a class, including but not limited to, papers, projects, exams, problem sets, artwork, and architectural models.

Maintain
The process of keeping student work where it can be safely stored and accessed, whether submitted physically or electronically.

RESPONSIBILITIES

Academic Units
Maintain grade books or their equivalents for a minimum of one year, or until the end of an appeal if a grade is appealed.

Instructors
Return student work or retain it for 30 days after grades are posted to a student’s transcript. Maintain the privacy of student work.

Students
Before the last day of instruction, request their student work be retained for 30 days into the next semester.

RELATED INFORMATION

- Administrative Policy: Managing University Records Retention

HISTORY

Amended:
January 2017 - Comprehensive Review, Minor Revision. 1. Clarifies obligations when work has been returned earlier than the 30-day requirement for retention. 2. Revise to use “course” and “class” clearly in policy. 3. Title Change: Maintaining Course Records changed to Maintaining Records of Student Work.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009
## POLICY STATEMENT

University policy recognizes that there are a variety of legitimate circumstances in which students will miss coursework, and that accommodations for makeup work will be made. This policy applies to all course requirements, including any final examination. Students are responsible for planning their schedules to avoid excessive conflicts with course requirements.

1. Instructors may not penalize students for absence during the academic term due to the following unavoidable or legitimate circumstances:
   - illness, physical or mental, of the student or a student’s dependent;
   - medical conditions related to pregnancy;
   - participation in intercollegiate athletic events;
   - subpoenas;
   - jury duty;
   - military service;
   - bereavement, including travel related to bereavement;
   - religious observances;
   - participation in formal University system governance, including the University Senate, Student Senate, and Board of Regents meetings, by students selected as representatives to those bodies; and
   - activities sponsored by the University if identified by the senior academic officer for the campus or the officer’s designee as the basis for excused absences.

2. Voting in a regional, state, or national election is not an unavoidable or legitimate absence.

3. Instructors are expected to accommodate students who wish to participate in party caucuses, pursuant to Board of Regents resolution (see December 2005 Board of Regents Minutes, p 147.)

4. For circumstances not listed in (1), the instructor has primary responsibility to decide on a case-by-case basis if an absence is due to unavoidable or legitimate circumstances and grant a request for makeup work.

### Notification, Verification of Absences, and Make-up Work

5. Students must notify their instructors of circumstances identified in (1) or other circumstances leading to a request for makeup work as soon as possible and provide information to explain the absence. Some
situations will be sufficiently urgent that arrangements for makeup work cannot be made prior to the date of an absence. In such cases, arrangements should be made as soon as possible following the student's return.

6. The instructor has the right to request, and the student must provide if requested, verification for absences, with the exception of a single episode medical absence that does not require medical services.

7. The instructor has the right to request verification for a single episode medical absence if (i) the student has had more than one single episode medical absence in the class, or (ii) the single episode medical absence involves missing laboratory sessions, exams or important graded in-class assignments.

8. The instructor may not penalize the student and must provide reasonable and timely accommodation or opportunity to make up missed work, including exams or other course requirements that have an impact on the course grade if the student:
   - Was absent due to circumstances identified in (1);
   - Has complied with the notification requirements; and
   - Has provided verification if the instructor has requested further information.

9. Colleges and academic units may establish more specific criteria for notifying instructors and completing the associated make-up work, especially when the absence involves activities that may not be possible to make up, such as laboratory or clinical sessions and performances.

10. Instructors are not obligated to accommodate a student who has missed so much of the critical components of a course, even for legitimate reasons, that arrangements for makeup work would not be reasonable.

Instructors should take all factors into consideration when determining whether to grant an excused absence and how to make arrangements for makeup work that has an impact on the course grade. If a student has missed a component of the course that cannot be made up in exactly the same manner, the instructor may substitute another activity or assignment in order to assess the missed components. If no substitution can be devised, the missing component(s) cannot be factored into determining that student's final grade for the course.

**Appeals**

If a student believes the student has been wrongly denied the opportunity to make up work due to disagreement with the instructor about the legitimacy or unavoidability of an absence, the student should pursue the student's complaint using the usual process for appeals of student grievances. Chairs and deans who have questions about what constitutes an excusable bereavement absence, religious observance, or eligible dependent illness should consult with the senior academic officer for the campus for resolution of the disagreement.

In accordance with the Administrative Policy: *Addressing Student Academic Complaints*, final authority rests with the senior academic officer for the campus.

**Special Situations**

For health or safety of a campus, the senior academic officer for the campus or the officer’s designee may waive the requirement that students provide verification from a health care provider for illness.

**Exclusions**

This policy does not apply to the Duluth campus.

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**REASON FOR POLICY**

The University aims to foster an atmosphere of honesty and trust between instructors and their students. It is in both the University's and the student's interest to outline academic protections for students when they miss class for legitimate reasons. This policy places parameters around what is a legitimate absence, and reinforces the responsibilities of the instructor and the student.

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**PROCEDURES**

There are no procedures associated with this policy.
FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

- *Makeup Work for Legitimate Absences FAQ*

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DEFINITIONS

**Dependent**
A person, typically a qualifying child or other relative, other than the taxpayer or spouse, who entitles the taxpayer to claim a dependency exemption for tax purposes.

**Intercollegiate athletics**
Sports teams organized and funded by the institution through the athletics department. Intercollegiate does not refer to or include recreational sports, intramural sports, club sports, or other special interest sport clubs or organizations.

**Medical provider**
A licensed mental health or medical professional including registered nurses (RNs).

RESPONSIBILITIES

**Instructor**
- Provide timely and clear responses to requests for makeup work for absences.
- Provide reasonable and timely accommodation for makeup work for legitimate absences.
- Maintain consistency in how this policy is applied to all students enrolled in the course.

**Student**
- Plan schedules to avoid excessive conflict with course requirements.
- Notify instructors of circumstances related to absences as soon as possible.
- Provide verification of absence, if requested by the instructor.
RELATED INFORMATION

Related Administrative Policies

- Administrative Policy: Intercollegiate Athletic Events during Study Day and Finals Weeks: Twin Cities, which prohibits intercollegiate athletic competition during study day and finals week except under certain circumstances.
- Administrative Policy: Teaching and Learning: Student Responsibilities
- Administrative Policy: Teaching and Learning: Instructor and Unit Responsibilities
- Administrative Policy: Mandatory Attendance at First Class Session and Consequences for Absence

Other Related Information

Board of Regents resolution. December 9, 2005, "Approval of a resolution related to Events and Classes on Precinct Caucus Night", [See pp.147-8].

HISTORY

Amended:
Comprehensive review, Major Revision: adding participation in U Senate, Student Senate, and Regents meetings by student reps to the list of approved absences. Specifying when instructors can request verification for "single episode" medical absences. Adding two FAQs about single episode medical absences. Adding an FAQ about student government absences. Adding a definition of a "medical provider"

Amended:
December 2015 - Comprehensive Review, Minor Revisions. 1. Organizes the information more logically and includes key subheadings. 2. Expands on the FAQ to incorporate numerous questions and answers received or given over the past years, including information related to family vacations and attendance at weddings. 3. Added new language addressing travel related to bereavement.

Amended:
June 2014 - Comprehensive Review. Clarifies the instructor responsibility for accommodating student absences due to medical conditions related to pregnancy, supporting a request from Kim Hewitt. Moves the sentence re: instructors having the right to request verification to a separate bullet. Adds instructor and student to the Responsibilities section.

Amended:
January 2011 - Comprehensive Review. Expands allowable absences to include caring for student's dependent. Documentation required only when requested by instructor. Responsibility for determining whether absence is legitimate rests with instructor.

Amended:
May 2010 - Expands the application of this policy to final exams, in addition to all course requirements, since legitimate absences can occur anytime during the academic year.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009
POLICY STATEMENT

The University protects the rights of students with respect to their education records. Education records generally include any personally identifiable records maintained about a student by the institution, including academic, disciplinary, and administrative records. Each campus must:

- provide students with an annual notice of their rights,
- regulate access to education records in accordance with law and policy,
- maintain records as required by law and policy,
- provide students with the right to request amendment to their education records and the right to a hearing concerning their education records,
- provide complete records, from all units at the University, in response to a student's request that records be provided.

Access to student records. University officials may have access to student information, if their responsibilities reasonably require access to that information for educational, administrative, or research purposes in the performance of their job duties. University employees who have access to student education records are obligated to carefully protect them and will be held accountable for safeguarding them. Policy or procedure violations may result in disciplinary action, including possible termination of employment, and applicable civil and criminal sanctions.

Distributing grades. The posting of grades or examination results with personally-identifiable information (i.e., student ID number, Social Security Number, student name) is prohibited. Examinations, papers, blue books, or any other graded materials that contain personally-identifiable student information (i.e., name, student ID number) should be distributed directly to students or made available for pick up in departmental offices in a manner that ensures the privacy of each student's grade.

Student right to review. Students are entitled by law to review portions of their records at the University and to request amendments of such records if the student believes they are inaccurate, misleading, or otherwise in violation of the privacy or other rights of the student.

Disclosure of student records, including disciplinary background checks. Personally-identifiable student information may only be released under the conditions outlined in the procedures or with the written permission of the student. When a student provides a valid authorization to release student records to a third party, all records that are legally covered by the authorization must be released as requested by the student. Units responding to external requests for information must ensure that the response includes all requested information that exists at the University.

REASON FOR POLICY

This policy implements Board of Regents Policy: Student Education Records, and establishes procedures to ensure compliance with state and federal law governing student education records.
PROCEDURES

- Assuring Student Rights Regarding Education Records
- Accessing and Using Student Education Records
- Releasing Student Information
- Responding to Authorizations to Disclose Student Records
- Students Managing Their Education Records

FORMS/INSTRUCTIONS

- UM 1801 - Reference Request and Employee Authorization [um1801.doc]
- UM 1711 - Reference Request and Student Authorization [refrequesttext.doc]
- Access Request Form (ARF) on the OIT Data Security page

APPENDICES

- Persons And Institutions That May Receive Information Without Student Permission

FREQUENTLY ASKED QUESTIONS

There is no FAQ associated with this policy.

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DEFINITIONS

Directory Information
Student's name, address, etc.

Legitimate Education Interest
An interest in student records for the purpose of performing stated job duties.

Student Applicant
A person who has applied for admission to a University college. It includes students who are enrolled in a University college and are applying for admission to another University college.

Student Education Records
Any student record maintained by the institution that contains personally identifiable information.
University Official
University officials are those members of the University whose responsibilities reasonably require access to student records for educational, administrative, or research functions and may include faculty, administration, clerical and professional employees, and other persons who manage student record information.

RESPONSIBILITIES

Custodian of Education Records
Bring Board of Regents Policy: Student Education Records and other pertinent federal and state laws to the attention of all people who have access to student records. Respond to requests by student to amend an educational record.

Vice Provost & Chancellors
Appoint the custodians of student education records.

Departments with Academic Records
Adopt these administrative procedures or prepare its own departmental procedures that are set forth in the Regents and this policy.

Hearing Officers
Comply with the hearing procedures.

Registered Student
Complete a request to prevent disclosure to prohibit the disclosure of directory information during the term of enrollment.

Office of the Registrar
Publish an annual public notice designating directory information and informing students of their option to prohibit release of directory information.

University Officials
Respond to inquiries about students without their consent if the requested information is a matter of public record or directory information and not suppressed.

RELATED INFORMATION

Statutes:

Related Policies:
- Board of Regents Policy: Student Education Records
- Administrative Policy: Reporting and Notifying Individuals of Information Security Breaches

HISTORY

Amended:
October 2009 - Added new procedure: Responding to Authorizations to Disclose Student Records. Title changed from Protecting the Privacy of Student Education Records to Managing Student Records. Clarifying changes made throughout policy.

Effective:
June 2005
University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

1. Students are required to attend the first class session in order to receive important information about the course from the instructor. Students must attend the first class meeting of every part of a course in which they are registered (including, labs, discussion sections, lectures, and other types of class meetings), unless they have obtained prior approval from the instructor (or department, if appropriate) for an intended absence before the first class meeting. Without such prior approval, a student may lose their place in the class to another student.

2. If a student wishes to remain in a course from which the student has been absent the first day without prior approval, the student must contact the instructor as soon as possible. In this circumstance, instructors have the right to deny access to the class if other students have been added and the course is full. However, instructors should consider extenuating circumstances that may have prevented a student from attending the first class session and from notifying the instructor in advance.

3. Absence from the first class session that falls during a recognized religious holiday (e.g., Rosh Hashanah) does not require instructor approval, but the student must notify the instructor in advance regarding the absence and the reason for the absence. In this instance, the place for the student will be retained. (See Administrative Policy: Makeup Work for Legitimate Absences: Twin Cities, Crookston, Morris, Rochester for further information regarding absences).

4. Students are responsible for officially canceling their enrollment in any course in which they have enrolled and subsequently been denied enrollment. If any such student does not officially cancel enrollment from the course, the instructor has the choice to either (a) assign a failing grade to the student for that course, or (b) request that the student be disenrolled.

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY

Students are required to attend the first class session to receive important information about the course from the instructor. In addition, because students can enroll and disenroll for courses on-line, the list of registered students
fluctuates. A student’s presence at the first class session is required to clearly indicate the number of students who are committed to taking the course. Instructors can then determine whether any students who were not able to register for a course because all seats were taken may take the place of students who registered but did not attend the first class session.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

**APPENDICES**

There are no appendices associated with this policy.

**FREQUENTLY ASKED QUESTIONS**

1. **Is it mandatory that a student be removed from a class if the student misses the first class session?**
   
   Instructors are not required to request that the student be removed from the class, but it is their prerogative to make such a request.

2. **What is the necessary process for instructors to disenroll students from a course?**
   
   Instructors can contact their college’s student services department or One Stop Student Services to request students be disenrolled for not attending the first class session.

3. **How does this policy apply to on-line courses?**
   
   The policy extends to on-line courses as well as traditional in-person courses. Students must attend the first class meeting or obtain permission from the faculty member to be absent. In the traditional classroom courses, attendance means the student is physically present in the course. For courses that are delivered partially or completely online, instructors have discretion to indicate on the syllabus the specific action(s) a student would need to take within a specified time period (e.g., post an online discussion group on academic matters, initiating contact with a faculty member to ask a question about an academic course topic, submitting an assignment, taking a quiz) in order to be considered as having attended the online course.

4. **How does this policy impact students who add a class during the first or second week of the semester?**
   
   Students may generally add open classes without instructor permission during the first week of the term (fall and spring), and with instructor permission during the second week (fall and spring). Students are not required to attend the sessions prior to registration. Students should communicate with their instructor to determine if any graded work has been missed and what makeup work is available.

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DEFINITIONS

Officially cancel
Students must cancel (drop) a class if they have been denied enrollment in that course. Students are responsible for dropping a course to officially remove it from their record and may do so online in the course registration system.

RESPONSIBILITIES

Students
Attend the first sessions of courses for which they have registered, or seek prior approval from the instructor if they are unable to attend. Use the course registration system to drop a course they have registered for but will not be attending.

Instructors
Monitor official course registration lists. Take attendance at first class meeting(s). Respond promptly to students who have contacted the instructor regarding not attending the first class session. Notify students if they have been denied enrollment in a course. Report a failing grade if a student who was denied enrollment in a course does not drop the course, or request that the student be disenrolled.

RELATED INFORMATION

- Administrative Policy: [Makeup Work for Legitimate Absences: Twin Cities, Crookston, Morris, Rochester](#)

HISTORY

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009
POLICY STATEMENT

This policy sets the standards for the master’s final examination and the requirements for completion of the master’s degree.

I. Final Examination Committee: Plan A and B Master’s Degrees
   a. The master's final examination committee must consist of at least three members, including the advisor(s). All members appointed to the committee must meet the minimum standards established by the program and college. All members of the committee and the student must participate in the final examination. Committee members and/or the student may participate remotely as long as all conditions for remote participation in examination are met.
      i. At least two members (including the advisor) must be from the student's major field.
      ii. At least one member must represent a field outside the student’s major. If the student has a declared minor(s), the outside member(s) must be from the minor field(s).
      iii. Members cannot satisfy the requirement with respect to more than one field.
      iv. Collegiate deans or their designated representatives at the collegiate level must verify eligibility and approve members of the final oral examination committee.
      v. The approved committee membership must be centrally archived in the system of record.
   b. Changes in committee membership may be made after filing the degree plan if approved by the program Director of Graduate Studies (DGS) and the collegiate unit. Changes must also be archived centrally in the system of record.

II. Final Examination:
   a. For students submitting a Plan A thesis, the final examination must contain an oral component.
      i. The final oral examination is a closed examination open only to the final oral examination committee and the student. Programs may also require a written final examination.
      ii. Students must provide the reviewers with a copy of the Plan A thesis/professional engineering design project at least 14 days before the scheduled date of the final examination.
      iii. Every member of the final examination committee must certify on the master’s thesis reviewer's report that the thesis/professional engineering design project is ready for defense before the final examination may take place.
   b. Committee members must notify the candidate in writing of all required revisions to the thesis or final project as well as specify a time limit for the submission of the revised master’s thesis or project within 7 days of the final examination.
      i. If revisions are required as a condition of passing, the advisor(s) must certify that the revisions have been completed before the degree is awarded.
   c. For students submitting a Plan B project, the final examination may be oral, written, or both. The final oral examination is a closed examination open only to the final oral examination committee and the student.
d. A majority vote of an examining committee is required to pass the master’s final examination.

e. If the student fails the final examination, the student may retake the examination only if all committee members, or all committee members save one, approve this option.

f. The second attempt to pass the master’s final examination must use the same committee members as the first examination unless an extraordinary or emergency situation necessitates a substitution.

g. If the committee does not approve a retake, or if the student fails the second attempt, the student will be terminated from the program.

III. Thesis Submission: Master’s Thesis/Professional Engineering Design Project

All students who complete a Plan A Thesis or Professional Engineering Design Project must file a digital copy of the thesis/project with the University in accordance with University standards. Students may choose whether or not to request an embargo of publication of the thesis or design project for a limited period of time.

IV. Plan C Master’s Degrees

Plan C master’s degrees typically do not include standard final examination formats like those for Plan A and Plan B master’s degrees. However, students must satisfy all of the course and other requirements specified by the program in order to complete the degree.

V. Minimum GPA required for graduation

Students must have a 2.800 minimum GPA for courses included on the degree plan at the time of degree clearance.

Exceptions

This policy does not apply to the M.B.A. [Twin Cities] degree.

Effective Date

This policy applies to all students admitted after January 1, 2013. Students who matriculated before January 1, 2013 may choose to continue under the policies in effect when they initially matriculated in their graduate program.

REASON FOR POLICY

This policy establishes uniform standards for the master’s final examination; defines timely submission of copies of the thesis for University archives, and supports Board of Regents Policy: Openness in Research which covers public dissemination of University-sponsored research.

PROCEDURES

- Canceling or Recessing the Doctoral Preliminary and/or Master’s or Doctoral Final Oral Examination
- Degree Completion Procedures

FORMS/INSTRUCTIONS

- Master’s Graduation Packet Request
- Thesis or Dissertation Hold Request

APPENDICES

- Degree Completion Steps: Master’s Plan A
- Degree Completion Steps: Master’s Plan B, Master’s Plan C
- Mutual Roles and Responsibilities for Faculty and Graduate Students: Guidelines
- Required Conditions and Best Practices for Remote Participation in Graduate Examinations
- Typical Roles and Responsibilities of the Director of Graduate Studies
- Thesis Formatting and Submission Guidelines
FREQUENTLY ASKED QUESTIONS

- [Master's Degree: Completion FAQ](#)

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</tr>
</tbody>
</table>

DEFINITIONS

There are no definitions associated with this policy.

RESPONSIBILITIES

Graduate School

- Provide guidelines for formatting and submitting the thesis, to include not only current instructions for electronic formatting and filing, but also guidelines governing the use of already published material in the thesis. Guidelines should take account of possible copyright issues.

Collegiate Units

- Approve and archive in the system of record committee membership (including any subsequent changes to an approved committee).
- Approve and record the specific procedures used by programs for administering and grading the master’s final examination.
- Maintain and publish any additional collegiate-level publishing standards or guidelines (e.g., stylistic conventions based on discipline, language of the thesis).

Departments/Programs

- Publish the specific procedures used for administering and grading the master's final examination, and identify whether candidates for each degree and track offered must take written examinations, oral examinations, or both.
- Provide program-specific information in the graduate handbook.
- Maintain and publish any additional program-level publishing standards or guidelines (e.g., stylistic conventions based on discipline, language of the thesis).
- Review and approve any changes in committee membership; route program-approved requests to the collegiate unit for approval.

RELATED INFORMATION

- Administrative Policy: [Appointments to Graduate Examination Committees](#)
- Administrative Policy: [Master's Degree: Performance Standards and Progress](#)
- Administrative Policy: [Admission for Master's and Doctoral Degrees](#)
- Administrative Policy: [Readmission or Changes to Master's or Doctoral Degree Objectives](#)
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

This policy sets minimum standards for master’s students to maintain academic good standing and satisfactory progress in their degree programs. Programs and collegiate units may have additional and/or more stringent requirements.

I. Requirements Upon Matriculation
   a. Students are responsible for knowing all program requirements of their master’s program when they matriculate.
   b. Upon matriculation, programs must:
      i. Provide each student a current graduate program handbook, specifying the program’s requirements and policies governing successful degree completion.
      ii. Assign each student a temporary advisor.

II. Progress Review
   a. Annual Review
      i. Programs must review the progress of each master’s student at least once per year. Students deemed not to be in good standing must be informed of the results of the review in writing, with a copy to the student’s advisor.
   b. Degree Plan
      i. Master’s degree students must have an approved degree plan on file with their collegiate unit in order to defend the degree and/or apply for degree clearance. It is recommended that the degree plan be filed at least one term (fall or spring semester) before the intended term of the defense and/or application for degree clearance.
      ii. Students intending to pursue a minor must declare the minor prior to the final examination. In master’s programs that do not include a final examination, students must declare the minor prior to filing for degree conferral.
      iii. The degree plan must be centrally archived in the system of record.

III. Performance Standards
   a. Continuous Enrollment Students are required to enroll every semester (fall and spring) from the time of matriculation until degree conferral except for cases with an approved Leave of Absence on the student’s record.
b. **Time Limit for Earning the Master's Degree** All requirements for the master's degree must be completed and the degree awarded within five calendar years after initial enrollment in the graduate program or the more restrictive time frame specified by the program.
   
i. Students who are unable to complete the degree within the time limits described above may, with the approval of their advisor/s and program DGS, petition the program and collegiate unit for one extension of up to 12 months. Students must submit the petition for an extension prior to the end of the term in which the time limit will expire.
   
   - If a petition is approved, the student is notified in writing of the expectations for progress and of the expected timeline for completion and award of degree.
   - If the petition is denied, the student is notified in writing that the student will be terminated from the graduate program upon expiration of the limit.
   - Students who have been terminated under such circumstances may apply for readmission to the program; however, readmission is not guaranteed.

c. **Minimum Grade Requirements** To remain in good academic standing, students must meet the minimum GPA requirement specified by the graduate program or 2.800 (on a 4.000 scale), whichever is higher. Students who have filed a master's degree plan must maintain a 2.800 GPA for courses included on the degree plan. Only courses with grades of A, B, C (including C-) and S may be counted toward the degree. Students who have not yet filed a degree plan should maintain an overall GPA of 2.800. Students who fall below the program's minimum GPA requirement may be terminated from the program.

d. **S/N grades for courses** A minimum of 2/3 of the course credits included on a degree plan must be taken A/F.

---

**Exception**

Programs with a distinctive student population or approved joint-degree programs may request a program-wide exception to the five-year time limit for earning the master's degree.

This policy does not apply to the M.B.A. [Twin Cities] degrees.

**Effective Date**

This policy applies to all students admitted after January 1, 2013. Students who matriculated before January 1, 2013 may choose to continue under the policies in effect when they initially matriculated in their graduate program.

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**REASON FOR POLICY**

Assists student and advisor in planning for timely completion of program requirements; provides timely evaluations to students as they proceed through program; alerts student and advisors to problems, and provides opportunity to develop best approach for addressing those problems; creates clear record in cases where program decides to terminate student.

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**PROCEDURES**

There are no procedures associated with this policy.

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**FORMS/INSTRUCTIONS**

- OTR 198 - Graduate Degree Plan
- UM 1778 - Master's Degree: Program-Wide Exception to the Maximum Time Limit
- UM 1779 - Master's Degree: Request for Extension to the Maximum Time Limit

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**APPENDICES**
FREQUENTLY ASKED QUESTIONS

- Master's Degree: Performance Standards and Progress FAQ

CONTACTS

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DEFINITIONS

Good standing/good academic standing
Students remain in good standing if they: (a) make timely progress towards degree completion as required by the program and by this policy; (b) maintain a GPA at or above the minimum set by the program and by this policy; and (c) pass all appropriate examinations within the time frame specified by the program.

RESPONSIBILITIES

Collegiate Units
- Ensure appropriate review of coursework on the degree plan (including any subsequent changes to an approved degree plan); archive the degree plan in the system of record
- Set college deadline for students who are requesting an extension to the time limit for completing master’s degrees
- Review and approve program-wide requests for exceptions to the time limit for completing the master’s degree, archive requests in the system of record
- Review and approve requests for extensions to the time limit for completing the master’s degree; archive petitions in the system of record

Departments/Programs
- Clearly state the program requirements for maintaining good standing in the Graduate Program Handbook, even if they are identical to the requirements in this policy
- Review and approve the degree plan (including any subsequent changes to an approved degree plan)
- Review and approve requests for extensions to the time limit for completing the master’s degree; notify students in writing of the decision and subsequent actions (i.e., expectations for progress and for the month/year of degree conferral or termination from the program upon expiration of the limit)

Students
- Must obtain the required approvals and file the degree plan with the collegiate unit
- Must initiate the request for an extension to the maximum time limit for completing the master’s degree, obtain the approval of their advisor(s) and program DGS, and submit their request for an extension by the deadline
RELATED INFORMATION

- Administrative Policy: Admission for Master’s and Doctoral Degrees
- Administrative Policy: Eligibility to Serve on Graduate Examination Committees
- Administrative Policy: Leave of Absence and Reinstatement from a Leave: Graduate Students
- Administrative Policy: Master’s Degree: Completion
- Administrative Policy: Readmission or Changes to Master’s or Doctoral Degree Objectives

HISTORY

Amended:
June 2017 - Comprehensive Review, Minor Revision. 1) Rewrote introduction to clarify the goal of the policy and distinguish from unrelated policies, 2) Added Leave of Absence language, 3) Clarified language related to conditions that necessarily result in discontinuation from program, 3) Clarified language regarding grading requirements for preliminary examination, removing pass with reservations when recording the final result of the prelim exam, 4) moved language on voting requirements for the prelim from an appendix to the body of the policy. Changes in policy respond to need for greater clarity on policy intent on the part of affected constituencies and enhanced consistency in policy implementation across programs.

Effective:
July 2012 - New Policy, Comprehensive Review. 1. Continues the five year time limit for master’s degrees, but provides a process for requesting a program wide exception for distinction student populations. 2. Requires an annual progress review for all master’s students. 3. Extends applicability of policy requirements to programs not formerly under the aegis of the Graduate School.
POLICY STATEMENT

This policy governs post-baccalaureate certificates approved by the Board of Regents. Such certificates may be offered by collegiate units to individuals who wish to enhance their knowledge, skills, and professional training.

I. Admission

Minimum admission requirements for post-baccalaureate certificates are the same as for master’s and doctoral degrees. Admission is governed by the Administrative policy: Admission for Master’s and Doctoral Degrees.

II. Program Requirements

Programs offering post-baccalaureate certificate plans must assure students receive graduate-level training. The minimal criteria are:

a. Plans must consist of at least 12 semester course credits.

b. All courses must be at the 4000 level or above. At least 50% of the certificate course credits must be at the 5000 level or above.

c. Students must maintain at least a 2.800 GPA (on a 4.000 scale) for satisfactory progress.

d. Only courses with grades of A, B, C (including C-) and S may be counted toward the degree.

Colleges and programs may specify additional or more stringent requirements. Colleges and graduate programs must publish these requirements and provide them to students upon matriculation.

Note: Students must have at least a 2.800 GPA for courses included on the degree plan at the time of degree clearance.

III. Transfer of Credits

a. Graduate course credits earned at other institutions may be transferred to University post-baccalaureate certificate plans subject to approval by the University graduate program. Such credits must have been earned at an accredited institution in the United States or at a non-U.S. institution judged by the graduate program to be comparable to a regionally accredited graduate program in the United States.

b. At least 60% of the graduate course credits required for the certificate must be taken at the University.

IV. Credits in Common

A maximum of three graduate course credits may be counted in common between two University post-baccalaureate certificate plans.

V. Certificate Completion Timeline

All requirements for the certificate must be completed and the certificate awarded within five calendar years after initial enrollment. Colleges and programs may set more stringent time requirements and may
allow students to petition for exceptions to the time limit.

**REASON FOR POLICY**

This policy provides a framework for offering post-baccalaureate education that is oriented primarily toward professional and skills development and that culminates in the award of a certificate.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

**APPENDICES**

- Degree Completion Steps: Specialist Certificate in Education (SC), Post-Baccalaureate Certificate (PBC)

**FREQUENTLY ASKED QUESTIONS**

- Post-Baccalaureate Certificate Plans Approved by the Board of Regents FAQ

**CONTACTS**

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<tr>
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</tbody>
</table>

**DEFINITIONS**

**Post-baccalaureate**
Following the completion of undergraduate studies and the award of the undergraduate degree.

**RESPONSIBILITIES**

**Colleges and Programs**
Publish the requirements for post-baccalaureate certificate plans and provide them to students upon matriculation.

**RELATED INFORMATION**

- Administrative Policy: Adding, Changing, or Discontinuing Academic Plans
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Graduate programs make all decisions about readmission, change of degree objective, or addition of degree objective. Programs have the discretion to require a full admissions application from a student requesting a new or additional degree objective.

I. Readmission
In cases where active student status has lapsed and an individual wishes to resume graduate studies, readmission to a University graduate program is required. Readmission is not guaranteed, and colleges and programs may add conditions to the readmission (e.g., course grades older than a specified number of years may not be included in the degree plan). These conditions must be specified in writing by the time of readmission. If the specified conditions are not satisfied, the student may be terminated at the discretion of the graduate program.

II. Change to or Addition of a Degree Objective within the Same Program
Currently enrolled graduate students, or returning students, who wish to change or add a degree objective (e.g., add the doctoral degree in the same program in which they are completing a master's degree) must request the change or addition of degree objective. The student's graduate program must either approve or deny the request.

If the change is to a lesser degree (e.g., to a master's degree from a doctoral degree) in the same program to which the student was admitted, the student must still request a change of degree objective (see Procedures for Readmission/Change or Addition of Degree Objective and Associated Requirements).

III. Change to or Addition of a Degree Objective in a Different Program
Currently enrolled graduate students who wish to change to a different program, or add another degree objective in a different program, must complete and submit an application for admission. The graduate program offering the new degree must either approve or deny the request (see Procedures for Readmission/Change or Addition of Degree Objective and Associated Requirements).

IV. Exceptions
a. This policy does not apply to the J.D., M.D., Pharm.D., D.V.M., D.D.S, L.L.M., and M.B.A (Twin Cities) degrees.

b. Programs may request from their collegiate dean or unit's chief academic officer (or designee) an exception to the required use of the University's central graduate admissions application system for admission, readmission, and changes to master's and doctoral degree objectives.
REASON FOR POLICY

Decisions on readmission, and the addition or change of a degree objective, should ensure that students admitted to a program have appropriate preparation for graduate work in a particular discipline and at the intended degree level.

PROCEDURES

- Use of the Central Graduate Admissions Application System

FORMS/INSTRUCTIONS

- UM 1768 - Request for Exception: Use of the University’s Central Graduate Admission Application System for Admission, Readmission and Changes to Master’s or Doctoral Degree Objectives
- UM 1772 - Request for Express Readmission: Post-Baccalaureate Certificates, Master's and Doctoral Degree Programs
- University of Minnesota Central Graduate Admission Application System

APPENDICES

- Procedures for Readmission or Change to Master's or Doctoral Degree Objective

FREQUENTLY ASKED QUESTIONS

- Readmission and Changes to Master's or Doctoral Degree Objectives FAQ

CONTACTS

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<tr>
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<tbody>
<tr>
<td>Primary Contact(s)</td>
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</tr>
</tbody>
</table>

DEFINITIONS

There are no definitions associated with this policy.

RESPONSIBILITIES

Colleges

- Publish and maintain the requirements for readmission, and adding or changing a degree objective.
- Request exceptions from the Executive Vice President and Provost (or designee) to the required use of the University’s central graduate admission application system for admission, readmission, and changes to master’s and doctoral degree objectives.
• Publish and maintain the requirements for readmission, and adding or changing a degree objective.
• Approve or deny requests for readmission, change to or additions of additions a degree objective within the same program, and change to or addition of additions of a degree objective in a different program.
• Request exceptions from the collegiate dean or unit's chief academic officer (or designee) to the required use of the University's central graduate admission application system for admission, readmission, and changes to master's and doctoral degree objectives.

Central Graduate Admissions Office

• Process requests from programs for student readmission
• Communicate readmission decisions to the applicant
• Reactivate the student record for students who are readmitted

RELATED INFORMATION

• Administrative Policy: Leave of Absence and Reinstatement from a Leave: Graduate Students - Twin Cities, Rochester
• Administrative Policy: Admission for Master's and Doctoral Degrees

HISTORY

Amended:
June 2017 - Comprehensive Review, Minor Revision. 1. Documents appropriate reasons for a leave of absence. 2. Uses "discontinue" language rather than "inactive" language for accuracy about the process. 3. Clarifies language regarding semester/term including how terms are counted for leaves and discontinuation.

Effective:
May 2012 - New Policy. Establishes the University's minimum readmission and change of status requirements for master's and doctoral degrees, which help ensure that students are sufficiently prepared to succeed in obtaining their degree. Consolidates information that was previously contained in the Graduate School catalog and on the Graduate School website.
POLICY STATEMENT

Each campus will develop and maintain fair processes for resolving complaints against students and student organizations under Board of Regents Policy: Student Conduct Code. These processes will emphasize student development through understanding and accepting responsibility for personal behavior, while protecting community interests and due process. Each campus's disciplinary process will:

- provide fair notice to students of alleged violations of Board of Regents Policy: Student Conduct Code;
- encourage informal resolution of alleged violations without the need for a hearing;
- permit students the opportunity for a fair hearing upon request, and the opportunity for one campus-wide appeal of a finding of violation of the Code; and
- provide for a preponderance of the evidence (i.e. more likely than not) standard of proof.

For cases involving violations of sexual assault, sexual harassment, stalking, or relationship violence, each campus's disciplinary process will also:

- be conducted by officials who receive annual training on the issues related to sexual assault, sexual harassment, stalking, and relationship violence and how to conduct an investigation and hearing process that protects the safety of victims and promotes accountability;
- provide equitable access to an appeal by both the accused student and the reporting party;
- allow equitable access to a support person of their choice for both the accused student and the reporting party at any related meeting or proceeding;
- allow equitable access to an advocate, if permitted for either, for both the accused student and the reporting party at any related meeting or proceeding; and
- provide simultaneous written notice to both the accused student and the reporting party:
  - of the results of any disciplinary proceeding;
  - of the procedure for the accused student and the reporting party to appeal the results of the disciplinary proceeding;
  - of any change to the results prior to the time the results become final; and
  - when the results become final.

The campus will provide a hearing body to conduct hearings requested by students. The hearing body may differ depending on the college or program in which the student is enrolled and the nature of the alleged violation. Each campus will maintain a student behavior committee that may be the hearing body for any case under Board of Regents Policy: Student Conduct Code. Colleges may, however, establish their own hearing bodies to decide intracollege scholastic honesty cases under the Code (that is, cases that involve the college's student within the college's own course). Likewise, certain administrative programs, such as housing and residential life, student activities offices, and learning abroad offices, may establish and apply their own codes of conduct and hearing procedures. Any student
found to have violated Board of Regents Policy: Student Conduct Code under any of these processes is entitled to one campus-wide appeal.

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**REASON FOR POLICY**

This administrative policy implements Board of Regents Policy: Student Conduct Code. It provides a framework for each campus to fairly resolve complaints about violations of Board of Regents Policy: Student Conduct Code.

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**PROCEDURES**

- Student Conduct Code Procedure: Twin Cities
- Resolving Student Conduct Code Violations - Crookston
- Student Academic Integrity Misconduct Procedures - Morris
- Student Conduct Code Procedure - Morris
- Student Behavior Committee Hearing Procedures - Morris
- Student Conduct Code Procedure: Duluth
- Student Conduct Code Procedures: Rochester

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**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

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**APPENDICES**

- Academic Integrity Violation Files: Morris
- Committee on Academic Integrity Order of Proceedings: Morris
- Committee on Academic Integrity Pre-Hearing Conference: Morris
- Student Proctors and Graders: Morris
- Campus Committee on Student Behavior Hearing Procedures: Twin Cities
- Disciplinary Processes of Professional or Graduate Programs and Administrative Units: Twin Cities

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**FREQUENTLY ASKED QUESTIONS**

There are no FAQs associated with this policy.

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**CONTACTS**

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<th>Subject</th>
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**Campus Contacts**
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**DEFINITIONS**

**Advocate:**
Non-attorney chosen by the party who represents the party through the disciplinary process.

**Attorney:**
An individual who has a law degree.

**Support Person:**
For sexual assault, sexual harassment, stalking, or relationship violence case, a person chosen by the party who accompanies the party through the disciplinary process but does not speak or participate in the process.

**Student organizations:**
Student-led organizations that are registered pursuant to campus policies.

**RESPONSIBILITIES**

**Chancellors:**
Ensure the establishment and maintenance of appropriate disciplinary procedures on their system campus.

**Provost:**
Ensure the establishment and maintenance of appropriate disciplinary procedures on the Twin Cities Campus.

**RELATED INFORMATION**

- Board of Regents Policy: *Conflict Resolution Process for Student Academic Complaints*
- Board of Regents Policy: *Student Conduct Code*
- Administrative Policy: *Sexual Harassment, Sexual Assault, Stalking and Relationship Violence*

**HISTORY**

**Amended:**
March 2014 - Comprehensive Review, Major Revision: 1. This policy version includes a new section that outlines required elements of a campus disciplinary process related to allegations of sexual assault, sexual harassment, stalking, or relationship violence. 2. Provides for one campus-wide appeal for the reporting party to align with recent law changes in the Violence Against Women Reauthorization Act of 2013.

**Effective:**
March 2008 - Administrative Policy to implement Board of Regents Policy: *Student Conduct Code*.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

A. Examinations During the Term

1. Examinations during the term (e.g., mid-terms) will normally be given only during the regular class sessions, except that make-up exams may be given at other times arranged to accommodate student class schedules. Exams may be held at times other than the regularly scheduled class period only under unusual circumstances, and only if approved by the dean of the college in consultation with the Vice Provost and Dean of Undergraduate Education or the appropriate decision-making office on the system campuses. Any regularly scheduled examination to be held outside of regular class time must be listed in the published class schedule.

2. Accommodation must be provided by the examining department(s) to any student who encounters an academic conflict, such as between an examination scheduled outside of regular class time and the regular class period of another course, or between two exams scheduled to be held simultaneously outside of regular class time.

3. Comprehensive examinations, which require reflection, study, and application of the work of the entire semester, are strongly encouraged, but must be given during the final examination period. The only examinations allowed during the last week of classes are those equivalent in scale, scope, length, and percent of grade to other examinations given in that class during the term. Although late-semester examinations may rely on cumulative knowledge of the work of the course during the semester, such examinations must not be comprehensive in nature if they are given prior to the final examination period. In a course where only one examination is given during the term, that examination must be given during the final examination period.

4. Take-home examinations are specifically exempted from this section of the policy.

B. Final Examinations

1. All classes that normally permit undergraduates to enroll will follow the standard examination schedule. Final examinations on the Twin Cities campus will extend over a six-day period. It is not a violation of this policy for a faculty member to use secure online test-taking, authorized by the academic unit, that permits students to take an exam at a time of their choosing rather than at a scheduled final examination time. System campuses will each determine the length of their final examination period.

2. Final examinations normally will be two clock hours (120 minutes) long.
3. Instructors may schedule longer examinations with the approval of their department, which will arrange longer use of the examination room with the appropriate campus scheduling office. Instructors and departments must decide in advance of scheduling a course if the examination is to exceed two hours, and must work with the campus office that schedules central classrooms on scheduling the location of the exam. Any examinations that exceed two hours must be noted in the class schedule, in order that students are informed and can try to fit the longer examination in their schedule of final examinations. Accommodation must be provided by the examining department to any student who encounters a conflict with another final examination because of this lengthened examination time.

4. Instructors may offer take-home final examinations (but see 7(c) below).

5. For courses that do not run for a full semester, the final examination will be administered (or due, in the case of take-home or other out-of-class examinations) on the last day of the course, except that short courses that end with the semester may use the final exam time scheduled for that course.

6. The requirement that the final examination period on the Twin Cities campus be six days will not apply to units that have been granted an exemption from the University calendar by the Senate Committee on Education Policy.

7. Final examinations at times other than regularly scheduled:
   a. **Examinations outside the final examination period.** Instructors are permitted to schedule their final examinations outside of the scheduled examination days only under extraordinary circumstances and with the approval of their dean and the campus academic officer. (For the Twin Cities, this is the Vice Provost and Dean of Undergraduate Education.)
   b. **Moving an examination within the final examination period.** When an instructor and students conclude they wish to move the final examination for the course to a different time and/or day during the final examination period, the change must be (1) proposed by the instructor, (2) have the concurrence of the department chair, and (3) must be approved unanimously by written secret ballot by students in class when the vote in taken.
   c. Laboratory practicums may be given during the final week of classes during the normal lab period, and take-home or other out-of-class finals may be distributed prior to the final exam period but may not be due before the scheduled final exam for that course.
   d. Students with final examination conflicts, or with three (or more) final examinations in one calendar day, will be expected to notify and provide documentation to instructors as soon as possible during the term. Instructors are expected to make appropriate accommodation to eliminate the conflict. In the event none of the instructors agrees to make appropriate accommodation, the student should contact the student’s advisor. If a student has three or more examinations in one day because one exam date was changed, the instructor who changed the exam must make the accommodation. Note: this section does not cover cases where a student has three (or more) examinations from morning to evening the same day.
   e. **Summer term final examinations.** Final examinations for summer terms will be scheduled during the regular meeting time of the course on the last day.

**C. Study Days**
Each campus will decide whether or not to have a Study Day; when the calendar permits, a Study Day should be added to the schedule. For campuses that choose to have one, the final examination period will begin on the second day after classes end, with the day after classes designated as a Study Day. In the event classes end on a Friday, final examinations will not start until the following Monday and Saturday and Sunday will be designated Study Days.

**D. Classes and Events During the Study Day/Finals Period**
1. No classes will be permitted after the last scheduled day of instruction for that term/semester for any course that normally includes undergraduate students. Instructors may not schedule classes on a Study Day.
2. Instructors may not hold a regular class during the final examination period (which can interfere with students’ other exams) and may not hold a class during the first hour of the examination period and then conduct the final examination during the remaining hour(s).
3. No University-sponsored extra-curricular events, which require the participation of students, may be scheduled from the beginning of Study Day to the end of Final Examinations. Exceptions to this policy may be granted ONLY by the Senate Committee on Educational Policy. Instructors must provide an alternative and timely opportunity for students to complete course requirements they were unable to complete because of an absence permitted by this policy.

**Exclusions**
This policy is not applicable to the Duluth campus.

**Special Situations**
The Senate Committee on Educational Policy has the authority to grant waivers to the provisions of this policy, and will report such waivers to the Faculty Senate at its next meeting.

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**REASON FOR POLICY**

This policy defines exams and outlines common scheduling practices and guidelines to allow students and faculty to plan for Study Day and examinations with a minimum of scheduling conflicts.

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**PROCEDURES**

There are no procedures associated with this policy.

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**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

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**APPENDICES**

There are no appendices associated with this policy.

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**FREQUENTLY ASKED QUESTIONS**

There are no FAQs associated with this policy.

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**CONTACTS**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Contact</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Contact(s)</td>
<td>Susan Van Voorhis</td>
<td>612-624-1111</td>
<td><a href="mailto:vanvo002@umn.edu">vanvo002@umn.edu</a></td>
</tr>
<tr>
<td>Twin Cities Campus Procedures</td>
<td>Stacey Tidball</td>
<td>612-626-0075</td>
<td><a href="mailto:tidball@umn.edu">tidball@umn.edu</a></td>
</tr>
<tr>
<td>Crookston Campus</td>
<td>Ken Myers</td>
<td>218-281-8200</td>
<td><a href="mailto:kmyers@crk.umn.edu">kmyers@crk.umn.edu</a></td>
</tr>
<tr>
<td>Morris Campus</td>
<td>Judy Korn</td>
<td>320-589-6011</td>
<td><a href="mailto:kornjr@morris.umn.edu">kornjr@morris.umn.edu</a></td>
</tr>
<tr>
<td>Rochester Campus</td>
<td>Diane Douglas</td>
<td>507-258-8008</td>
<td><a href="mailto:douglasd@r.umn.edu">douglasd@r.umn.edu</a></td>
</tr>
</tbody>
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**DEFINITIONS**

**Study Day**
A day designated in the Academic Calendar reserved for study, which occurs immediately before finals period or during finals period; no required classes or exams may be scheduled on a Study Day.
RESPONSIBILITIES

There are no specific responsibilities associated with this policy.

RELATED INFORMATION

- Administrative Policy: Makeup Work for Legitimate Absences

HISTORY

Amended:
May 2016 - Comprehensive Review, Minor Revision. 1. Clarifies that a course with a single exam must have the exam during the finals week. 2. Replaces “coordinate campuses” label with “system campuses”. 3. Provides clarity around the final exam period. May not necessarily be a final exam week.

Amended:
December 2009 - Policy now applies to Crookston.

Effective:
April 2009

University Policy Program
140 McNamara Alumni Center, Minneapolis, MN 55455 - P: 612-624-8081
policy@umn.edu

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

Introduction
The University supports and promotes international travel and education abroad by students for University purposes, while encouraging sound health, safety and security measures that minimize risks to the traveler and institution. This policy includes the minimum pre-departure requirements and minimum requirements while abroad. The education abroad office on each campus may have additional requirements.

Units Pre-Travel and Program Planning Requirements
All University units (including campuses, colleges, departments, centers, offices, or other operational units) and education abroad offices organizing or promoting student travel abroad must:

- complete a due diligence review of all programs before promoting them to University students;
- ensure appropriate contracting of partners;
- develop a 24-7 contact protocol and emergency plan;
- obtain International Travel Risk Assessment and Advisory Committee (ITRAAC) approval before promoting any program in a United States Department of State (USDOS) Travel Warning Country;
- ensure completion of the student requirements; and
- ensure completion of faculty/staff leader requirements, where relevant.

Undergraduate travel: All University units must work through one of the University's education abroad offices prior to organizing or promoting undergraduate student travel abroad for University purposes.

All University units supporting student travel (e.g. scholarship, credit, degree requirement etc.) that they are not organizing or promoting, must:

- notify students of the student requirements listed below; and
- provide students with a 24-7 University contact information.

Education Abroad Offices
In addition to the requirements above, each education abroad office in the system must also:

- register students for USDOS Smart Traveler Enrollment Program (STEP) or advise them on self registry;
- implement the student health disclosure form and process;
- implement consistent processes for any participant under the age of 18;
- implement the student behavior review and code of conduct policy/process; and
for any program with a program leader:
  - require the program leader acknowledgement form from the leader;
  - implement the program leader health process;
  - implement the program leader companion process; and
  - ensure staff/faculty led programs have two program leaders.

**Student Pre-Travel Requirements**

All students must complete the following requirements in advance of this travel:

- register their travel officially with the University;
- sign a Student Release and Waiver detailing their academic, financial, behavioral, travel risk and health-related responsibilities while abroad;
- obtain University-approved international travel, health and security insurance;
- create an emergency communications plan;
- complete the mandatory online health and safety orientation; and
- address any health and safety concerns prior to departure (e.g., check-ups, immunizations).

In addition, students must discuss self-identified travel plans (international activities not promoted by the University) with an appropriate education abroad office, University faculty and/or staff member prior to confirming travel plans.

All travelers are strongly encouraged to register with the USDOS Smart Traveler Enrollment Program (STEP) and review the [USDOS](#), [Centers for Disease Control (CDC)](#) and [World Health Organization (WHO)](#) resources for their planned destination.

**Travel Approval**

The University does not encourage travel to a country subject to a current travel warning issued by the U.S. Department of State (USDOS Travel Warning Country).

**Pre-Approval of Student Travel**

Any student planning to travel for University purposes, as well as any faculty member or staff planning to lead or travel with any University students, to a USDOS Travel Warning Country must obtain approval from the International Travel Risk Assessment and Advisory Committee (ITRAAC). Units who wish to promote an education abroad opportunity in a USDOS Travel Warning Country must receive ITRAAC approval prior to promotion. The University, in its sole discretion, may deny approval for international travel. In addition, travelers may be required to submit a request for permission to travel to locations or participate in programs that pose a specific health, safety, or security concern as indicated by authorities other than the U.S. Department of State, such as the Center for Disease Control (CDC), World Health Organization (WHO), non-U.S. government authorities (e.g., Australian or Canadian authorities), and University of Minnesota authorities.

**Suspension of Travel**

ITRAAC will review student travel currently in process when a significant health or safety concern arises regarding that travel including new and renewed USDOS travel warnings or advisories, travel warnings from the CDC or WHO, natural disasters, wars or other political disturbances, or other indicators of potential health or safety threats. The University, in its sole discretion, may withdraw approval for international travel at any time.

**While Abroad**

Students, and faculty/staff/units traveling with students and/or organizing, promoting or supporting student programs abroad, must keep their University contact apprised of any changes to their address and contact information while abroad. Changes should be submitted as soon as possible and at a minimum within 24 hours of the change taking effect.

Students are held to Board of Regents Policy: [Student Conduct Code](#) while abroad for University purposes in addition to any additional codes of conduct or behavior codes from the University unit organizing, promoting or supporting travel, education abroad office, affiliate or host.

Students are not permitted to drive motor vehicles (including but not limited to scooters, motorbikes, motorcycles and cars) while participating in an education abroad opportunity.

Faculty and staff may not drive vehicles in which students are passengers abroad without an approved exception from the Office of Risk Management in advance of departure from the U.S. Faculty and staff who need transportation for students must either use public transportation or hire a local driver/vehicle.

**Travel in Violation of this Policy**

Students who choose to travel in violation of this policy are acting outside the control and responsibility of the University. If the travel is occurring during a required term, the student must take a leave of absence from the...
University, where possible. Students on leave of absence from the University are not eligible for financial aid, scholarship, travel stipends and other University supports including credit. If a leave of absence is not an option, students who travel in violation of this policy risk losing their student status.

Exclusions
This policy does not apply to personal, non-University travel by students. For information on reimbursement for travel and faculty and staff travel requirements, see Administrative Policy: *Traveling on University Business*.

REASON FOR POLICY

This policy endeavors to support education abroad by balancing the educational value of participation in international activities with the potential risks to the welfare and safety of students.

PROCEDURES

- *Travel Approval (ITRAAC)*
- *Preparing for Travel and Education Abroad (Students)*
- *Preparing for Student Travel and Education Abroad (Units)*

FORMS/INSTRUCTIONS

- *Emergency Plan Template*
- *ITRAAC Application Process*
- *International Travel, Medical and Security Insurance (CISI)*
- *Program Leader Acknowledgement Form*
- Release and Waiver for Education Abroad:
  - For activities through an education abroad office: *OGC-SC245*
  - For activities NOT through an education abroad office: *OGC-SC246*

APPENDICES

- *International Health Insurance Eligibility Requirements*
- *University Policy Process Flowchart: Student International Travel and Education Abroad*

FREQUENTLY ASKED QUESTIONS

- *Student Travel and Education Abroad FAQ*

CONTACTS

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<thead>
<tr>
<th>Subject</th>
<th>Contact</th>
<th>Phone</th>
<th>Fax/Email</th>
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<tbody>
<tr>
<td>Primary Contact(s)</td>
<td>Kevin Dostal Dauer</td>
<td>612-625-5107</td>
<td><a href="mailto:dauer001@umn.edu">dauer001@umn.edu</a></td>
</tr>
<tr>
<td>International Insurance and Non-education Abroad Office travel registration</td>
<td>Kevin Dostal Dauer</td>
<td>612-625-5107</td>
<td><a href="mailto:dauer001@umn.edu">dauer001@umn.edu</a></td>
</tr>
<tr>
<td>Education Abroad Programs Offices</td>
<td>Crookston: Learning Abroad Office</td>
<td>218-281-8442</td>
<td>218-281-8588 <a href="mailto:umclabrd@umn.edu">umclabrd@umn.edu</a></td>
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<tr>
<td>Duluth: International Education Office</td>
<td>218-726-8764</td>
<td>218-726-7352 <a href="mailto:ieo@d.umn.edu">ieo@d.umn.edu</a></td>
<td></td>
</tr>
<tr>
<td>Morris: Academic Center for Enrichment (ACE)</td>
<td>320-589-7014</td>
<td><a href="mailto:ummace@morris.umn.edu">ummace@morris.umn.edu</a></td>
<td></td>
</tr>
<tr>
<td>Twin Cities: Learning Abroad Center</td>
<td>612-626-9000</td>
<td>612-626-8009 (fax) <a href="mailto:UMabroad@umn.edu">UMabroad@umn.edu</a></td>
<td></td>
</tr>
<tr>
<td>Twin Cities: Carlson Institute for Global Studies</td>
<td>612-625-9361</td>
<td><a href="mailto:cgi@umn.edu">cgi@umn.edu</a></td>
<td></td>
</tr>
</tbody>
</table>

Emergencies Abroad - Students

| Emergencies Abroad - Units, faculty and staff supporting a student abroad | International Health, Safety and Compliance in GPS Alliance | 612-624-5580 (call for 24-7 support information) |

Legal Approval: International Agreements

| Legal Approval: International Agreements | Don Amundson | 612-624-4100 | 612-626-9624 amund015@umn.edu |

Purchasing/Travel Services

| Purchasing/Travel Services | Beth Tapp | 612-624-5255 | 612-624-3410 bethtapp@umn.edu |

Office of Risk Management

| Office of Risk Management | Steve Pardoe | 612-625-0062 | 612-624-7384 pardo012@umn.edu |

Travel to embargoed countries (including Cuba)

| Travel to embargoed countries (including Cuba) | Pat Briscoe | 612-625-3860 | briso0022@umn.edu |

**DEFINITIONS**

**Education abroad/University purpose travel**

Travel by students (both for credit and not for credit) that is affiliated with the University in any way. This includes, but is not limited to:

- travel through one of the University's education abroad offices sponsored or affiliated programs;
- travel through unit organized or promoted education abroad programs or activities;
- travel to a University or unit exchange partner;
- travel as part of, or in support of, a University research activity;
- travel for University credit;
- travel that fulfills a degree requirement (including internships, field studies, service learning, research);
- travel that fulfills University contractual agreements;
- professional development opportunities promoted by or supported by any University unit (including conference attendance);
- travel for which you are acting as a representative of the University;
- travel for University athletics;
- travel supported by University funding including grant awards, scholarships, informal financial awards and financial aid;
- travel with, or organized by, a University faculty or staff member; and
- travel with a University Campus Life Program.

Students traveling abroad for University purposes, including education abroad, are held to this policy within the dates of their activity. Thus, they must follow this policy for any weekend or overnight travel taken during the activity. See definition of non-University travel below for more information on when this policy does not apply.
**Campus Life Program**

A University program similar to a student organization in purpose and composition but whose activities, operations, and decision-making processes are directly governed by University academic or administrative departments, and for which the University is ultimately responsible. A CLP is considered part of the University and is required to have a designated University faculty or staff advisor. University Recognized Organizations (URO) at Morris and Recognized Student Groups (RSG) at Rochester are treated like CLPs for the purpose of this policy.

**Faculty and staff**

Full and part-time faculty, including adjunct faculty and staff employees at the University. Graduate assistantship appointments and other appointments that require student status are not considered employees for the purpose of this policy. Where faculty and staff are also taking classes, they are faculty/staff when traveling for work and a student when traveling for education/coursework.

**International travel**

Travel to any country (including Mexico and Canada) or territory outside the continental U.S. (CONUS), Alaska and Hawaii. Travel to the non-contiguous US locations of American Samoa, Guam, Midway Islands, Northern Mariana Islands, Puerto Rico, the U.S. Virgin Islands, and Wake Island are considered international travel for purposes of this policy and CISI insurance purposes.

**International Travel Risk Assessment and Advisory Committee (ITRAAC)**

Committee responsible for reviewing all proposed student travel to USDOS Travel Warning Countries and other locations that pose a specific health, safety, or security concern as indicated by authorities other than the U.S. Department of State, such as the Center for Disease Control (CDC), World Health Organization (WHO), non-U.S. government authorities (e.g., Australian or Canadian authorities), and University of Minnesota authorities. Committee has University-wide jurisdiction and its decisions apply uniformly to all campuses. Composed of the Associate Vice President and Dean for International Programs (Chair), the General Counsel, the Associate Dean of Graduate Education, and the Vice President for Health Sciences (officials may delegate their responsibilities to others within their areas of authority and consult other administrators, faculty and experts as they choose). The Dean of the School of Public Health will serve on the committee whenever a decision is being considered to cancel or suspend an education abroad opportunity for public health reasons.

**Non-University travel**

Travel that is not related to the University in any way. This means travel that is not in support of University business, programs or education and for which the University assumes no control or responsibility, and therefore this policy does not apply. Examples include:

- Registered Student Organization travel (see definition below) that is not otherwise funded or supported by the University (see Education abroad/University purpose travel above);
- Personal travel such as vacation;
- Personal travel before or after a University/education abroad activity.

**Registered Student Organization (RSO)**

A voluntary association composed primarily of students that has no direct relationship to the University; but upon completion of the established registration process is entitled to certain privileges including operating, meeting, advertising, and participating in activities on the University of Minnesota campuses, as well as eligibility to receive services from the University. Also referred to as an Independent Student Group (Morris) and Non-Recognized Student Organization (Rochester).

**Sponsored or Affiliated Programs through Education Abroad Offices**

Sponsored programs are study abroad experiences developed, administered and evaluated by an education abroad office. Affiliated programs are administered by other institutions/organizations and approved by the University (students will receive support and services from the education abroad office, and credits will be posted as resident credit).

**Students**

Any undergraduate, graduate or professional student enrolled in a degree program, credit bearing non-degree program, professional certificate or executive education program at the University. Students traveling as part of assigned duties within an assistantship are considered students and not employees for the purpose of this policy.

**Unit**

A campus, college, department, program, research center, institute, business center, office or other operating unit.

**Unit Organized or Promoted Travel**

Student travel or education abroad activities organized or promoted by a University unit. This includes programs for the unit administers directly as well as any education abroad opportunities administered outside the University for which a University staff or faculty member has promoted to students (via email, word of mouth, print, etc.). Units are required to comply with the Procedure: Preparing for Student Travel and Education Abroad (Units) and, for all undergraduate student travel abroad, work through one of the University's education abroad offices.
Unit Supported Travel
Student travel or education abroad activities NOT organized or promoted by a University unit but supported by a unit by providing funding, offering credit, fulfilling a degree requirement, etc. Units are required to notify students of the student requirements in this policy and provide students with a 24-7 University emergency contact.

U.S. Department of State (USDOS) Travel Warning Country
A country subject to a current travel warning issued by the U.S. Department of State. Travel warnings are issued when long-term, protracted conditions make a country dangerous or unstable and lead the State Department to recommend that Americans avoid or consider the risk of travel to that country. A travel warning is also issued when the U.S. Government's ability to assist American citizens is constrained due to the closure of an embassy or consulate or because of a drawdown of its staff. See list of countries subject to a travel warning at http://travel.state.gov/travel/cis_pa_tw/tw_1764.html.

RESPONSIBILITIES

Associate Vice President and Dean for International Programs
Promotes the global dimensions of teaching, research, and engagement across all colleges and campuses of the University. Chair the International Travel Risk Assessment and Advisory Committee (ITRAAC).

Director of International Health, Safety and Compliance, GPS Alliance
Provide background information on specific health and safety risks and participate in the decision whether to cancel or suspend education abroad opportunities. Call a meeting of the International Travel Risk Assessment and Advisory Committee (ITRAAC). Notify unit and/or program directors when an educational opportunity has been suspended or canceled by the committee and when ITRAAC approves applications to travel to a USDOS Travel Warning Country or other locations that pose a specific health, safety, or security concern as indicated by authorities other than the U.S. Department of State, such as the Center for Disease Control (CDC), World Health Organization (WHO), non-U.S. government authorities (e.g., Australian or Canadian authorities), and University of Minnesota authorities. A member of the director's staff will provide assistance to ITRAAC applicants and facilitate ITRAAC reviews of applications.

Education abroad offices
Ensure compliance with University policy for all programs and activities they support. Serve as a resource to units, faculty and staff planning international activities.

The following are the education abroad offices:
- Carlson School of Management Global Institute
- Crookston Learning Abroad Office
- Duluth International Education Office
- Morris Academic Center for Enrichment
- Twin Cities' Learning Abroad Center

Export Controls Officer and Designated Cuba Representative
Reviews and approves proposed student travel to embargoed countries and works with travelers to apply for any licenses needed for U.S. citizens to travel to Cuba. Advises on any restrictions that may apply during travel to embargoed countries.

Faculty, staff and unit organizing or promoting travel and/or leading student travel abroad
Ensure compliance with University policy before and during organizing or promoting travel or leading student travel abroad.

International Travel Risk Assessment and Advisory Committee (ITRAAC)
Determine when to cancel or suspend education abroad opportunities because of significant health or safety risks to students at any time. In the members' absence, appoint alternates to serve on the ITRAAC. Make exceptions to suspension of education abroad opportunities and approve applications for travel to USDOS Travel Warning Countries or other locations that pose a specific health, safety, or security concern as indicated by authorities other than the U.S. Department of State, such as the Center for Disease Control (CDC), World Health Organization (WHO), non-U.S. government authorities (e.g., Australian or Canadian authorities), and University of Minnesota authorities on a case-by-case basis.

Office of General Counsel (OGC)
Create and approve the student release and waiver. Serve on the International Travel Risk Assessment and Advisory Committee (ITRAAC). Work with the International Health, Safety and Compliance Director to review mandatory health and safety orientation, assist faculty and staff with related questions and resources while abroad.

Office of Risk Management (ORM)
Regularly review and approve the University's mandatory international travel, health and security insurance. Work with the International Health, Safety and Compliance Director to review mandatory health and safety orientation, assist faculty and staff with related questions and resources while abroad.

**Purchasing/Travel Services**
Advises University faculty and staff on appropriate contracting procedures for activities involving travel or purchasing. Assists those traveling for University purposes on a variety of travel items. Ensures the integrity, accountability, and efficiency of purchasing processes.

**Students**
Complete the requirements detailed in this policy and procedures before departure on international travel. Take independent measures to promote one's own safety, the safety of fellow travelers and the safety of the broader University community including consulting with experts on the region of travel, as appropriate. Abide by the University Student Code of Conduct while abroad.

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**RELATED INFORMATION**

**Board of Regents Policies**
- *International Engagement and Education*
- *Student Conduct Code*

**Administrative Policies**
- *Export Controls*
- *Leave of Absence and Readmission for Undergraduates: Twin Cities, Crookston, Morris, Rochester*
- *Leave of Absence and Reinstatement from a Leave: Graduate Students*
- *Purchasing a Professional Service*
- *Traveling on University Business*

**Other Policies**
- *Student Conduct Code for Education Abroad*

**Related Websites**
- *Global Programs and Strategy Alliance*
- *Centers for Disease Control (CDC)*
- *Overseas Security Advisory Counsel (OSAC)*
- *U.S. Department of State-Travel Warnings*
- *World Health Organization (WHO)*

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**HISTORY**

**Amended:**
October 2014 - 1. Adds the involvement of the collegiate dean(s) in any situation where ITRAAC is considering a rejection (or request to delay travel) of an application submitted by a graduate student. 2. Explicitly notes the role of the Vice President for Academic Affairs when consensus cannot be reached. 3. Standardizes processes carried out the education abroad offices across the University system. 4. Clarifies the pre-travel and program planning requirements for units and students. 5. Adds a new requirement that units may not promote or organize an education abroad opportunity for undergraduates unless they work through an education abroad office. Title changed from *Education Abroad Opportunities: Addressing Health and Safety Risks to Student Travel and Education Abroad: Health and Safety*

**Amended:**
January 2009 - Statement and Responsibilities clarified, Updated Contacts section, Updated procedures, and added Appendix: International Insurance Eligibility Requirements.

**Amended:**
January 2007 - Statement, definitions and responsibilities and procedures rewritten.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
**Policy Statement**

Instructors are required to develop a course syllabus for each offering of a course and communicate the syllabus to students unless the course is offered to an individual student (e.g. directed study, readings or research courses that require contracts between the student and instructor). For the purposes of this policy, a syllabus is a written or electronic document that contains information students need to know in order successfully to complete the work of the course.

Each syllabus includes two types of information. First is information specific to the course such as its title, goals, readings, assignments and instructor. Second is information informing students of University policies that may have an impact on their participation in the course. This information includes, for example, the University grading system, a disabilities statement, and how to resolve problems between students and instructor.

**A. Syllabus Requirements: Information Specific to the Course**

The elements listed in this section of the policy are required. This information may also be distributed or provided by the department or college if done so routinely and explicitly. (For additional recommendations for good practice in teaching, see Administrative Policy: *Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Crookston, Morris, Rochester*).

1. Catalog information such as the course name, department, number, meeting time, meeting place, and credits.
2. Instructor’s name and contact information.
3. Course pre-requisites if any exist.
4. Course goals and objectives. (For undergraduate courses on the Twin Cities campus, instructors are encouraged to identify learning and development outcomes addressed by the course. See the Administrative Policy: *Undergraduate Student Learning and Development Outcomes: Twin Cities, Crookston, Morris, Rochester*).
5. Required and recommended materials and, if necessary, the location of materials. After the second week of the term, minor, but not major, changes in the assigned readings may be made (see Administrative Policy: *Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Crookston, Morris, Rochester*).
6. General description of assignments, papers, projects, exams and other student work with a schedule of approximate due dates and relative weight in the grade. Minor but not major changes may be made to assignments after the second week of the term.
7. Description of any course meetings that occur outside of the regularly scheduled class time (see Administrative Policy: Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Crookston, Morris, Rochester).

8. Attendance requirements and penalties if any (see the Administrative Policy: Enrolling in Overlapping or Back-to-back Classes: Twin Cities, Crookston, Morris, Rochester).

9. Statement on extra credit. If an instructor wishes to offer what is commonly known as extra credit opportunities for students in a class to allow them to improve their grade, those opportunities must be announced and made available to all students. (This provision does not address the option of increasing the number of credits a student may earn for the course.)

10. Policy for making up missed exams and grading late work.

11. The date, time and place of the final examination if one is scheduled. Instructors who schedule final exams that are longer than two hours must provide alternative testing times for students who have other final exams scheduled during that time (see the Administrative Policy: Scheduling Examinations, Final Examinations, and Study Days: Twin Cities, Crookston, Morris, Rochester).

B. Syllabus Requirements – Policy Statements

Instructors must have as part of the syllabus copies of, references to, or statements on the following and are encouraged to discuss elements of the policies particularly applicable to their course (see Appendix - Recommended Policy Statements for Syllabi):


5. Board of Regents Policy: Sexual Harassment, Sexual Assault, Stalking and Relationship Violence.


8. Statement about the availability of mental health and stress management services.


The Office of the Executive Vice President and Provost will prepare electronic copies of these policy statements for instructors to incorporate into syllabi. Instructors are encouraged to provide paper copies of these policies to classes with first-year students.

Exclusions

This policy is not applicable to the Duluth campus.

REASON FOR POLICY

Students need a consistent level of basic information about the content and expectations for each course in which they are enrolled. This policy outlines the minimum components of a syllabus and notes recommended policy statements for inclusion, to ensure that instructors communicate course requirements to students in writing and in a timely manner. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

PROCEDURES

There are no procedures related to this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.
APPENDICES

- Recommended Policy Statements for Syllabi

FREQUENTLY ASKED QUESTIONS

There is no FAQ related to this policy.

CONTACTS

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<tbody>
<tr>
<td>Primary Contact(s)</td>
<td>Stacey Tidball (undergraduate) Karen Starry (graduate)</td>
<td>612-626-0075 612-625-2815</td>
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<td><a href="mailto:lcarrell@umn.edu">lcarrell@umn.edu</a></td>
</tr>
</tbody>
</table>

DEFINITIONS

There are no definitions related to this policy.

RESPONSIBILITIES

There are no specific responsibilities related to this policy.

RELATED INFORMATION

- Board of Regents Policy: Equity, Diversity, Equal Opportunity, and Affirmative Action
- Board of Regents Policy: Sexual Harassment, Sexual Assault, Stalking and Relationship Violence
- Board of Regents Policy: Student Conduct Code
- Administrative Policy: Enrolling in Overlapping or Back-to-back Classes: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Scheduling Examinations, Final Examinations, and Study Days: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Teaching and Learning: Instructor and Unit Responsibilities: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Teaching and Learning: Student Responsibilities (Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Undergraduate Student Learning and Development Outcomes: Twin Cities, Crookston, Morris, Rochester
- Higher Learning Commission, Criteria and Requirements for Accreditation
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

The University promotes community-building activities for its faculty, staff, students, and visitors, and recognizes that tailgating has the potential to enhance the TCF Bank Stadium event experience within a safe, responsible, and controlled environment.

Tailgating is permitted only on Gopher football game days in designated areas, during specified hours, and under the conditions specified in the Tailgating Rules. Tailgating is not permitted for events at any venue on the Twin Cities campus other than TCF Bank Stadium.

Violations

Individuals who violate this policy, the Tailgating Rules, or applicable policies, rules, or law may be assessed fines; lose their season tickets, parking, or tailgating privileges; be removed from campus; and, for students, be subjected to disciplinary action under Board of Regents Policy: Student Conduct Code.

Exceptions

This policy supports the Gopher football experience. The vice president for University Services may approve tailgating at non-Gopher football events held in TCF Bank Stadium at their discretion.

In rare instances, the vice president for University Services in consultation with the director of Intercollegiate Athletics may grant exceptions to the Tailgating Rules within the scope of the law.

This policy applies to the Twin Cities campus only, and only to those events held in TCF Bank Stadium.

REASON FOR POLICY

To provide the framework for responsible tailgating on Gopher football game days or approved TCF Bank Stadium event days that enhances the event experience, promotes a safe campus environment, and preserves the beauty of the campus.

PROCEDURES

There are no procedures associated with this policy.
FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

- Tailgating Map with Zones
- Tailgating Rules

FREQUENTLY ASKED QUESTIONS

There are no FAQs associated with this policy.

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</tbody>
</table>

DEFINITIONS

Tailgating
Pre- and post-game festivities outdoors in designated tailgating locations which may include some or all of the following: eating food, drinking beverages (alcoholic or nonalcoholic), grilling, or a canopy.

RESPONSIBILITIES

Director, Intercollegiate Athletics
- Jointly administer the policy, including maintaining Tailgating Rules and communicating policy and rules for responsible tailgating to participants.

University of Minnesota Parking and Transportation
- Open and close designated tailgating areas on football game days.

University of Minnesota Police Department
- Enforce applicable laws and Tailgating Rules on football game days.

Vice President for University Services
- Jointly administer the policy, including maintaining Tailgating Rules and communicating policy and rules for responsible tailgating to participants.
- Determine, in consultation with appropriate University administrators and Intercollegiate Athletics, the University-authorized locations and hours for tailgating on Gopher football game days.
- Determine exceptions for TCF Bank Stadium events that are permitted to tailgate.

RELATED INFORMATION
Board of Regents Policies:
- *Alcoholic Beverages on Campus*
- *Code of Conduct*
- *Student Conduct Code*
- *Possession and Carrying of Weapons*

Administrative Policies:
- *Distributing Publications and Installing Banners at the University*
- *Drug Free University*
- *Use and Lease of Real Estate*
- *Using and Leasing University Outdoor Space: Twin Cities*

**HISTORY**

Amended:
February 2018 - Comprehensive Review, Minor Revision. The main change is to clarify that the policy applies specifically to events at TCF Bank Stadium, and not at other stadiums or arenas. It also specifies that the policy applies to Gopher football games, not necessarily to other football games that may take place at TCF Bank Stadium.

Amended:
January 2014 - Comprehensive Review, Major Revision. 1. Expands the applicability of the policy to other major stadium events on the Twin Cities campus, such as concerts. 2. Revises the list of lots in which tailgating is allowed, and addresses hours for tailgating on weekdays and for the RV tailgating lot. 3. Prohibits pets on tailgating lots and includes a new reference to the Board of Regents policy on weapons.

Effective:
January 2009
POLICY STATEMENT

Instructors have a responsibility to establish and maintain a civil, productive, inclusive, and stimulating learning environment. Both instructors and students have a fundamental obligation to respect the instructional setting as a place for civil, courteous discourse. Instructors have a responsibility to accommodate students with documented disabilities and are encouraged to invite students to talk or communicate with them about such circumstances.

Instructors have a responsibility to accommodate legitimate student absences and student exam conflicts in accordance with the policies (1) Intercollegiate Athletic Events During Study Day and Finals Week, (2) Makeup Work for Legitimate Absences, and (3) Scheduling Examinations, Final Examinations, and Study Days.

Instructor Responsibilities

A. Provide Course Information
Instructors are responsible for providing accurate and timely information about their courses to prospective students, current students, and relevant members of the University community.

1. Instructors must provide academic units and students with accurate course descriptions in a timely fashion. Instructors should use official information tools, to provide information about courses to students.

2. The course descriptions available in University catalogs and/or in the Course Guide must be generally consistent with the content of the actual course taught, though the content may vary somewhat with the individual instructor and across sections.

3. At the beginning of each course, instructors must communicate the course objectives. Class activities should be directed toward the fulfillment of these objectives and student performance should be evaluated in relationship to these objectives.

4. If an instructor changes the course requirements or materials, students should be given timely notice consistent with the magnitude of the change (e.g., a few days of notice for an additional article to read or a few weeks of notice if a paper is added). No major change (e.g., adding a research paper or major examination) should be imposed after the second week of the semester.

5. In accordance with Administrative Policy: Grading and Transcripts, instructors must inform students in their classes of the methods to be used in determining course grades, i.e., evaluation criteria and the contribution to the final grade of each graded component.

6. At the beginning of the course, instructors must inform students of any requirements related to regular course attendance and participation.
7. At the beginning of the course, instructors must inform students of any special attendance requirements. This includes, insofar as possible, specific dates, times, and places of additional outside-of-class work such as field trips, study sessions, or extra class meetings, and whether or not attendance at these additional activities will be reflected in the grade. If an instructor schedules mandatory activities that occur outside the regularly scheduled class time, information about these activities must be included on the syllabus and, when possible, in the class schedule.

8. Instructors should discuss scholastic dishonesty and what it means in the context of their class (e.g., whether collaboration is permitted and limits on it, requirements about and methods for citing sources, whether direct quotes are allowed and to what extent, receiving or giving aid on tests, and using electronic aids or communications during exams when prohibited).

B. Provide Students with Access to and Feedback on Their Work

1. Instructors must evaluate examinations and other student work with sufficient promptness to enhance the learning experience. Instructors must promptly return examinations or permit students to review their exams to request clarification of grades.

2. Instructors should specify the process and schedule for returning student work during the semester. Term papers and comparable projects are the property of students who prepare them (see Board of Regents Policy: [Copyright](#)). Instructors who desire to retain a copy for their own files should state their intention to do so.

3. Instructors are strongly encouraged to provide sufficient graded feedback early in the term and before the deadline for withdrawing from classes to enable students to assess their progress in the course.

4. Instructors must turn in grades within three business days after the last day of final examinations.

5. Instructors must provide mid-term alerts to students in 1-xxx courses who are at risk of failing a class, in accordance with the provision of the policy on Mid-term Alerts.

C. Secure Handling of Examinations

Instructors must maintain the security of student examinations both before and after exams are given. For those using a University office, such as the Office of Measurement Services (OMS), for scoring answer sheets, instructors or their designate (departmental office employee or teaching assistant) must submit examination answer sheets in the manner prescribed by that office.

D. Observe Scheduled Class Times

1. Instructors are expected to meet their classes at the scheduled times, to be prepared for all class sessions, and to start and end classes at the scheduled times.

2. When instructors know in advance that they will be unable to attend particular class sessions, they are responsible for working with their academic unit to make appropriate alternate arrangements.

E. Observe Office Hours or Appointment Times

Instructors must schedule and keep a reasonable number of office hours or appointment times for student conferences. The minimum number of office hours or appointment times may be defined by the academic unit.

F. Report Scholastic Dishonesty

Instructors are obligated to report suspected scholastic dishonesty to their departments and to the appropriate office on campus (on the Twin Cities campus, the Office for Community Standards; at Morris, the Office of the Vice Chancellor for Student Affairs; at Rochester, the Office of Student Affairs; and at Crookston, the Vice Chancellor of Academic Affairs and Student Life).

G. Maintain an Appropriate Learning Environment

Instructors should take appropriate steps to have removed from class students who disrupt the educational process because of discourteous, threatening, harassing, or other aggressive behavior. "Appropriate steps" may include calling the University Police.

H. Maintain the Classroom Environment

Instructors are expected to leave the classroom and its equipment in good order (e.g., white/blackboards clean, chairs arranged, electronic equipment shut off).

Academic Unit Responsibilities

A. Maintain an Appropriate Schedule

1. Courses must be offered on a schedule, and frequently enough, to permit students to graduate in a timely fashion. All undergraduate departments must have a four-year graduation plan in place and must have course offerings that support it.

2. Classes must be offered at standard times. Failure to observe standard class periods leads to inefficient use of classrooms and is disrespectful of students and faculty: students are forced to be late to other classes, and faculty access to classrooms they need is reduced.
Academic units are responsible for retaining course records in accordance with Administrative Policy: Maintaining Records of Student Work.

Exclusions
This policy is not applicable to the Duluth campus.

REASON FOR POLICY

This policy clarifies and outlines responsibilities, to provide clear expectations for the instructor and the instructor’s department and college. Faculty and students need a common understanding of their responsibilities for the learning process. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

1. How do these instructor responsibilities apply to courses in which instruction is provided by more than one individual, for example, a course in which a faculty member and teaching assistants share responsibilities?
   The person in charge of the course (e.g., the lead instructor, course coordinator, faculty member supervising teaching assistants who work with the faculty member within a course) is responsible for ensuring that standards and policies are applied consistently to all students enrolled in the course. The lead instructor is responsible for communicating this information to teaching assistants, responding to questions, and ensuring a common understanding among everyone who is part of the instructional team for the course.

CONTACTS

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<tr>
<td>Rochester Campus Procedures</td>
<td>Lori Carrell</td>
<td>507-258-8006</td>
<td><a href="mailto:lcarrell@r.umn.edu">lcarrell@r.umn.edu</a></td>
</tr>
</tbody>
</table>
DEFINITIONS

Scholastic Dishonesty
Plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using course materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, misrepresenting, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

RESPONSIBILITIES

There are no specified responsibilities associated with this policy.

RELATED INFORMATION

- Board of Regents Policy: Copyright
- Board of Regents Policy: Student Conduct Code
- Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester)
- Administrative Policy: Maintaining Records of Student Work: Twin Cities, Crookston, Morris, Rochester)
- Administrative Policy: Teaching and Learning: Student Responsibilities (Twin Cities, Crookston, Morris, Rochester)
- Higher Learning Commission, Criteria and Requirements for Accreditation

HISTORY

Amended:
September 2014 - Added clarifications related to Higher Learning Commission accreditation requirements.

Amended:
December 2013 - Comprehensive Review, Minor Revision. Includes language from the retired policy on classroom environment.

Amended:
December 2009 - Policy now applies to Crookston.

Amended:
April 2009 - Clarified policy and put in standard format. Added contact information.

Effective:
April 2009

Supercedes:
Classroom Expectations Guidelines

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

1. Satisfying prerequisites. Students should not register for courses in which they lack the prerequisites unless they have permission from the instructor.

2. Responsibility for class work. Students are responsible for knowing all information contained in the syllabus. Students are responsible for meeting all course requirements, observing all deadlines, examination times, and other course procedures.

3. Attending class.
   a. Students are expected to attend all meetings of their courses. They may not be penalized for absence from class, however, to participate in religious observances, for approved University activities, and for other reasons in accordance with the policy on Makeup Work for Legitimate Absences. Students should notify instructors as soon as possible about such absences. (See Administrative Policy: Makeup Work for Legitimate Absences: Twin Cities, Crookston, Morris, Rochester).
   b. Students must attend the first class meeting of every course in which they are registered unless(1) they obtain approval from the instructor before the first meeting or (2) they provide notice to the instructor they must miss class because of a recognized religious holiday (see the policy on Mandatory Attendance at First Class Session and Consequences for Absence). Otherwise, they may lose their places in class to other students. (See Administrative Policy: Mandatory Attendance at First Class Session and Consequences for Absence: Twin Cities, Crookston, Morris, Rochester).
   c. Students are responsible for being on time and prepared for all class sessions.

4. Maintaining academic integrity. Students are expected to maintain academic integrity, including doing their own assigned work for courses. If it is determined that a student has engaged in scholastic dishonesty, the instructor may impose an academic consequence (e.g., giving the student a grade of "F" or an "N" for the course), and the student may face additional sanctions from the University. (See Board of Regents Policy: Student Conduct Code, Section VI, Subd 1, Scholastic Dishonesty, and Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester).

5. Seeking help and accommodation.
   a. Students are responsible for seeking academic help in a timely fashion.
   b. Students who need special accommodations are responsible for working first with the relevant University offices and then with the instructor at the beginning of the course.

6. Respecting intellectual property. Students may not distribute instructor-provided notes or other course materials, except to other members of the same class or with the express (written) consent of the
instructor. Instructors have the right to impose additional restrictions on course materials in accordance with copyright and intellectual property law and policy. Students may not engage in the widespread distribution or sale of transcript-like notes or notes that are close to verbatim records of a lecture or presentation.

7. **Keeping classroom in good order.** Students may be responsible for helping straighten up a classroom at the end of a class period, if requested to do so by the instructor. Keeping a classroom in good order includes taking away or disposing of everything one came in with, such as pop cans/bottles, food containers/wrappers, newspapers, etc. Students must also not deface or damage classrooms or classroom furniture or equipment.

8. **Use of personal electronic devices in the classroom.** Instructors determine if personal electronic devices (such as cell phones and laptops) are allowed in the classroom. Students may be directed to turn off personal electronic devices if the devices are not being used for class purposes. Students are not permitted to record any part of a class/lab/other session unless explicitly granted permission by the instructor. If the student does not comply, the student may be asked to leave the classroom.

9. Guests may not be brought to class without permission from the instructor.

**Exclusions**

This policy is not applicable to the Duluth campus.

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**REASON FOR POLICY**

This policy clarifies and outlines student responsibilities and expectations for enrollment and participation in a course. Faculty and students need a common understanding of their responsibilities for the learning process. This policy implements criteria and requirements for accreditation established by the Higher Learning Commission.

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**PROCEDURES**

There are no procedures associated with this policy.

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**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

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**APPENDICES**

There are no appendices associated with this policy.

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**FREQUENTLY ASKED QUESTIONS**

1. **Is it permissible for a student to bring the student's child to class?**
   
   All guests, including a student's family members, may not attend class with the student without permission from the instructor.

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DEFINITIONS

Prerequisite
A course that is a necessary requirement before subsequent advanced courses.

Scholastic Dishonesty
Plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using course materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, misrepresenting, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

RESPONSIBILITIES

Responsibilities are specified in the Policy Statement.

RELATED INFORMATION

- Board of Regents Policy: Student Conduct Code
- Administrative Policy: Grading and Transcripts: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Mandatory Attendance at First Class Session and Consequences for Absence: Twin Cities, Crookston, Morris, Rochester
- Administrative Policy: Teaching and Learning: Instructor and Department Responsibilities (Twin Cities, Crookston, Morris, Rochester)
- Administrative Policy: Makeup Work for Legitimate Absences
- Higher Learning Commission, Criteria and Requirements for Accreditation

HISTORY

Amended:
September 2014 - Clarifications related to Higher Learning Commission accreditation requirements.

Amended:
May 2013 - Major Revision, Comprehensive Review.
1. Incorporates language from two related policies (Appropriate Use of Class Notes and Course Materials, and Use of Personal Electronic Devices in the Classroom). These policies are proposed for elimination.
2. Expands the language around academic integrity. The reference now is on scholastic dishonesty, which would include cheating, plagiarism, etc.

Amended:
December 2009 - Policy now applies to Crookston.
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

University-administered fellowships or traineeships are ones for which the funds are administered by the University to the student, regardless of the funding source. Graduate student fellowships and traineeships are awarded on the basis of academic merit and provide actively enrolled students with the opportunity to pursue study, training and research. Fellowships carry no service obligations. Traineeships may carry service obligations.

I. Eligibility and Selection for Graduate Student Fellowships and Traineeships

a. Students who are admitted to a University of Minnesota graduate program are eligible to hold a University-administered fellowship or traineeship if they are registered for at least the minimum number of credits required by the fellowship or traineeship for a particular term.

b. Recipients of graduate student fellowships and traineeships must meet registration requirements and other terms and conditions of their award for the duration of their fellowship or traineeship.

c. All students who apply for and meet the eligibility criteria for a fellowship or traineeship must be considered for the fellowship or traineeship in accordance with established review and selection processes and criteria.

d. University colleges and departments, or other University units as appropriate, must publicize the fellowships and traineeships the unit offers, including the eligibility and selection criteria.

II. Fellowship and Traineeship Stipends and Benefits

a. Ranges for graduate fellowship and traineeship stipends are established each fiscal year by the awarding collegiate unit, department, academic program, and/or external agency. These ranges must follow the rules and guidelines set by the sponsoring entity.

b. The awarding collegiate unit, department, academic program, and/or external agency stipulates the benefits. These benefits must follow the rules and guidelines set by the sponsoring entity.

c. Students who hold University-administered fellowships or traineeships that provide a stipend that is equivalent to at least a 25% graduate assistantship are eligible for resident tuition rates.

d. Students who hold University-administered fellowships or traineeships for at least two academic semesters are eligible for the extended benefit of resident tuition rates once their fellowship or traineeship ends. They may receive this benefit for no more than the number of semesters for which they held their fellowship or traineeship, up to a maximum of four semesters. This benefit will not extend beyond three years from the termination of the qualifying fellowship or traineeship. Members of the student’s immediate family may also be eligible for resident tuition rates.
e. Fellows and trainees are responsible for payment of charges not covered by the fellowship or traineeship (e.g., lab, installment, or late registration fees).

f. Fellows or trainees who leave their graduate program before the end of a semester in which they hold a fellowship or traineeship may be required to re-pay all or a portion of the stipend for that term.

g. Fellowships and traineeships may be supplemented by other University-administered support (e.g., a graduate assistantship) unless restricted by the terms of the fellowship or traineeship. The level of supplementation may vary according to the terms of the fellowship or traineeship.

**Exceptions**

This policy does not apply to the J.D., M.D., Pharm.D., D.V.M., D.D.S, L.L.M. and M.B.A. (Twin Cities) degrees.

**REASON FOR POLICY**

This policy incorporates equity and fairness standards in the selection of recipients for University-administered fellowships and traineeships. This policy also aids the University in recruiting high-quality graduate students.

**PROCEDURES**

There are no procedures associated with this policy.

**FORMS/INSTRUCTIONS**

There are no forms associated with this policy.

**APPENDICES**

There are no appendices associated with this policy.

**FREQUENTLY ASKED QUESTIONS**

- [University-Administered Graduate Student Fellowships and Traineeships FAQ](#)

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</tr>
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</table>

**DEFINITIONS**

**Graduate Fellowship**

A merit-based stipend award that an individual student wins competitively. The student applies (or is nominated) directly to the funding source.
Graduate Traineeship
Is awarded competitively to a group of faculty members in a particular disciplinary or interdisciplinary area, the discipline having been specified in advance by the funding agency. The University faculty group awarded the training grant identifies the recipients from among its students interested in studying in the targeted field.

University-Administered Graduate Fellowship or Traineeship
University-administered fellowships or traineeships are ones for which the funds are administered by the University to the student, regardless of the funding source. Funding sources for University-administered graduate fellowships may be national (e.g., the National Science Foundation Fellowship), the University or Graduate School (e.g., the Graduate School Doctoral Dissertation Fellowship) or from programs and departments (e.g., fellowships from department funds.)

Service
Work performed that is typically recognized by payment of a salary.

Stipend
A fixed sum of money primarily paid to cover living costs and educational expenses while the recipient is enrolled in an educational program.

Salary
A wage paid for work performed.

Immediate Family (for the purpose of qualifying for resident tuition rate)
Spouse, children, or legal ward living in the household.

RESPONSIBILITIES

Graduate School Fellowships Office
- Publicize the fellowships the Graduate School offers.
- Clearly stipulate the benefits provided by each fellowship offered by the Graduate School.
- Fairly consider all students who apply and meet the eligibility criteria for a fellowship or traineeship.

Colleges
- Publicize the fellowships the college offers.
- Clearly stipulate the benefits provided by each fellowship offered by the college.
- Fairly consider all students who apply and meet the eligibility criteria for a fellowship or traineeship.

Programs/Departments
- Publicize the fellowships the program offers.
- Clearly stipulate the benefits provided by each fellowship offered by the program.
- Fairly consider all students who apply and meet the eligibility criteria for a fellowship or traineeship.

Students
- Meet all requirements, terms and conditions associated with their award.

RELATED INFORMATION

- Board of Regents Policy: Tuition and Fees
- Administrative Policy: Leave of Absence and Reinstatement from a Leave: Graduate Students
- Administrative Appendix: Resident Tuition Rate

HISTORY

Amended:
June 2017 - Comprehensive Review, Minor Revision. Clarifies language in the following areas: a. eligibility for University-administered graduate student fellowships and traineeships and the need for publication of the eligibility and selection criteria; b. when a student holding a University-administered fellowship or traineeship is eligible for resident
Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

The University provides students with an email account upon the student's matriculation to the institution. This account is free of charge and currently is active as long as the student remains active.

A University assigned student email account is the University's official means of communication with all students. Students are responsible for all information sent to them via their University assigned email account. If a student chooses to forward the provided University email account, the student is responsible for all information, including attachments, sent to any other email account.

REASON FOR POLICY

To better serve our students, upon matriculation students are informed that their University assigned email account is the primary means of communication from the University community and that they will be held responsible for the information in the email. Email is the primary method of communication between students and the University. It is imperative that students understand that information will be communicated to them via their University assigned account while they are students.

PROCEDURES

There are no procedures associated with this policy.

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.
FREQUENTLY ASKED QUESTIONS

1. Are other forms of communication (i.e., social media or websites) considered official communications?
While the content found in these forms of communication should match information included in emails sent to students, the content of the email is considered the official information.

CONTACTS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Contact</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy Information</td>
<td>Susan Van Voorhis</td>
<td>612-625-8098</td>
<td><a href="mailto:vanvo002@umn.edu">vanvo002@umn.edu</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>612-626-1754 (fax)</td>
<td></td>
</tr>
<tr>
<td>Crookston</td>
<td>Ken Myers</td>
<td>218-281-8200</td>
<td><a href="mailto:kmyers@crk.umn.edu">kmyers@crk.umn.edu</a></td>
</tr>
<tr>
<td>Duluth</td>
<td>Carla Boyd</td>
<td>218-726-8795</td>
<td><a href="mailto:cboyd@d.umn.edu">cboyd@d.umn.edu</a></td>
</tr>
<tr>
<td>Morris</td>
<td>Judy Korn</td>
<td>320-589-6011</td>
<td><a href="mailto:kornjr@morris.umn.edu">kornjr@morris.umn.edu</a></td>
</tr>
<tr>
<td>Rochester</td>
<td>Diane Douglas</td>
<td>507-258-8008</td>
<td><a href="mailto:douglasd@r.umn.edu">douglasd@r.umn.edu</a></td>
</tr>
</tbody>
</table>

DEFINITIONS

Student
Any undergraduate, graduate and professional students. Student status starts upon matriculation. Student status may depend upon credit load.

Student Information
Any information related to student activities at the University of Minnesota.

Matriculation
The time a deposit has been submitted by a student for attendance.

RESPONSIBILITIES

Faculty and staff
Communicate information to students via email with sufficient time for the student to act upon/respond to the information included in the message.

Student
Routinely check assigned University of Minnesota email account to review relevant information.

Registrars on each campus
Maintain policy. Respond to student requests.

RELATED INFORMATION

- Administrative Policy: Acceptable Use of Information Technology Resources
- Internet Account Initiation

HISTORY

Amended:
December 2013 - Comprehensive review, minor revision. Improves the clarity of the policy by minor adjustments to the language and a new FAQ.

Amended:
April 2008 - This policy now applies University Wide, rather than to the Twin Cities Campus Only.

Effective:
September 2001

University Policy Program
140 McNamara Alumni Center, Minneapolis, MN 55455 - P: 612-624-8081
policy@umn.edu

Have a good faith belief there has been a violation of University policy? Please report concerns to your supervisor, the appropriate University administrator to investigate the matter, or submit a report to UReport.
POLICY STATEMENT

The University will not issue diplomas or official transcripts to students with financial obligations equal to, or in excess of, $100 or to students who have not satisfied any student conduct or academic integrity sanctions. Once a student satisfies the student's financial obligation or satisfies the outstanding sanction, the diploma will be issued and the hold barring issuance of the official transcript will be removed.

REASON FOR POLICY

The University expects students to meet any financial and/or student conduct and academic integrity obligations to the institution, both during their enrollment and upon graduation. Withholding the diploma and official transcript for not meeting these responsibilities is consistent with both of these expectations.

PROCEDURES

- [Diplomas and Official Transcripts: Notification to Students of the Hold and Issuance after the Obligation is Met](#)

FORMS/INSTRUCTIONS

There are no forms associated with this policy.

APPENDICES

There are no appendices associated with this policy.

FREQUENTLY ASKED QUESTIONS

Printed on: 08/24/2018. Please go to http://policy.umn.edu for the most current version of the Policy or related document.
1. How is a student notified that the student will not be receiving a diploma or an official transcript due to these obligations?
Students are notified via both email and paper letter.

2. Will a student's degree still be posted to the individual's record if money is owed or a judicial sanction is not met?
Yes.

### CONTACTS

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<td>Judy Korn</td>
<td>320-589-6011</td>
<td><a href="mailto:kornjr@umn.edu">kornjr@umn.edu</a></td>
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<td>Carla Boyd</td>
<td>218-726-8795</td>
<td><a href="mailto:cboyd@d.umn.edu">cboyd@d.umn.edu</a></td>
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<td>Policy Information - Crookston</td>
<td>Ken Myers</td>
<td>218-281-8200</td>
<td><a href="mailto:kmyers@crk.umn.edu">kmyers@crk.umn.edu</a></td>
</tr>
<tr>
<td>Policy Information - Rochester</td>
<td>Diane Douglas</td>
<td>507-258-8008</td>
<td><a href="mailto:douglasd@r.umn.edu">douglasd@r.umn.edu</a></td>
</tr>
</tbody>
</table>

### DEFINITIONS

**Financial Obligation**
Students that owe a minimum of $100 to the University handled by the University collections offices on respective campuses.

**Student conduct and academic integrity sanction**
A sanction imposed upon a student for violation of the University's Student Conduct Code

### RESPONSIBILITIES

**Registrar**
Notify faculty, staff and students of the policy of withholding diplomas and official transcripts.

**College or department**
Advise students of the policy on the policy of withholding diplomas and official transcripts.

**Campus Collections Office**
Determines if diploma can be issued based on satisfactory payment of financial obligations.

**Office for Community Standards (OCS) - Twin Cities Campus**
Notify faculty, staff and students of the policy of withholding diplomas and official transcripts. Determines if diploma can be issued based on satisfactory resolution of obligation.

### RELATED INFORMATION

There is no related information associated with this policy.

### HISTORY

**Amended:**
December 2013 - Comprehensive Review, Minor Revision. Provides additional guidance to the students who have a hold on their record through a new FAQs.
Amended:
December 2009 - Changes withholding of "degrees" to withholding of "diplomas and official transcripts"; Improves satisfaction of student conduct or academic integrity sanctions by expanding the policy to address these types of obligations; Aligns with practices of our peer institutions.

Effective:
December 2004
Twin Cities Campus
Medical Laboratory Sciences MMLS
Allied-Medical Technology
Academic Health Center Shared

Link to a list of faculty for this program.

Contact Information:
420 Delaware St SE, MMC 711, Minneapolis, MN 55455  877-334-2659
Email: cahpinfo@umn.edu
Website: https://www.alliedhealth.umn.edu/medical-laboratory-sciences

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 55
- This program requires summer semesters for timely completion.
- Degree: Master of Laboratory Sciences

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The masters in medical laboratory sciences (MMLS) is a 5 semester full-time or 8 semester part-time, graduate level program for students with a baccalaureate (or higher) degree in biology or a related field. The program includes all of the essentials of the bachelor of science in medical laboratory science (BS in MLS) program, plus additional graduate work. Upon completion of the coursework, students are eligible to take the American Society of Clinical Pathologists Generalist (MLS) Board of Certification exam (ASCP BOC) as well as the categorical exam in molecular biology (MB).

Accreditation
This program is accredited by National Accrediting Agency for Clinical Laboratory Science (NAACLS)

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Completion of a baccalaureate degree from an accredited institution completed no later than June 1 prior to start of fall semester for year admitted.

Required prerequisites
Prerequisite Biology
8 credit hours of biology must be taken prior to entry to the program.
BIOL 1009 - General Biology [BIOL] (4.0 cr)
PHSL 3051 - Human Physiology (4.0 cr)

Prerequisite Calculus
3-4 credits of calculus must be completed prior to program entry.
MATH 1142 - Short Calculus [MATH] (4.0 cr)
or MATH 1271 - Calculus I [MATH] (4.0 cr)

Prerequisite Statistics
3-4 credit hours of statistics is required prior to being admitted to the program.
STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)

Prerequisite Chemistry
14 credits of chemistry must be completed prior to entering the program.
Chemistry Principles I and II
Chemistry Principles I
CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
Chemistry Principles II
CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)

Organic Chemistry
Organic Chemistry I and II
CHEM 2301 - Organic Chemistry I (3.0 cr)
CHEM 2302 - Organic Chemistry II (3.0 cr)

Microbiology with Lab
5 credit hours of microbiology with laboratory component must be completed prior to entry to the program.
VBS 2032 - General Microbiology With Laboratory (5.0 cr)
or MICB 3301 - Biology of Microorganisms (5.0 cr)

Genetics
3 credit hours of genetics must be completed prior to entry to the program.
GCD 3022 - Genetics (3.0 cr)
or BIOL 4003 - Genetics (3.0 cr)

Biochemistry
3 credit hours of biochemistry must be completed prior to entry to the program.
BIOC 3021 - Biochemistry (3.0 cr)

Immunobiology
3 credit hours of immunobiology must be completed prior to entry to the program.
MLSP 5511 - Principles of Immunobiology (3.0 cr)

Other requirements to be completed before admission:
There are fourteen prerequisite courses to complete before the start of the master in medical laboratory sciences program (MMLS) program: biology, general chemistry (2 semesters with lab), organic chemistry (2 semesters), biochemistry, calculus, statistics, human physiology, microbiology with lab, plus upper division genetics and immunology. At least ten courses must be completed, with final grades sent to the MLS program, by the application deadline.

Special Application Requirements:
Prior to matriculation to the program, students must complete a Minnesota background check, immunizations, and meet the Medical Laboratory Sciences Program published technical standards. Application to the MMLS program is available on the Medical Laboratory Sciences Program website. After a preliminary review of submitted materials, selected applicants are invited to participate in an interview with representatives of the admissions committee.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
• MELAB
  - Final score: 85
  - Speaking test score: 0

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 30 to 55 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The capstone project is an examination of a clinical problem in the setting where students complete their final clinical rotation. It may also be a type of research experience or research paper with an MLS program faculty member.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.
A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Coursework (55 Credits)
Take the following courses for a total of 55 credits:
- MLSP 5011W - Professional Issues in the Health Care Community [WI] (2.0 cr)
- MLSP 5012 - Foundations in Interprofessional Communication and Collaboration (1.0 cr)
- MLSP 5013 - Scholarly Inquiry and Analysis in Medical Laboratory Sciences (1.0 cr)
- MLSP 5014W - Laboratory Operations and Management in Health Care Systems [WI] (2.0 cr)
- MLSP 5112 - Application of Diagnostic Microbiology Principles (2.0 cr)
- MLSP 5212 - Application of Hematology & Hemostasis Principles (1.0 cr)
- MLSP 5214 - Advanced Hematology Morphology (1.0 cr)
- MLSP 5311 - Fundamental Biomedical Laboratory Techniques (4.0 cr)
- MLSP 5312 - Body Fluid Analysis (2.0 cr)
- MLSP 5514 - Application of Transfusion Medicine Principles (2.0 cr)
- MLSP 5701 - Clinical Experience in Microbiology (2.0 cr)
- MLSP 5702 - Clinical Experience in Hematology and Hemostasis (2.0 cr)
- MLSP 5703 - Clinical Experience in Clinical Chemistry and Urinalysis (2.0 cr)
- MLSP 5704 - Clinical Experience in Transfusion Medicine (2.0 cr)
- MLSP 6024 - Advanced Laboratory Operations and Management (3.0 cr)
- MLSP 6111 - Concepts in Diagnostic Microbiology (3.0 cr)
- MLSP 6113 - Advanced Diagnostic Microbiology (3.0 cr)
- MLSP 6211 - Advanced Principles in Hematology and Hemostasis (3.0 cr)
- MLSP 6213 - Advanced Diagnostic Hematology (3.0 cr)
- MLSP 6313 - Advanced Chemical Analysis in Health and Disease (3.0 cr)
- MLSP 6401 - Fundamentals of Molecular Diagnostics (3.0 cr)
- MLSP 6513 - Advanced Principles in Transfusion Medicine (3.0 cr)
- MLSP 6801 - Advanced Practicum in Medical Laboratory Science (2.0 cr)
- MLSP 6905 - Research Methods and Capstone Project (3.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.
Twin Cities Campus
Occupational Therapy M.O.T.
Allied-Occupational Therapy
Academic Health Center Shared

Link to a list of faculty for this program.

Contact Information:
Program in Occupational Therapy
MMC 368
420 Delaware Street SE
Minneapolis, MN 55455
877-334-2659; fax: 612-626-8127
Email: cahpinfo@umn.edu
Website: http://www.cahp.umn.edu/ot

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 78
- This program requires summer semesters for timely completion.
- The program admits students to two locations, the Minneapolis campus and the Rochester campus.

Level I Fieldwork occurring within select courses, will be located across the state of Minnesota. Two full-time Level II Fieldwork placements occur in Minnesota with rare exceptions. Students are responsible for all costs associated with Level I and Level II fieldwork including housing arrangements and transportation for all fieldwork placements.

- Degree: Master of Occupational Therapy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Occupational Therapy (OT) program is a 22-25 month, 78-credit, graduate-level professional program completed over five semesters.

Graduates of the program will be eligible to sit for the National Certification Examination for the Occupational Therapist, administered by the National Board for Certification in Occupational Therapy (NBCOT). After successful completion of this examination, the graduate will be an occupational therapist, registered (OTR). In addition, most states require licensure to practice; however, state licenses are usually based on the results of the NBCOT certification examination.

A felony conviction may affect a graduate's ability to sit for the NBCOT certification examination or attain state licensure. Information is available from:
National Board for Certification in Occupational Therapy
12 South Summit Avenue, Suite 100
Gaithersburg, MD 20877-4150
(301) 990-7979
FAX (301) 869-8492
www.nbcot.org
info@nbcot.org

The program has been continuously accredited since 1946. In 2007, a new performance site was accredited making the OT program available in both Minneapolis and Rochester, Minnesota.

The OT program at both performance sites is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association (AOTA).
4720 Montgomery Lane, Suite 200
Bethesda, MD 20814-3449
ACOTE's telephone number, c/o AOTA, is (301) 652-AOTA
www.acoteonline.org.

Accreditation
This program is accredited by Accreditation Council for Occupational Therapy Education (ACOTE) - see above contact information
Program Delivery
This program is available:
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have a bachelor’s degree completed prior to fall enrollment in order to apply to the Occupational Therapy program. There are no preferred undergraduate majors.

Required prerequisites
Core Prerequisite Courses
Courses must be satisfactorily completed at a regionally accredited institution. Six of the seven courses must be completed at the time of application. All prerequisites must be completed no later than the end of summer session of the year of admission. The non-core prerequisite, medical terminology, may be taken as a college course or as an online course equivalent to 1 college credit.

Prerequisites must be fulfilled with a minimum number of semester credits, listed next to each course.
Human Anatomy (3 cr)
Human Physiology (3 cr)
Statistics (3 cr)
This course must include descriptive and inferential statistics. Courses that focus on Research Methods are not sufficient to fulfill this requirement.
General Psychology (3 cr)
Abnormal Psychology (3 cr)
Human Development Across Life Span (3 cr)
Students will be required to verify that the course(s) taken covered content from conception to death. Students may need to take a series of courses to complete this prerequisite.

Sociology/Anthropology
This course should include content related to human societies and behaviors, social theory and theories of social change, methods of study in sociology, characteristics of social units (for example, race/ethnicity, economics/social organizations, gender, politics, religious systems) and the impact of cultural diversity. Courses that focus on one topic (e.g. sociology of education or sociology of sports) are not sufficient to fulfill this requirement.
Intro to Sociology (3 cr)
or Cultural Anthropology (3 cr)

Non-Core Prerequisite
Medical Terminology (1 cr)
Or the equivalent to 1 college credit may be substituted.

Other requirements to be completed before admission:
Computer Competency:
Admitted applicants must be proficient at using a personal computer, including but not limited to sending and receiving email, using data and word processing software (primarily Microsoft Office software), using the Internet, and navigating the U of MN and other web sites. See computer requirements for online courses http://cahp.umn.edu/minimum-technical-standards.

Practical Experience:
Minimum of 20 hours of OT observation in at least two practice areas OR completion of an Orientation to OT course is required.

Recommended:
• Additional OT observation experience, above that which is required.
• Work, volunteer or observation experience in health or education related fields (e.g. nursing, physical therapy, education/teaching, speech pathology, long term care, home health, children and youth, neurotypical or disability populations). Experiences must be direct interaction with patients/clients/students.
• Participation in research.
• Leadership experiences.

Special Application Requirements:
• Applicants must meet Minimum Technical Standards found on the OT Program web page. http://cahp.umn.edu/minimum-technical-standards
- Applicants whose native language is not English or whose academic studies were done exclusively at a non-English speaking institution(s) must prove English proficiency by providing official Test of English as a Foreign Language (TOEFL) scores.

- International Applicants: The OT Program is NOT able to accept students on F1 or F2 visas due to federal regulations regarding online degree programs. Applicants with other visa types should contact cahpinfo@umn.edu for information about admission eligibility.

- Applicants should complete a prerequisite planning sheet found on the OT program web page. http://cahp.umn.edu/prerequisites

If the student's school(s) is not listed, or if the Prerequisite Planning Sheet does not list the courses taken, the student should send course description(s) for each course taken that the student believes fulfills a specific prerequisite requirement to cahpinfo@umn.edu.

- Criminal Background Studies: The University of Minnesota requires Minnesota Department of Health criminal background studies on all students admitted to the OT Program. Failure to pass the background study may preclude successful completion of the program. Additional background studies may be required by specific fieldwork settings. Students will be required to complete these studies in order to participate in the experiences.

Admitted students are provided detailed instructions for how to request a criminal background study soon after beginning the program.

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 550

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 78 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Students will engage in a group or individual study of a research question related to occupational therapy. Students will demonstrate a high level of critical thinking as they plan, conduct, and evaluate their mentored scholarly project. Students will submit a written description of their project in APA format and defend their scholarly project through an oral poster presentation.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

All courses must be graded "C" or higher and a minimum semester GPA of 2.8 is also required for students to remain in good standing.

Students complete two 12-week, full-time equivalent, Level II fieldwork experiences in Minnesota after successfully completing all classroom-based coursework. All Level II fieldwork must be completed within 24 months of classroom-based coursework.

Year One
The first year builds a foundation in the study of activity and occupation; society, community, family, and environmental influences on human occupation; and foundations of occupational therapy practice when human occupation is reduced. All students participate in their communities as engaged citizens and with their inter-professional colleagues as they practice professional level skills. Five Level I fieldwork experiences provide guided practice in the occupational therapist role.

Fall Semester
6-8 sessions face-to-face
CAHP 5110 - Foundations of Interprofessional Communication and Collaboration (1.0 cr)
OT 6100 - Public and Professional Engagement I (0.5 cr)
OT 6101 - Foundations of Occupational Science and Occupational Therapy (4.0 cr)
OT 6102 - Professional Identity: Behaviors and Attitudes (2.0 cr)
OT 6103 - Occupational Therapy Process for Society (3.0 cr)
OT 6111 - Foundations: Occupations as Therapy (3.0 cr)
OT 6113 - Occupational Therapy Process for Community (3.0 cr)

Spring Semester
6-8 sessions face-to-face
OT 6200 - Public and Professional Engagement II (0.5 cr)
OT 6201 - Functional Anatomy and Kinesiology (3.0 cr)
OT 6202 - Occupational Therapy Process for Individuals: Occupation Through Compensation (5.0 cr)
OT 6203 - Occupational Therapy Process for Family (2.0 cr)
OT 6213 - Occupational Therapy Process for Individuals: Medical Contexts (2.0 cr)
OT 7201 - Scholarly Inquiry in Health Sciences (4.0 cr)

**Summer Semester**
8-15 sessions face-to-face
OT 6200 - Public and Professional Engagement II (0.5 cr)
OT 6301 - Neuroscience (5.0 cr)
OT 6302 - Occupational Therapy Process for Individuals: Occupation Through Remediation (4.0 cr)
OT 6312 - Occupational Therapy Process for Individuals: Psychosocial Approaches (3.0 cr)
OT 6322 - Occupational Therapy Process for Individuals: Work Contexts (2.0 cr)
OT 7394 - Scholarly Project in OT I (2.0 cr)

**Year Two**
Year two shifts to a focus on practice. Students apply OT concepts to increasingly complex areas of practice in a broad range of contexts including work, school, and group settings. Level I fieldwork provides opportunities to practice within communities. Six months is devoted to Level II fieldwork where students practice under the direct supervision of an occupational therapist in a medical and/or community setting. Students should expect to travel to fieldwork sites.

**Fall Semester**
15 sessions face-to-face
OT 6200 - Public and Professional Engagement II (0.5 cr)
OT 6402 - Occupational Therapy Process for Individuals: Occupation Through Neurorehabilitative Approaches (4.0 cr)
OT 6403 - Management of Occupational Therapy Services (1.0 cr)
OT 6412 - Occupational Therapy Process for Individuals: Orthotics and Prosthetics (3.0 cr)
OT 6422 - Occupational Therapy Process: Group Context (2.0 cr)
OT 6432 - Occupational Therapy Process for Individuals: Educational Context (2.0 cr)
OT 7494 - Scholarly Project in OT II (4.0 cr)

**Spring Semester**
OT 7596 - Occupational Therapy Level II Fieldwork I (6.0 cr)
OT 7696 - Occupational Therapy Level II Fieldwork II (6.0 cr)

**Program Sub-plans**
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

**Rochester**
Sub-plan is used by the program in Occupational Therapy to differentiate between students admitted to the Minneapolis or the Rochester campus. Regardless of the assigned campus, all occupational therapy students take the same courses with the same instructors during the same semester. Instructional support staff may vary by campus.
Twin Cities Campus
Ecology, Evolution and Behavior M.S.
Ecology, Evolution & Behavior
College of Biological Sciences

Contact Information:
Email: eebgrad@umn.edu
Website: http://www.cbs.umn.edu/explore/departments/eeb/graduate/about-program

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Courses in inorganic chemistry, organic chemistry, biochemistry, general physics, one year of college calculus, animal biology, genetics, physiology, and plant biology are strongly recommended and provide an important background to pursue graduate work in EEB. Proficiency in a foreign language is not required but is strongly recommended for students who expect to pursue field work in a country where English is not the native language. Deficiencies must be made up early in the graduate program.

Special Application Requirements:
Students are admitted only in fall semester. Deadline for application is December 1. Refer to the EEB website for more details.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MS is offered under both Plan A (with thesis) and Plan B (without thesis). Plan A requires 20 course credits in the major and 10 thesis credits. Plan B requires 30 course credits and a research paper. Students pursuing the joint JD/MS degree have the exception that some Law courses can be "cross counted" for credit. Degree programs are planned by the student and an advisory committee of three faculty members to meet the student's interests and needs.

EEB Foundations course: EEB 8201-8202

All students are expected to complete EEB 8201-8202 their first year. The goal of this course is to provide students in their first year with foundation of knowledge in ecology, evolution and behavior.

EEB 8201 - Graduate Foundations in Ecology, Evolution and Behavior - Semester 1 (4.0 cr)
EEB 8202 - Graduate Foundations in Ecology, Evolution and Behavior - Semester 2 (4.0 cr)

Electives/Supporting Courses

Plan A students select a minimum of 12 coursework credits and Plan B students select a minimum of 22 elective credits, in consultation with the advisor. Electives may include courses in statistics or history of science if additional background is needed.

- EEB 5042 - Quantitative Genetics (3.0 cr)
- or EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
- or EEB 5068 - Plant Physiological Ecology (3.0 cr)
- or EEB 5221 - Molecular Evolution (3.0 cr)
- or EEB 5322 - Evolution and Animal Cognition (3.0 cr)
- or EEB 5327 - Behavioral Ecology (3.0 cr)
- or EEB 5371 - Principles of Systematics (3.0 cr)
- or EEB 5407 - Ecology (3.0 cr)
- or EEB 5409 - Evolution (3.0 cr)
- or EEB 5601 - Limnology (3.0 cr)
- or EEB 5605 - Limnology Laboratory (2.0 cr)
- or EEB 5609 - Ecosystem Ecology (3.0 cr)
- or EEB 8150 - EEB Lab Tours (1.0 cr)
- or EEB 8151 - EEB Lab Tours (1.0 cr)
- or EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
- or EEB 8301 - Prelim Proposal Writing Seminar (1.0 cr)
- or EEB 8302 - EEB Written Prelim Workshop (1.0 cr)
- or EEB 8360 - Behavioral Biology Seminar (1.0 cr)
- or EEB 8500 - NSF GRF Graduate Research Fellowship Proposal Writing Seminar (1.0 cr)
- or EEB 8601 - Introduction to Stream Restoration (3.0 cr)
- or EEB 8602 - Stream Restoration Practice (2.0 cr)
- or EEB 8641 - Spatial Ecology (3.0 cr)
- or EEB 8980 - Seminar on Current Topics (1.0 - 3.0 cr)
- or EEB 8990 - Graduate Seminar (1.0 - 3.0 cr)
- or EEB 8991 - Independent Study: Ecology, Evolution, and Behavior (1.0 - 10.0 cr)

- Courses Outside of EEB

Students may select graduate-level courses outside of EEB in consultation with their advisor.

- AGRO 5121 - Applied Experimental Design (4.0 cr)
- or BIOL 8100 - Improvisation for Scientists (1.0 cr)
- or DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (3.0 cr)
- or EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- or FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
or HSCI 5211 - Biology and Culture in the 19th and 20th Centuries [CIV] (3.0 cr)
or HSCI 5242 - Navigating a Darwinian World (3.0 cr)
or HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
or HSCI 8920 - Seminar: History of Biological Sciences (3.0 cr)
or PA 5701 - Science and State (3.0 cr)
or PA 5721 - Energy Systems and Policy (3.0 cr)
or PHIL 5602 - Scientific Representation and Explanation (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or STAT 5101 - Theory of Statistics I (4.0 cr)
or STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)
or STAT 5601 - Nonparametric Methods (3.0 cr)
or BIOL 5272 - Applied Biostatistics (4.0 cr)
or HSCI 5401 - Ethics in Science and Technology (3.0 cr)
or HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
or FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)

Ethics Requirement
A four-session ethics seminar offered during the Friday Noon Seminar series. Required areas of ethics include: Academic and Research Community; Authorship; Peer Review and Research Conduct.

Plan A

Plan A Thesis
Take exactly 10 credit(s) from the following:
+EEB 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Joint- or Dual-degree Coursework: JD/MS-Ecology, Evolution, and Behavior Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Ecology, Evolution and Behavior Minor
Ecology, Evolution & Behavior
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
140 Gortner Laboratory, 1479 Gortner Ave, St. Paul, MN 55108 (612-624-6770, fax: 612-624-6777)
Email: eebgrad@umn.edu
Website: http://www.cbs.umn.edu/explore/departments/eeb/graduate/about-program

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in Ecology, Evolution, and Behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Master's Course List
Take 6 or more credit(s) from the following:
• EEB 5xxx
• EEB 8xxx

Doctoral
Doctoral Course List
Take 12 or more credit(s) from the following:
• EEB 5xxx
• EEB 8xxx
Twin Cities Campus
Ecology, Evolution and Behavior Ph.D.

Ecology, Evolution & Behavior
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Ecology, Evolution, and Behavior Graduate Program, 140 Gortner Laboratory, 1479 Gortner Avenue, St. Paul, MN 55108 (612-624-6770, fax: 612-624-6777)
Email: eebgrad@umn.edu
Website: http://www.cbs.umn.edu/explore/departments/eeb/graduate/about-program

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in ecology, evolution, and behavior (EEB) links faculty and students interested in the biology of organisms from molecules to ecosystems. Studies address questions from molecular mechanisms of evolution, the interactions of organisms in social groups and populations, the distributions and abundances of species in communities and ecosystems, to global biogeochemical processes. The program provides broad training in the general areas of ecology, evolution, and animal behavior, and specialized courses and research in vertebrate and invertebrate zoology; behavior and ethology; evolution; population genetics; molecular evolution; systematics; population, community, and ecosystem ecology; global ecology; limnology; ecology of vegetation; and theoretical ecology. Opportunities for field research are available in Africa, Central America, and other parts of the world, as well as in local ecosystems, including the Cedar Creek Ecosystem Science Reserve and Itasca Biological Station. Seminars and individually designed tutorials are an important part of student programs and provide an exciting intellectual environment.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Courses in inorganic chemistry, organic chemistry, biochemistry, general physics, one year of college calculus, animal biology, genetics, physiology, and plant biology are strongly recommended and provide an important background to pursue graduate work in EEB. Proficiency in a foreign language is not required but is strongly recommended for students who expect to pursue field work in a country where English is not the native language. Deficiencies must be made up early in the graduate program.

Special Application Requirements:
Students are admitted only in fall semester. Deadline for application is December 1. Refer to the EEB website for more details.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Significant field or laboratory experience, proficiency in using computers in research, and competence in advanced statistics are required. Students are expected to gain some appreciation of history or philosophy of science and are required to teach a minimum of two semesters at 50 percent time. Course plans are discussed and agreed upon by the student and an advisory committee of three to five faculty members.

Required EEB Coursework
Take the following courses for a total of 13 credits:
EEB 8150 - EEB Lab Tours (1.0 cr)
EEB 8151 - EEB Lab Tours (1.0 cr)
EEB 8201 - Graduate Foundations in Ecology, Evolution and Behavior Semester 1 (4.0 cr)
EEB 8202 - Graduate Foundations in Ecology, Evolution and Behavior - Semester 2 (4.0 cr)
EEB 8301 - Prelim Proposal Writing Seminar (1.0 cr)
EEB 8302 - EEB Written Prelim Workshop (1.0 cr)
EEB 8500 - NSF GRF Graduate Research Fellowship Proposal Writing Seminar (1.0 cr)

Elective Coursework
Select at least 11 elective credits, in consultation with the advisor. Electives may include courses in statistics or history of science if additional background is needed.
Take 0 - 24 course(s) totaling 11 - 24 credit(s) including 0 - 24 sub-requirements(s) from the following:
• EEB 5068 - Plant Physiological Ecology (3.0 cr)
• EEB 5221 - Molecular Evolution (3.0 cr)
• EEB 5322 - Evolution and Animal Cognition (3.0 cr)
• EEB 5327 - Behavioral Ecology (3.0 cr)
• EEB 5371 - Principles of Systematics (3.0 cr)
• EEB 5407 - Ecology (3.0 cr)
• EEB 5409 - Evolution (3.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• EEB 5605 - Limnology Laboratory (2.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8100 - EEB Department Seminar (1.0 cr)
• EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
• EEB 8360 - Behavioral Biology Seminar (1.0 cr)
• EEB 8601 - Introduction to Stream Restoration (3.0 cr)
• EEB 8602 - Stream Restoration Practice (2.0 cr)
• EEB 8641 - Spatial Ecology (3.0 cr)
• EEB 8980 - Seminar on Current Topics (1.0 - 3.0 cr)
• EEB 8990 - Graduate Seminar (1.0 - 3.0 cr)
• BIOL 8100 - Improvisation for Scientists (1.0 cr)
• EEB 8991 - Independent Study: Ecology, Evolution, and Behavior (1.0 - 10.0 cr)
• EEB 8994 - Directed Research (1.0 - 5.0 cr)

Courses outside of EEB
Courses from the following, or other coursework selected in consultation with the advisor, may be used to fulfill the 24-credit minimum requirement.
Take 0 - 24 course(s) totaling 0 - 24 credit(s) including exactly 0 sub-requirements(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• BIOL 8100 - Improvisation for Scientists (1.0 cr)
• DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• HSCI 5211 - Biology and Culture in the 19th and 20th Centuries [CIV] (3.0 cr)
• HSCI 5242 - Navigating a Darwinian World (3.0 cr)
• HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
• HSCI 8920 - Seminar: History of Biological Sciences (3.0 cr)
• PA 5701 - Science and State (3.0 cr)
• PA 5721 - Energy Systems and Policy (3.0 cr)
• PHIL 5602 - Scientific Representation and Explanation (3.0 cr)
• PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• BIOL 5272 - Applied Biostatistics (4.0 cr)
• HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
• TH 5950 - Topics in Theatre (1.0 - 4.0 cr)

Ethics requirement
A four-session ethics seminar offered during the Friday Noon Seminar series. Required areas of ethics include: Academic and Research Community; Authorship; Peer Review and Research Conduct.

Thesis Credits
Take 24 doctoral thesis credits.
EEB 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: JD/PhD-Ecology, Evolution, and Behavior
Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Microbial Ecology Minor
College of Biological Sciences - Adm
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Microbial Ecology Minor Program, University of Minnesota, 439 Borlaug Hall, 191 Upper Buford Circle, Saint Paul, MN 55108 (612-624-2706)
Email: micecol@umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This minor is available to master's (M.S.) and doctoral (Ph.D.) students. Microbial ecology is an interdisciplinary research area concerned with the relationships between microorganisms and their natural environment. The microbial ecology minor offers core coursework in microbiology, microbial physiology, microbial genetics, microbial genomics, microbial ecology, ecology, and theoretical ecology. Additional courses and opportunities to interact with others interested in microbial ecology are also part of the minor. The microbial ecology/biotechnology seminar series allows students and faculty to interact with microbial ecologists from other universities. The curriculum encourages interdisciplinary interaction, communication, and synthesis.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
To be admitted to the minor, a student must be admitted to a master's or doctoral degree-granting program within the Graduate School, should have broad training in the biological sciences, and must be accepted by the director of graduate studies of the microbial ecology minor program. All students are expected to have had the equivalent of introductory microbiology (MICB 3301) and general ecology, but may fulfill deficiencies in these areas by taking these courses while in the program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The master's minor requires 6 graduate credits, all of which must be outside the student's major department and must include at least one laboratory course in microbiology (e.g., MICB 4215) and one ecology (EEB) course chosen from the list below. The remaining courses also are chosen from this list with the guidance and approval of the director of graduate studies.

The doctoral minor requires 12 graduate credits, 9 credits of which must come from the core courses listed below (contact the director of graduate studies for potential alternatives to these courses). The remaining credits must come from at least two courses chosen from this list, but may not be in the student's major.

Core courses:
EEB 5053 (4 cr)
MICB 4111 (3 cr)
MICB 4121 (3 cr)
MICA 8002 (4 cr)
Additional courses
CE 8541
CE 8542
CE 8551
EEB 4601
EEB 4609
PLPA 8102
PLPA 8103
SOIL 5515
SOIL 5611
Twin Cities Campus
Microbial Engineering M.S.
BioTechnology Institute
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
M.S. Program in Microbial Engineering, University of Minnesota, 1479 Gortner Avenue, Suite 140, Saint Paul, MN 55108 (612-624-6774; fax 612-625-5780)
Email: mce@umn.edu
Website: http://www.bti.umn.edu/MicE

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Microbial engineering allows students to pursue an interdisciplinary program that combines microbiology, biochemistry, molecular biology, bioinformatics, chemical engineering, and related sciences. Students perform brief rotations in faculty laboratories to choose an independent project, and tailor their coursework to support and complement their research. Projects can span modern basic microbiology, applied industrial engineering, as well as include computer science and informatics disciplines. After graduation, many students choose to continue on to a PhD program in a related discipline or work directly in biotechnology research and development. Supporting courses are chosen from fields including biochemistry, microbiology, food science, genetics and cell biology, and computer science. The program is coordinated by the BioTechnology Institute (BTI) and involves faculty from 10 departments and 5 institutes of the University.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Science or Engineering Discipline
N/A

Other requirements to be completed before admission:
Typically, applicants with a bachelor's degree in biological sciences, biochemistry, chemistry, or chemical engineering or related engineering disciplines apply. Recommended academic preparation includes one year each of calculus, organic chemistry, physics, microbiology, and a background in a field such as basic chemical engineering, biology, physical chemistry, or genetics. Background deficiencies can be made up during the first year of graduate work. Most students enter the program with a GPA of 3.00 or higher.

Special Application Requirements:
Three letters of recommendation, scores from the General Test of the GRE, the TOEFL score for international applicants, transcripts, Curriculum Vitae, and an autobiographical statement including occupational goals must be submitted to the director of graduate studies. Applications are accepted for fall semester only. To receive full consideration for financial aid, students must apply for fall semester admission by January 14.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
  • IELTS
    - Total Score: 6.5
  • MELAB
    - Final score: 80
    - Speaking test score: 0

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

MicE Requirements

All students are required to sign up for the following courses:

MicE 5355 (1 Credit during winter break with special registration) and MicE 8990 (1 Credit per semester) Attendance is MANDATORY for two semesters. Two credits are needed for graduation.
MICE 5355 - Advanced Fermentation and Biocatalysis Laboratory (1.0 cr)
MICE 8990 - Biotechnology Seminar (1.0 - 3.0 cr)

Computer Proficiency Requirement

Students are required to show evidence of competence in using computers and a practical working knowledge of at least one computer language such as Pascal, Fortran, python, scripting, or statistical packages appropriate to their area of interest. Experience and competence may be obtained by passing a semester of basic computer use and programming courses, or submitting evidence that Equivalent courses of study have been completed elsewhere. (One course upper level required.)
BIOL 5272 - Applied Biostatistics (4.0 cr)
or CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)

Plan Options

Plan A
Take at least 14 additional course credits, in consultation with the advisor, and 10 thesis credits (MICE 8777).

Thesis Credits
Take at least 10 master's thesis credits.
MICE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

RELATED ELECTIVES
A maximum of 9 credits of 4000-level coursework is allowed. Additional courses can be used with the approval of the director of graduate studies.
Take 14 or more credit(s) from the following:
• BBE 4713 - Biological Process Engineering (3.0 cr)
• BBE 5713 - Biological Process Engineering (3.0 cr)
• BIOC 4125 - Laboratory in Molecular Biology and Biotechnology (3.0 cr)
• BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
• BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
• BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
• BIOC 5309 - Biocatalysis and Biodegradation (3.0 cr)
• BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
• BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
• BIOC 5xxx
• BIOC 8084 - Research and Literature Reports (1.0 cr)
• BIOL 4003 - Genetics (3.0 cr)
• BIOL 4004 - Cell Biology (3.0 cr)
• CHEN 5751 - Biochemical Engineering (3.0 cr)
• CHEN 5xxx
• CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CHEN 8xxx
• FSCN 4121 - Food Microbiology (3.0 cr)
• FSCN 4122 - Food Fermentations and Biotechnology (2.0 cr)
• FSCN 4332 - Food Processing Operations (3.0 cr)
• GCD 5036 - Molecular Cell Biology (3.0 cr)
• GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
• GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
• MICB 4131 - Immunology (3.0 cr)
• MICB 4151 - Molecular and Genetic Bases for Microbial Diseases (3.0 cr)
• MICB 4171 - Biology, Genetics, and Pathogenesis of Viruses (3.0 cr)
• MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
• MICB 4235 - Advanced Laboratory: Virology, Immunology, and Microbial Genetics (3.0 cr)
• MICE 5035 - Personal Microbiome Analysis (3.0 cr)
• MICE 5xxx
• MICE 8920 - Teaching Practicum (1.0 cr)
• MICE 8xxx
• PMB 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)

-OR- 

Plan B
Take 24 additional credits, in consultation with the advisor.

RELATED ELECTIVES
Take 24 or more credit(s) from the following:
• BBE 4713 - Biological Process Engineering (3.0 cr)
• BBE 5713 - Biological Process Engineering (3.0 cr)
• BIOC 4125 - Laboratory in Molecular Biology and Biotechnology (3.0 cr)
• BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
• BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
• BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
• BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
• BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
• BIOC 5xxx
• BIOC 8084 - Research and Literature Reports (1.0 cr)
• BIOL 4003 - Genetics (3.0 cr)
• BIOL 4004 - Cell Biology (3.0 cr)
• CHEN 5751 - Biochemical Engineering (3.0 cr)
• CHEN 5xxx
• CHEN 8xxx
• FSCN 4121 - Food Microbiology (3.0 cr)
• FSCN 4122 - Food Fermentations and Biotechnology (2.0 cr)
• FSCN 4332 - Food Processing Operations (3.0 cr)
• GCD 5036 - Molecular Cell Biology (3.0 cr)
• GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
• GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
• MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
• MICB 4131 - Immunology (3.0 cr)
• MICB 4151 - Molecular and Genetic Bases for Microbial Diseases (3.0 cr)
• MICB 4215 - Advanced Laboratory: Microbial Physiology and Diversity (3.0 cr)
• MICB 4235 - Advanced Laboratory: Virology, Immunology, and Microbial Genetics (3.0 cr)
• MICE 5xxx
• MICE 8xxx
• BIOC 5309 - Biocatalysis and Biodegradation (3.0 cr)
• CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
• MICE 5035 - Personal Microbiome Analysis (3.0 cr)
• MICE 8920 - Teaching Practicum (1.0 cr)
• PMB 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)

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Information current as of August 31, 2018
Twin Cities Campus
Plant and Microbial Biology M.S.
Plant and Microbial Biology
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant and Microbial Biology Graduate Program, 1479 Gortner Avenue, Suite 140, St. Paul, MN 55108 (612-625-4222; fax: 612-625-1738)
Email: pmb@umn.edu
Website: https://cbs.umn.edu/academics/departments/pmb/graduate-education

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Plant and microbial biology encompasses all aspects of plant and microbial life, from molecular biology to genomics to ecosystem science. Students study plants from the subcellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Students are admitted to the M.S. program only under special arrangement with a faculty advisor. The deadline to apply is December 1. Refer to the Plant and Microbial Biology website for full details on application requirements and procedures: https://cbs.umn.edu/academics/departments/pmb/graduate-education.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.
Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The MS is offered under both Plan A (with thesis) and Plan B (without thesis). Plan A requires 20 course credits in the major and 10 thesis credits. Plan B requires 30 course credits in the major and one to three research papers, which may be written in conjunction with graduate courses. Significant field or laboratory experience and competence in statistics, to include hypothesis testing, regression, and correlation are required. Degree programs are planned by the student and an advisory committee of three faculty members to meet the student's interests and needs.

Core Coursework
All students take the following required courses, for a total of 6.5 credits. [Note: Take PMB 8900 three times (1 credit each time, for a total of 3 credits): section 001 (PMB colloquium), section 002 (Itasca orientation seminar), and section 003 (PMB graduate students seminar).]

- PMB 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3.0 cr)
- PMB 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- PMB 8900 - Seminar (1.0 - 2.0 cr)

Professional development requirement
Participate in at least one professional development activity. Options to fulfill this requirement include, but are not limited to: courses (e.g., GRAD 8101 Preparing Future Faculty, BIOL 8100 Improvisation for Scientists), workshops (e.g., career planning, research group management, teaching skills, leadership development), internships in industry.

Plan A and Plan B course options

Plan A
Take at least 13.5 credits of additional coursework, in consultation with the academic advisor and advisory committee, and with approval from the PMB Director of Graduate Studies (DGS), to complete the 20 course credits total (6.5 credits of required core coursework and 13.5 credits of electives/supporting courses) required for the Plan A master's degree. A maximum of two 4000-level courses is allowed.

Take 14 or more credit(s) from the following:
- PBS 8xxx
- PMB 4xxx
- PMB 5xxx
- AGRO 5xxx
- AGRO 8xxx
- BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
- BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
- BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
- BIOL 4003 - Genetics (3.0 cr)
- BIOL 4004 - Cell Biology (3.0 cr)
- BIOL 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
- BIOL 8100 - Improvisation for Scientists (1.0 cr)
- CSCI 5xxx
- EEB 5xxx
- EEB 8xxx
- FNRM 5xxx
- FNRM 8xxx
- GCD 5xxx
- GCD 8xxx
- GRAD 5xxx
- GRAD 8xxx
- HORT 5xxx
- HORT 8xxx
- MICB 4xxx
• PLPA 5xxx
• PLPA 8xxx
• STAT 5xxx
• STAT 8xxx

**Thesis Credits**

Take 10 master's thesis credits.

**PMB 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)**

**Plan B**

Take at least 23.5 credits of additional coursework, in consultation with the academic advisor and advisory committee, and with approval from the PMB Director of Graduate Studies (DGS), to complete the 30 course credits total (6.5 credits of required core coursework and 23.5 credits of electives/supporting courses) required for the Plan B master's degree. A maximum of two 4000-level courses is allowed.

Take 24 or more credit(s) from the following:

• PBS 8xxx
• PMB 4xxx
• PMB 5xxx
• AGRO 5xxx
• AGRO 8xxx
• BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
• BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
• BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
• BIOC 5xxx
• BIOL 4003 - Genetics (3.0 cr)
• BIOL 4004 - Cell Biology (3.0 cr)
• PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
• BIOL 5xxx
• BIOL 8100 - Improvisation for Scientists (1.0 cr)
• CSCI 5xxx
• EEB 5xxx
• EEB 8xxx
• FNRM 5xxx
• FNRM 8xxx
• GCD 5xxx
• GCD 8xxx
• GRAD 5xxx
• GRAD 8xxx
• HORT 5xxx
• HORT 8xxx
• MICB 4xxx
• PLPA 5xxx
• PLPA 8xxx
• STAT 5xxx
• STAT 8xxx
Twin Cities Campus

Plant and Microbial Biology Minor

Plant and Microbial Biology
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant and Microbial Biology Graduate Program, 1479 Gortner Avenue, Suite 140, St. Paul, MN 55108 (612-625-4222)
Email: pmb@umn.edu
Website: https://cbs.umn.edu/academics/departments/pmb/graduate-education

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Plant and microbial biology encompasses all aspects of plant and microbial life, from molecular biology to genomics to ecosystem science. Students study plants from the sub-cellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Special Application Requirements:
Refer to the Plant and Microbial Biology website for full details on application requirements and procedures:

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters-level Minor
Take at least 6 credits, chosen in consultation with the Plant and Microbial Biology director of graduate studies.

Doctoral-level Minor
Take at least 12 credits, chosen in consultation with the Plant and Microbial Biology director of graduate studies.
Twin Cities Campus
Plant and Microbial Biology Ph.D.
Plant and Microbial Biology
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant and Microbial Biology Sciences Graduate Program, 1479 Gortner Avenue, Suite 140, St. Paul, MN 55108 (612-625-4222; fax: 612-625-1738)
Email: pmb@umn.edu
Website: https://cbs.umn.edu/academics/departments/pmb/graduate-education

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 54
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Plant and microbial biology encompasses all aspects of plant and microbial life, from molecular biology to genomics to ecosystem science. Students study plants from the subcellular and molecular to the whole plant and community levels of biological organization. They also have opportunities for laboratory and field research at state, national, and international levels. Each student's program is planned to meet individual requirements within the framework of a multidisciplinary core of coursework.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Students are admitted only in fall semester. The deadline to apply is December 1. Refer to the Plant and Microbial Biology website for full details on application requirements and procedures: https://cbs.umn.edu/academics/departments/pmb/graduate-education.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
10 to 18 credits are required in the major.
12 to 20 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semester must be completed before filing a Degree Program Form.

Course plans are discussed and agreed upon by the student and an advisory committee of at least four faculty members. Students are expected to teach at least one semester at 50-percent time.

Required Core Coursework
Complete the following required courses, for a total of 9.5 credits. [Note: Take PMB 8900 three times (1 credit each time, for a total of 3 credits): section 001 (PMB colloquium), section 002 (Itasca orientation seminar), and section 003 (PMB graduate students seminar). Take one credit of PMB 8994 in fall semester of the first year.]

- PMB 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3.0 cr)
- PMB 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- PMB 8900 - Seminar (1.0 - 2.0 cr)
- PMB 8901 - Preparation of Research Proposals (2.0 cr)
- PMB 8994 - Research (1.0 - 5.0 cr)

Electives/Supporting Courses
Take at least 20.5 credits of additional coursework, in consultation with the academic advisor and advisory committee, and with approval from the PMB director of graduate studies (DGS), to complete the 30 course credits total (9.5 credits of required core coursework and 20.5 credits of electives/supporting courses) required for the doctoral degree. A maximum of two 4000-level courses is allowed.

Take 21 or more credit(s) from the following:
- AGRO 5xxx
- AGRO 8xxx
- BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
- BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
- BIOC 4521 - Introduction to Physical Biochemistry (3.0 cr)
- BIOC 5xxx
- BIOL 4003 - Genetics (3.0 cr)
- BIOL 4004 - Cell Biology (3.0 cr)
- PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
- BIOL 5xxx
- BIOL 8100 - Improvisation for Scientists (1.0 cr)
- CSCI 5xxx
- EEB 5xxx
- EEB 8xxx
- FNRM 5xxx
- FNRM 8xxx
- GCD 5xxx
- GCD 8xxx
- GRAD 5xxx
- GRAD 8xxx
- HORT 5xxx
- HORT 8xxx
- MICB 4xxx
- PLPA 5xxx
- PLPA 8xxx
- PMB 4xxx
- PMB 5xxx
- PMB 8xxx
- STAT 5xxx
- STAT 8xxx

Professional development requirement
Participate in at least one professional development activity. Options to fulfill this requirement include, but are not limited to: courses (e.g., GRAD 8101 Preparing Future Faculty, APSC 8124 Professional Skills for Plant Scientists, BIOL 8100 Improvisation for Scientists), workshops (e.g., career planning, research group management, teaching skills, writing skills, leadership development), internships in industry.

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Information current as of August 31, 2018
Required Doctoral Thesis Credits
Take at least 24 doctoral thesis credits.

PMB 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Addictions Counseling M.P.S.
CCAPS Addiction Studies
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
College of Continuing and Professional Studies Information Center
20 Ruttan Hall
1994 Buford Ave
St Paul, MN 55108
(612-624-4000)
Email: ccapsinfo@umn.edu
Website: https://ccaps.umn.edu/addictions-counseling-masters-degree

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Professional Studies

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the MPS in addictions counseling experience a rigorous, evidence-informed applied clinical preparation program that fulfills Minnesota's Licensed Alcohol and Drug (MNLADC) educational requirements, with the added benefit of receiving a master's degree. The 30-credit curriculum includes specific licensure preparation content in the following areas: evidence based practices and evaluation, individual and group counseling skills, professional ethics, diversity and cultural sensitivity, co-occurring assessment and treatment interventions, and an applied field placement experience. The MPS meets the education and training needs of individuals new to the helping profession as well as individuals with an allied license (MSW, LP, LPC, LMFT) seeking to add the LADC.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Bachelor's degree from an accredited institution - Transcripts - Personal statement - Two letters of reference - Updated resume or CV

Special Application Requirements:
International students interested in the M.P.S. in Addictions Counseling should contact the International Student and Scholar Service (www.isss.umn.edu) for information on visa status and academic requirements.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 563
• IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
• MELAB
  - Final score: 84

Key to test abbreviations (TOEFL, IELTS, MELAB).
Program Requirements

Plan C: Plan C requires 30 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The ADDS 5996 Internship Seminar serves as a capstone experience where students apply the knowledge and skills learned in their previous courses in a real-world clinical setting. Students receive close clinical supervision from both a site and faculty supervisors, participate in formal on-campus clinical supervision meetings, and actively engage in weekly required postings and practice assignments. Upon completion of the internship experience, each student undergoes an extensive formal written and oral evaluation process to ensure ethical and competent clinical practice.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

In addition to course work, an 880-hour field placement is required to complete the degree. This field placement will be done as part of the 4 credit class ADDS 5996.

Students may take one or more courses per term and have up to five years to complete a master's degree. Students who wish to transfer graduate-level coursework from other institutions should contact the Graduate Programs office at ccapsinfo@umn.edu for information and assistance.

Only coursework for which the student has earned a grade of B- or better will be counted toward the minimum of 30 semester credits required for the degree.

Foundation Courses (7 credits)
These courses are prerequisites for most other courses in the program. They should be the first courses students complete.

- ADDS 5011 - Foundations in Addiction Studies (2.0 cr)
- ADDS 5021 - Introduction to Evidence Based Practices and the Helping Relationship (3.0 cr)
- ADDS 5031 - Applied Psychopharmacology (2.0 cr)

Required Courses (16 credits)
Required courses. All courses except ADDS 5051 are prerequisites for the internship (ADDS 5996). Either ADDS 5071 or ADDS 5081 may be taken concurrently with the internship.

- ADDS 5041 - Methods and Models I: Motivational Counseling (2.0 cr)
- ADDS 5051 - Methods and Models II: Cognitive-Behavioral Therapy (2.0 cr)
- ADDS 5061 - Foundations of Group Work (3.0 cr)
- ADDS 5071 - Foundations of Co-occurring Disorders (2.0 cr)
- ADDS 5081 - Multicultural Foundations of Behavioral Health (3.0 cr)
- ADDS 5091 - Assessment and Treatment Planning I (3.0 cr)
- ADDS 5121 - Professional Seminar 1 (1.0 cr)

Elective Courses (3 credits)
Electives not on this list must be preapproved.

Take 3 or more credit(s) from the following:

- ADDS 5993 - Directed Study (1.0 - 3.0 cr)
- IBH 6021 - Methods and Models III: Synthesis Seminar in Client Centered Care (2.0 cr)
- IBH 6031 - Methods and Models IV: Trauma and Anxiety, Assessment and Treatment Intervention (2.0 cr)
- IBH 6032 - Advanced Multicultural Practice (1.0 cr)
- IBH 6081 - Human Lifespan Development and Behavioral Health (3.0 cr)
- IBH 6111 - Research and Evaluation Methods (3.0 cr)
- IBH 6222 - Adolescents and Co-occurring Substance Use and Mental Health Disorders (3.0 cr)

Required Internship (4 credits)
Students must take 4 credits/880 field hours of ADDS 5996.

ADDS 5996 - Internship in Behavioral Health (1.0 - 4.0 cr)
Twin Cities Campus
Arts and Cultural Leadership M.P.S.
CCAPS Graduate Programs Instruction
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
College Continuing and Professional Studies, M.P.S. in Arts and Cultural Leadership, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000; fax: 612-626-2800)
Email: ccapsacl@umn.edu
Website: https://ccaps.umn.edu/arts-and-cultural-leadership-masters-degree

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Professional Studies

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Arts and Cultural Leadership (ACL) program is designed for students who have at least three years of professional, volunteer, and/or advocacy work in the arts and cultural field. Required curriculum, blended with flexible course work, allows students to build a program around their current strengths, experiences, and career direction. Courses in leadership and nonprofit management, along with seminars and directed studies in arts and cultural studies, provide working adults a degree with a clear, career-related focus.

The ACL program is designed to help students:

Gain insight and develop approaches to creating and stewarding the relationships and interdependencies necessary for sustaining a vibrant arts community
Refine strategic planning and communications skills in order to better lead organizations in complex environments
Advocate for the arts and culture sector by promoting better understanding and integrating the economic, political, ethical, technological, and diverse social environments in which it functions
Understand and convey the international context for the arts and the impact of the global economy
Appreciate and nurture the creative process, recognizing how art and the artist function in society

The ACL program uses a foundation of 18 credits (out of 30 that are required for the degree), with latitude built in to pursue elective coursework in support areas such as nonprofit management, leadership, education, public affairs/policy, urban planning, strategic planning, etc. Using an applied learning approach, students receive a high-quality education that draws on the expertise of University faculty and community-based faculty.

By the end of the program, students will be knowledgeable in:

Critical and strategic thinking, and effective communication
The intersection, navigation, and impact of cultural and creative practices within local and global dynamics
Policy formation, implementation, and application relevant to culture, creativity, and the arts
Leadership practices in a variety of contexts
How to implement expertise, improve relationships, and optimize resources

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

To be admitted, students must have a bachelor's degree from an accredited post-secondary US institution or its foreign equivalent.

Other requirements to be completed before admission:
At least 3 years of professional, volunteer, and/or advocacy work in the arts and cultural field is required. Factors of academic
preparation, relevant experience, evidence of readiness and maturity, writing ability, and reasons for seeking the degree will be taken into account as part of the admissions review. GRE scores may be submitted, but are not required.

**Special Application Requirements:**
The application package must include official transcripts of all baccalaureate and post-baccalaureate work, a current resume, two letters of recommendation, a two- to three-page written statement of purpose in which the student elaborates on his or her interest in the program, and an additional writing sample of approximately 10 pages. Application deadlines are in spring for fall semester admission, and fall for spring semester admission. Please refer to the program website for further details.

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 563
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 84

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** See department for more details.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

A minimum of 30 credits are required for completion of the MPS degree.

Take core courses for a letter grade, earning a B- or better.

Obtain a cumulative GPA for all degree course work of 3.0 or better.

**Required courses (15 credits)**

- ACL 8001 - Introduction to Critical and Cultural Inquiry in Arts and Culture (2.0 cr)
- ACL 5211 - Trends and Impacts in Arts and Cultural Leadership and Management (3.0 cr)
- ACL 5221 - Creative Entrepreneurship and Resource Development (3.0 cr)
- ACL 5231 - Ethical Dilemmas and Legal Issues for Cultural Leaders (3.0 cr)
- ACL 8201 - Creative Leadership in Practice (2.0 cr)
- ACL 8202 - Service Leadership and Board Practicum (1.0 - 2.0 cr)

**Electives (12 credits)**

Elective courses can be selected from related academic departments including ACL, MST, OLPD, and PA. Electives should relate to the professional tasks required of arts and cultural leaders or enhance the student's understanding of the arts within a broader cultural context. Courses must be chosen in consultation with the advisor. Examples include, but are not limited to the courses listed below. Take 12 or more credit(s) from the following:

- ACL 5100 - Topics in Arts and Cultural Leadership (1.0 - 4.0 cr)
- ACL 5241 - Financial Management for Arts Nonprofits (2.0 cr)
- ACL 5251 - Arts Advocacy in the Political Landscape (2.0 cr)
- ACL 5950 - Special Topics (1.0 - 4.0 cr)
- ACL 5993 - Directed Studies (1.0 - 4.0 cr)
- DES 5165 - Design and Globalization (3.0 cr)
- GEOG 8106 - Seminar: Social and Cultural Geography (3.0 cr)
• JOUR 4263 - Strategic Communication Campaigns (3.0 cr)
• JOUR 5251 - Strategic Communication Theory (3.0 cr)
• LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
• LS 5100 - Liberal Studies Seminar (1.0 - 4.0 cr)
• MST 5011 - Museum History and Philosophy (3.0 cr)
• MST 5012 - Museum Practices (3.0 cr)
• OLPD 5011 - Leading Organizational Change: Theory and Practice (3.0 cr)
• OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
• OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
• PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
• PA 5011 - Management of Organizations (3.0 cr)
• PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
• PA 5102 - Organization Performance and Change (3.0 cr)
• PA 5103 - Leadership and Change (3.0 cr)
• PA 5104 - Strategic Human Resource Management (3.0 cr)
• PA 5111 - Financing Public and Nonprofit Organizations (3.0 cr)
• PA 5190 - Topics in Public and Nonprofit Leadership and Management (1.0 - 3.0 cr)
• PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
• PA 5211 - Land Use Planning (3.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
• Other electives chosen in consultation with student's advisor.

Final Project

The ACL Final Project provides students with an opportunity to focus on the needs of a particular organization or community as they identify and carry out, in consultation with the leadership of that group and their academic advisor(s), a project that meets a need within that group and reflects both the interest of the students and their academic achievement.

ACL 8002 - Capstone: Applied Research Project (1.0 cr)
ACL 8003 - Capstone: Reflections and Presentation (2.0 cr)
Twin Cities Campus
Biological Sciences M.B.S.
CCAPS Graduate Programs Instruction
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
College of Continuing and Professional Studies, Master of Biological Sciences Program, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000; fax: 612-626-2800)
Email: ccapsmb@mbs.umn.edu
Website: https://ccaps.umn.edu/biological-sciences-masters-degree

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Biological Sciences

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of biological sciences (MBS) degree is a highly flexible graduate-level program designed to meet the needs of members of the working community who wish to increase their knowledge in areas of modern biology. Students focus their studies in one of three broad areas: molecular biosciences, cellular and organismal biology, or environmental and population biology. Limited elective credits in areas, such as education, business, and public health can be used to support a student's individual career goals and program focus. The degree enables recipients to learn new job skills, change professional emphasis, or provide added value to their present job and may be completed on a part-time basis.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

To be admitted, students must have a bachelor's degree from an accredited post-secondary US institution or its foreign equivalent.

Other requirements to be completed before admission:
Evidence of knowledge of current, college-level concepts of basic chemistry, organic chemistry, and some biology coursework is required. Transcripts showing equivalent coursework combined with professional experience will be considered for application toward fulfillment of the prerequisites for admission. Two years of relevant experience in the workforce is preferred for admission.

Special Application Requirements:
A statement of career goals, letters of reference, transcripts for all undergraduate and post-baccalaureate degrees or coursework, and an updated resume must accompany the application. Application deadlines are in the spring for fall semester admission, and in the fall for spring semester admission. Please refer to the program website for further details.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 563
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 84
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** The Plan B project is carried out under the direction of a faculty member. It can be literature-based or lab-based with a testable hypothesis and a final paper of 30-50 pages in length, which is an in-depth examination and analysis of a particular area, problem, technique, etc.

**Plan C:** Plan C requires 30 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** The Plan C requirement is the Capstone course APS 8003.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The program includes coursework, independent study, and a project for Plan B master's students or capstone course for Plan C master's students. With guidance from program advisors, students complete 30 credits. MBS candidates may transfer up to 12 credits into the program. Foundation credits may be waived or substituted if the student can show proficiency in the subject area. A bioethics requirement may be met with a credit or non-credit course. Coursework is taken from the regular graduate-level coursework. An overall GPA of 3.00 is required for the degree to be awarded.

**Introductory Course (1 credit)**

- APS 8001 - Introduction to Research in the Biological Sciences (1.0 cr)

**Biochemistry Foundation (3 credits)**

- BIOC 6021 - Biochemistry (3.0 cr)

**Biological Sciences Courses (17 - 23 credits)**

Courses in the student's area of concentration within the biological sciences chosen in consultation with student's advisor. One course in at least two of the following areas should be taken: Molecular Biosciences, Cellular and Organismal Biology, Environmental and Population Biology. Up to 7 credits of directed research or directed study courses can be included. Plan C students MUST take at least 1 credit of APS 8110.

Take 17 - 23 credit(s) from the following:

- Courses in the student's area of concentration within the biological sciences chosen in consultation with student's adviser.

**Electives (0 - 6 credits)**

Elective courses outside the biological sciences chosen with student's advisor.

Take 0 - 6 credit(s) from the following:

- Electives courses outside the biological sciences chosen with student's adviser.

**Final Project or Capstone (3 credits)**

Plan B students take APS 8002 in their final semester.

Plan C students take APS 8003 in their final semester.

- APS 8002 - Final Project Course for Plan B MBS Students (2.0 - 3.0 cr)
- **or APS 8003 - Capstone Course for Plan C MBS Students (2.0 - 3.0 cr)**
**Twin Cities Campus**

**Biological Sciences Minor**

CCAPS Graduate Programs Instruction

**College of Continuing and Professional Studies**

Link to a list of faculty for this program.

**Contact Information:**
College of Continuing and Professional Studies, Master of Biological Sciences Program, 20 Ruttan Hall, 1994 Buford Ave, St. Paul, MN 55108 (612-624-4000, fax: 612-626-2800)
Email: ccapsmb@mns.edu
Website: https://ccaps.umn.edu/biological-sciences-masters-degree

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: This program is not currently accepting students. Please contact the College of Continuing and Professional Studies for more information about the status of this program.

**Program Delivery**
This program is available:
* via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
Twin Cities Campus
Horticulture M.P.S.
CCAPS Graduate Programs Instruction
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
Email: ccapshort@umn.edu
Website: https://ccaps.umn.edu/horticulture-masters-degree

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Professional Studies

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of professional studies in horticulture is designed to enhance the capacity of those currently working in the horticulture industry and to provide the knowledge base needed by others interested in beginning new careers, starting their own business, or pursuing personal interests in horticulture. The degree provides a solid foundation of contemporary horticultural knowledge, yet is flexible enough to allow individuals to focus on the specific skills they wish to hone.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

To be admitted, students must have a bachelor's degree from an accredited post-secondary U.S. institution or its foreign equivalent.

Other requirements to be completed before admission:
Evidence of knowledge of current, introductory, college-level concepts of algebra, chemistry, biology, botany, or plant propagation is required for admission to the program. Prerequisite coursework may be completed at the University of Minnesota or at other educational institutions subject to transfer review. In all cases, documentation of completed, equivalent coursework combined with professional experience will be considered for application toward fulfillment of the prerequisites for admission to the M.P.S. in Horticulture. A minimum grade of C will be the standard for admission for all prerequisite coursework. Undergraduate prerequisite coursework must come from the following areas: algebra, chemistry, biology, botany, or plant propagation. Please refer to the program website for further details.

Special Application Requirements:
The application package must include official transcripts of all baccalaureate and post-baccalaureate work, a current resume, two letters of reference, a written statement of purpose (no more than two pages) which addresses pertinent aspects of the student’s background and academic qualifications as related to admission to the program and demonstrates a strong interest in horticultural science including documentation of any relevant experiences in the field of horticulture. Application deadlines are in spring for fall semester admission, and in fall for spring semester admission. Refer to the program website for further details.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 563
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5

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Information current as of August 31, 2018
Program Requirements

Plan C: Plan C requires 30 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: See department for more details.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

Students who have not completed relevant introductory coursework in soils, plant pathology, and entomology, either during or subsequent to completion of their bachelor's degree, will be required to complete courses in these areas as part of their M.P.S. degree requirements. These courses are not prerequisites for admission. Depending on the specific courses included in the student's program, some additional coursework may also be required over and above the 30 graduate credits required for the degree.

All prerequisites associated with courses included in the student's course program must be completed as part of the student's degree requirements, unless exempted in writing by the instructor for the course and approved by the student's advisor and the program director of graduate studies (DGS) prior to taking the course.

Excluding the capstone course, a maximum of 3 credits taken S/N may be applied toward the minimum requirements for the degree.

The student's course program must be approved by the DGS and M.P.S. Steering Committee.

Only coursework for which the student has earned a grade of B- or better will be counted toward the minimum of 30 semester credits required for the degree.

Horticulture Coursework (15 credits)

15 credits of Horticulture (HORT) courses are required. A maximum of 9 credits total at the 4xxx level may be applied to the program in consultation with the student's advisor. A maximum of 3 credits of HORT 5090 Directed Studies may be used.

Take 15 or more credit(s) from the following:

• HORT 4xxx
• HORT 5xxx
• HORT 6003 - Masters of Professional Studies in Horticulture Professional Experience Program: Internship (1.0 - 3.0 cr)
• HORT 6011 - Plant Propagation (4.0 cr)
• HORT 8xxx

Related Fields (12 credits)

Select at least 12 credits, such as the following, from related fields coursework offered across the University. Other courses can be selected in consultation with the advisor. A maximum of 9 total credits at the 4xxx level, in consultation with the advisor, can be applied to program requirements.

Take 12 or more credit(s) from the following:

• AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
• APS 5103 - Integration of Sustainable Agriculture Concepts (3.0 cr)
• APS 5101 - Ecological Design for Horticulture (3.0 cr)
• APS 5102 - Garden Design: Theory and Application (2.0 cr)
• ENT 5011 - Insect Structure and Function (4.0 cr)
• ENT 5021 - Insect Biodiversity and Evolution (4.0 cr)
• ENT 5051 - Scientific Illustration of Insects (3.0 cr)
• ENT 5081 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
• ENT 5121 - Applied Experimental Design (4.0 cr)
• ENT 5341 - Biological Control of Insects and Weeds (3.0 - 4.0 cr)
• ENT 5361 - Aquatic Insects (4.0 cr)
• HORT 4xxx
• HORT 5xxx

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Information current as of August 31, 2018
PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
PLPA 5202 - Field Plant Pathology (2.0 cr)
PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
PLPA 5300 - Current Topics in Molecular Plant Pathology (1.0 cr)
PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)
PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
PLPA 5480 - Principles of Plant Pathology (3.0 cr)
PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
PLPA 8005 - Supervised Classroom or Extension Teaching Experience (1.0 - 2.0 cr)
PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
SOIL 4xxx
SOIL 5xxx
HORT 6011 - Plant Propagation (4.0 cr)
HORT 8xxx

Capstone: HORT 6002 (3 credits)
Intended as a capstone experience that integrates the knowledge gained from coursework, personal research, and the student's academic and professional experiences. Enrollment is limited to students who have completed 18 or more credit hours. Students should register for 3 credits.
HORT 6002 - Problem Solving in Horticulture (3.0 cr)
Twin Cities Campus
Human Sexuality Post-baccalaureate Certificate
CCAPS Graduate Programs Instruction
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
Phone: 612-624-4000
Email: ccapsinfo@umn.edu
Website: https://ccaps.umn.edu/human-sexuality-certificate

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Human Sexuality Postbacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human sexuality and associated gender roles and sexual behavior are an integral part of health care, clinical and social sciences, biological sciences, and a determinant of population dynamics and population science. The HIV pandemic, and the prevalence of sexually transmitted infections (STIs) worldwide, make training in human sexuality an essential component of international development, reproductive and population health, and social policy. Sexual health issues are often part of a clinically oriented medical curriculum, and this online certificate broadens human sexuality education to a wider audience across the US and internationally. Completing this coursework will fulfill part of the requirements towards AASECT certification for sex educators in the components of core knowledge and sexuality education training.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have a bachelors degree from an accredited post-secondary US institution or an international equivalent.

Other requirements to be completed before admission:
Online Application through Apply Yourself
Online application fee of $75 ($95 for international students)
Resume or CV
Personal Statement (1-2 pages)
Two letters of recommendation from academic or professional references

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
• IELTS
  - Total Score: 65
  - Reading Score: 6.5
  - Writing Score: 6.5
• MELAB
  - Final score: 84

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Foundations of Human Sexuality (3 credits)
- Required foundations of human sexuality course.
  HSEX 6001 - Foundations of Human Sexuality (3.0 cr)

Electives (9 credits)
- Elective coursework in human sexuality. Under exceptional circumstances and with the permission of the director of graduate studies, students may substitute elective credits from other graduate level coursework in human sexuality.
  HSEX 6011 - Policy in Human Sexuality: Cutting Edge Analyses (3.0 cr)
  HSEX 6012 - Sexual Function and Dysfunction (3.0 cr)
  HSEX 6013 - Perspectives and Practices in Sexuality Education (3.0 cr)
Twin Cities Campus
Integrated Behavioral Health M.P.S.
CCAPS Addiction Studies
College of Continuing and Professional Studies

Link to a list of faculty for this program.

Contact Information:
College of Continuing and Professional Studies Information Center, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN, 55108 (612-624-4000)
Email: ccapsinfo@umn.edu
Website: https://ccaps.umn.edu/integrated-behavioral-health-masters-degree

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Master of Professional Studies

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The high prevalence of co-occurring mental health and substance use disorders virtually guarantees that counselors, no matter the treatment setting, will encounter clients struggling with not one, but two or more disorders.

The master of professional studies in integrated behavioral health (IBH) prepares counselors for this clinical reality. The IBH degree merges mental health and substance abuse education and training into a single, comprehensive and cohesive program. This synthesis represents an important and pioneering shift in the preparation of clinicians.

The IBH is designed to fulfill education and training requirements for two licenses: Licensed Professional Clinical Counselor (LPCC) and Licensed Alcohol and Drug Counselor (LADC).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
- Bachelor's degree from an accredited institution
- Transcripts
- Personal statement
- Two letters of reference
- Updated resume or CV

Special Application Requirements:
International students interested in the master of professional studies in integrated behavioral health should contact the International Student and Scholar Service (http://www.isss.umn.edu) for information on visa status and academic requirements.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 84
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 563
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
- Final score: 84

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 60 major credits and 0 credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: Satisfactory completion of a portfolio demonstrates the student's clinical conceptualization and practice skills through the following:

- A client case study that includes an assessment and treatment plan
- A videotaped treatment session with a mock client
- A philosophy of counseling statement outlining the student's theoretical orientation to counseling and specific applications of his/her counseling philosophy to the population she/he intends to serve
- Evaluations outlining areas of competence and skill as assessed by internship site supervisor
- Self-selected papers and projects from program coursework that demonstrate the student's mastery of knowledge and skills

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

In addition to course work, an 880-hour field placement is required to complete the degree. The credit and field placement requirements are designed to fulfill licensing requirements as defined in the Minnesota Statutes, section 148B.54, subdivision 2; and Minnesota Rules, part 2150.2500 to 2150.2660. As noted in the statute, "The national trend for master's programs in counseling is towards 60 semester credits." In order for a practitioner to be eligible for third party reimbursement for services, the practitioner must demonstrate a minimum of 60 semester graduate level credits in counseling coursework.

Students may take one or more courses per term and have up to five years to complete a master's degree. Students who wish to transfer graduate-level coursework from other institutions should contact the Graduate Programs office at ccapsinfo@umn.edu for information and assistance.

Only coursework for which the student has earned a grade of B- or better will be counted toward the minimum of 60 semester credits required for the degree.

Foundation Courses (10 credits)

These courses are prerequisites for most other courses in the program. They should be the first courses students complete.

- ADDS 5011 - Foundations in Addiction Studies (2.0 cr)
- ADDS 5021 - Introduction to Evidence Based Practices and the Helping Relationship (3.0 cr)
- ADDS 5031 - Applied Psychopharmacology (2.0 cr)
- IBH 6111 - Research and Evaluation Methods (3.0 cr)

Prerequisites for First Internship (14 credits)

These courses (along with "Foundation Courses" ADDS 5011, 5021, 5031, and IBH 6111) must be completed before students can register for the first internship ADDS 5996.

Either ADDS 5071 or ADDS 5081 may be taken concurrently with the internship.

- ADDS 5041 - Methods and Models I: Motivational Counseling (2.0 cr)
- ADDS 5061 - Foundations of Group Work (3.0 cr)
- ADDS 5071 - Foundations of Co-occurring Disorders (2.0 cr)
- ADDS 5081 - Multicultural Foundations of Behavioral Health (3.0 cr)
- ADDS 5091 - Assessment and Treatment Planning I (3.0 cr)
- ADDS 5121 - Professional Seminar 1 (1.0 cr)

First Internship (2 credits)

Two credits (440 field hours) of ADDS 5996 must be completed near the program's mid-way point.

- ADDS 5996 - Internship in Behavioral Health (1.0 - 4.0 cr)

Prerequisites for Second Internship (21 credits)

These courses must be completed before students can register for the second internship IBH 6996.

- ADDS 5051 - Methods and Models II: Cognitive Behavioral Therapy (2.0 cr)
IBH 6011 - Foundations in Differential Diagnosis (3.0 cr)
IBH 6022 - Foundations of Psychological Assessment (2.0 cr)
IBH 6031 - Methods and Models IV: Trauma and Anxiety, Assessment and Treatment Intervention (2.0 cr)
IBH 6061 - Applied Advanced Diagnostics I (2.0 cr)
IBH 6071 - Advanced Professional Issues (3.0 cr)
IBH 6081 - Human Lifespan Development and Behavioral Health (3.0 cr)
IBH 6101 - Family Dynamics and Therapy (3.0 cr)
IBH 6121 - Professional Seminar 2 (1.0 cr)

Second Internship (2 credits)
Two credits (440 field hours) of IBH 6996 must be completed near the end of the program.
IBH 6996 - Internship for Integrated Behavioral Health (1.0 - 4.0 cr)

Additional Required Courses (4 credits)
Additional required courses. Can be taken any time.
IBH 6051 - Advanced Group Practice (2.0 cr)
IBH 6091 - Intersection of Career and Mental Health (2.0 cr)

Electives (6 credits)
Electives not on this list must be preapproved.
Take 6 or more credit(s) from the following:
• ADDS 5996 - Internship in Behavioral Health (1.0 - 4.0 cr)
• HSEX 6001 - Foundations of Human Sexuality (3.0 cr)
• HSEX 6012 - Sexual Function and Dysfunction (3.0 cr)
• HSEX 6013 - Perspectives and Practices in Sexuality Education (3.0 cr)
• IBH 6021 - Methods and Models III: Synthesis Seminar in Client Centered Care (2.0 cr)
• IBH 6032 - Advanced Multicultural Practice (1.0 cr)
• IBH 6041 - Prolonged Exposure Therapy for PTSD (2.0 cr)
• IBH 6062 - Applied Advanced Diagnostics II (2.0 cr)
• IBH 6221 - Applications of Counseling Theories (2.0 cr)
• IBH 6222 - Adolescents and Co-occurring Substance Use and Mental Health Disorders (3.0 cr)
• IBH 6227 - Supervision Models and Methods in Integrated Behavioral Health (3.0 cr)
• IBH 6228 - Mental Health and Addiction Program Administration (2.0 cr)
• IBH 6230 - Clinical Application in Prolonged Exposure Therapy (3.0 cr)
• IBH 6232 - Introduction to Navigating Issues of Sexual Health and Gender in the Therapy Session (2.0 cr)
• IBH 6233 - DBT Skills Training: Group Practices and Treatment Modalities (2.0 cr)
• IBH 6234 - Counseling Grief and Loss (2.0 cr)
• IBH 6910 - Topics in Integrated Behavioral Health (1.0 - 4.0 cr)
• IBH 6993 - Directed Study in Integrated Behavioral Health (1.0 - 3.0 cr)
• IBH 6996 - Internship for Integrated Behavioral Health (1.0 - 4.0 cr)

Portfolio (1 credit)
Required portfolio course
IBH 8002 - Portfolio Seminar (1.0 cr)
Advanced Wearable Products Post-Baccalaureate Certificate

Design, Housing & Apparel

College of Design

Link to a list of faculty for this program.

Contact Information:
240 McNeal Hall, 1985 Buford Ave, St. Paul, MN 55108
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad/index.html

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2018
• Length of program in credits: 12
• This program does not require summer semesters for timely completion.
• N/A
• Degree: Advanced Wearable Products PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Advanced Wearable Products certificate is a supplemental curriculum intended to provide and deepen interdisciplinary skills and knowledge related to the design, development, and assessment of wearable functional products including wearable technology, functional clothing, and personal protective equipment.

Accreditation
This program is accredited by N/A

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Required: undergraduate degree in a related discipline.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Coursework
Take 12 or more credit(s) from the following:
• DES 5185 - Human Factors in Design (3.0 cr)
• APST 5224 - Functional Clothing Design (4.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• ADES 4196 - Internship in Apparel Design (1.0 - 4.0 cr)
• DES 5188 - Anthropometrics, Sizing & Fit (4.0 cr)
Twin Cities Campus
Architecture M.Arch.
School of Architecture
College of Design

Contact Information:
School of Architecture, College of Design, University of Minnesota, 145 Rapson Hall, 89 Church Street S.E., Minneapolis, MN 55455
(612-624-7866; fax: 624-5743)
Website: http://arch.design.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 59 to 90
- This program does not require summer semesters for timely completion.
- Degree: Master of Architecture

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Architecture encompasses the making and study of the buildings and environments that we inhabit. The concerns of architecture involve a wide variety of areas of study, including the art of representing built projects through drawings and computer graphics; the technology of building structure, building materials, and natural and mechanical systems; the history, theory, and art of making, using, and understanding buildings as cultural artifacts for human use; and the practice of architecture in the context of sustainable environmental systems, urban form, and business economics. The School of Architecture offers one accredited professional degree, the Master of Architecture (M.Arch.), and a non-professional research degree, the Master of Science (MS) in architecture, with four potential tracks: heritage conservation and preservation, metropolitan design, research practices, and sustainable design.

The Master of Architecture degree is the accredited three-year professional program that prepares students for licensure and practice in the discipline of architecture as a speculative, analytic, and investigative endeavor. Through rigorous methods of inquiry developed in the design studio, lectures, and seminars students acquire the breadth of knowledge required of the professional architect, including: the techniques and processes of representation, communication, and analysis; the history and theory of making architecture and urban form for human use; and the technology, systems, processes, and economics of construction and practice. The 90-credit M.Arch. professional degree program is accredited by the National Architectural Accrediting Board (NAAB). A portfolio for admission is required.

The Master of Science in architecture is a nonprofessional degree offering advanced studies and research methods in heritage conservation and preservation, metropolitan design, research practices, or sustainable design. The nonprofessional MS in architecture seeks advanced students from architecture, building science, art history, geography, archaeology, landscape architecture, environmental design, or related disciplines to pursue multidisciplinary graduate study and research in sustainable building practices and historic preservation. The School of Architecture also offers a concurrent degree program that combines the M.Arch. professional degree and the MS in architecture. Students may take a total of 24 credits in common between the two academic programs. See information on the MS in architecture for degree requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
- Total Score: 6.5
- MELAB
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 59 to 90 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

**Capstone Project:** The Master's Final Project is a 10-credit studio-based design exploration under the supervision of a studio faculty mentor.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Advanced placement into the second year is possible for students with a Bachelor of Science or other pre-professional degree and excellent English language proficiency.

**Required Coursework (61 credits)**

Take the following required courses for a total of 61 credits:

- ARCH 5411 - Principles of Design Theory (3.0 cr)
- ARCH 5412 - Architecture: A Global and Cultural History (3.0 cr)
- ARCH 5561 - Tech 1, Structures for Building (3.0 cr)
- ARCH 5562 - Tech 2, Intro to Building Technology (3.0 cr)
- ARCH 5563 - Tech 3: Advanced Building Technology Integrated Building Systems (3.0 cr)
- ARCH 5564 - Tech 4: Building Structural Systems (3.0 cr)
- ARCH 5621 - Professional Practice in Architecture (3.0 cr)
- ARCH 8251 - Graduate Architectural Design I (9.0 cr)
- ARCH 8253 - Graduate Architectural Design II (6.0 cr)
- ARCH 8255 - Graduate Architectural Design III (6.0 cr)
- ARCH 8299 - Master's Final Project (10.0 cr)
- ARCH 5518 - Environmental Technology: Integrative Ecological Design for Responsive Architecture (3.0 cr)
- ARCH 5413 - Modern and Contemporary Global Architecture (3.0 cr)
- ARCH 8254 - Technical Applications in Design (3.0 cr)
- ARCH 5563 - Tech 3: Advanced Building Technology Integrated Building Systems (3.0 cr)

**Project Modules (9 credits)**

Take 9 credits (3 courses) from the following:

- ARCH 5250 - Advanced Topics in Design (1.0 - 6.0 cr)
- or ARCH 8250 - Advanced Topics in Design (1.0 - 6.0 cr)

**Catalysts (2 credits)**

Take the following course twice for a total of 2 credits:

- ARCH 5110 - Architecture as Catalyst (1.0 cr)

**Electives (18 credits)**

Take 18 credits of Architecture electives. At least 3 credits must be in ARCH 54xx or 84xx.

- Arch 5xx
- or Arch 8xxx

**Advanced Standing (59 credits)**

Students with a Bachelor of Science in Architecture may be eligible for a waiver of the required first-year coursework.

**Required Courses (40 credits)**

Take the following courses for 40 credits:

- ARCH 5563 - Tech 3: Advanced Building Technology Integrated Building Systems (3.0 cr)
- ARCH 5564 - Tech 4: Building Structural Systems (3.0 cr)
- ARCH 5621 - Professional Practice in Architecture (3.0 cr)
ARCH 8253 - Graduate Architectural Design III (6.0 cr)
ARCH 8255 - Graduate Architectural Design V (6.0 cr)
ARCH 8299 - Master's Final Project (10.0 cr)
ARCH 8254 - Technical Applications in Design (3.0 cr)
ARCH 5411 - Principles of Design Theory (3.0 cr)
ARCH 5413 - Modern and Contemporary Global Architecture (3.0 cr)

**Project Modules (3 credits)**
Take one of the following courses once for 3 credits:
ARCH 5250 - Advanced Topics in Design (1.0 - 6.0 cr)
or ARCH 8250 - Advanced Topics in Design (1.0 - 6.0 cr)

**Catalysts (1 credit)**
Take the following course for 1 credit:
ARCH 5110 - Architecture as Catalyst (1.0 cr)
Take 15 credits of Architecture electives. At least 3 credits must be in ARCH 54xx or 84xx.
Arch 5xxx
or Arch 8xxx

**Joint- or Dual-degree Coursework:** M.Arch/M.S.-Architecture
Student may take a total of 24 credits in common among the academic programs.
Twin Cities Campus
Architecture M.S.
School of Architecture
College of Design

Link to a list of faculty for this program.

Contact Information:
School of Architecture, University of Minnesota, 145 Rapson Hall, 89 Church Street SE, Minneapolis, MN 55455 (612-624-7866; fax: 612-624-5743)
Email: archinfo@umn.edu
Website: http://arch.cdes.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Architecture offers four distinct master of science in architecture degrees:
1) MS in architecture, sustainable design track (plan A or B);
2) MS in architecture, heritage conservation and preservation track (plan A or B);
3) MS in architecture, metropolitan design track (plan A, B, or C); and,
4) MS in architecture, research practices track (plan C only).

Each of the above has its own unique application requirements, prerequisites, and curriculum structure. Prospective applicants are encouraged to consult the degree programs section of the School of Architecture website for additional information: http://arch.design.umn.edu. Students who successfully complete the a master of science in architecture degree are eligible to receive 936 hours of IDP credit that is 17% of the 5,600 hours of mandatory internship for registration as an architect. To receive the IDP credit, the MS degree must be earned after receiving the M.Arch degree. The MS metropolitan design track requires summer semester coursework. The other three MS tracks do not require summer semester work.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Each of the master of science in architecture programs has its own unique application requirements, prerequisites, and curriculum structure. Prospective applicants are encouraged to consult the degree programs section of the School of Architecture website for additional information: http://arch.design.umn.edu.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS
- MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 27 to 28 major credits and 6 credits outside the major. The final exam is oral.

Plan C: Plan C requires 24 to 30 major credits and 0 to 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Joint- or Dual-degree Coursework: M.Arch/MS-ArchitectureMLA/MS-Architecture Student may take a total of 24 credits in common among the academic programs.

Program Sub-plans

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Sustainable Design

This sub-plan is limited to students completing the program under Plan A or Plan B.

The sustainable design track of the MS admits from diverse design and environmental backgrounds. Candidates for the program include, practicing design professionals, architecture graduate students, engineering and environmental science professionals, and related disciplines. Ideal applicants will have a clear sustainable design research agenda, experience in environmental design or design production, and a desire to develop new knowledge in the sustainable design field.

The sustainable design track’s goals are to foster sustainable design education, research, and practice and to create a significant positive impact on sustainable design in the region and nation. It will achieve these goals by providing courses and research opportunities that:

- Promote excellence and innovations in regional and global ecological design practice and research.
- Contribute to the evolving and emerging sustainable design practice and research knowledge base, which includes ecological, environmental, social, and economic issues and impacts.
- Provide architectural designers and researchers with qualitative and quantitative knowledge, methods, and tools to implement sustainable design in professional practice.

Required Coursework

Take the following courses for a total of 12 credits:

- ARCH 8561 - Sustainable Design Theory and Practice (3.0 cr)
- ARCH 8567 - Site and Water Issues in Sustainable Design (3.0 cr)
- ARCH 8563 - Energy and Indoor Environmental Quality Issues in Sustainable Design (3.0 cr)
- ARCH 8565 - Materials Performance in Sustainable Building (3.0 cr)

Architecture Electives

Take at least 6 ARCH elective credits, in consultation with the advisor or director of graduate studies.

Arch Electives

Take 6 - 7 credit(s) from the following:

- ARCH 5521 - Material Investigation: Concrete (4.0 cr)
- ARCH 5523 - Material Investigation: Steel and Glass (4.0 cr)
- ARCH 5527 - Material Investigations: Stone and Water (4.0 cr)
- ARCH 5541 - Material Strategies (3.0 cr)

Electives Outside Architecture

Take at least 6 credits outside the major, in consultation with the advisor or director of graduate studies.

Take 6 - 7 credit(s) from the following:

- SSM 5414 - Advanced Residential Building Science (4.0 cr)
- DES 5168 - Evidence-Based Design (3.0 cr)
- EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
- ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
- ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
- ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5605 - Recycling: Extending Raw Materials Supplies (3.0 cr)
• HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
• LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
• LA 5514 - Making the Mississippi (3.0 cr)
• PA 5211 - Land Use Planning (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
• PA 5511 - Community Economic Development (3.0 cr)
• PA 5721 - Energy Systems and Policy (3.0 cr)
• PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
• PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)

Plan A Requirements
Take 10 master's thesis credits.
ARCH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B Requirements
Take at least 10 additional credits, in consultation with the advisor or director of graduate studies.

Additional credits
Take 10 - 11 credit(s) from the following:
• ARCH 5521 - Material Investigation: Concrete (4.0 cr)
  or ARCH 5523 - Material Investigation: Steel and Glass (4.0 cr)
  or ARCH 5527 - Material Investigations: Stone and Water (4.0 cr)
  or ARCH 5541 - Material Strategies (3.0 cr)
  or SSM 5414 - Advanced Residential Building Science (4.0 cr)
  or DES 5188 - Evidence-Based Design (3.0 cr)
  or ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
  or ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
  or ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
  or ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
  or ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
  or ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
  or ESPM 5605 - Recycling: Extending Raw Materials Supplies (3.0 cr)
  or HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
  or LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
  or LA 5514 - Making the Mississippi (3.0 cr)
  or PA 5211 - Land Use Planning (3.0 cr)
  or PA 5253 - Designing Planning and Participation Processes (3.0 cr)
  or PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
  or PA 5511 - Community Economic Development (3.0 cr)
  or PA 5721 - Energy Systems and Policy (3.0 cr)
  or PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
  or PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
  or PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)

Heritage Conservation & Preservation
This sub-plan is limited to students completing the program under Plan A or Plan B.

The heritage conservation and preservation track of the Architecture MS offers courses and research opportunities in the study of the preservation of historic buildings, districts, and landscapes, as well as the design and management of cultural heritage sites. The track explores heritage on several distinct but related levels. It examines the materiality of heritage resources through documentation, diagnosis, and the design of treatment interventions. It also encourages critical analysis and assessment of the cultural values that underlie and define preservation policies, laws, and professional norms. Through fieldwork, case studies, and courses that investigate regional, national, and global heritage, the track focuses on the philosophy, policy, technology, economics, and social implications of heritage preservation.

Required Coursework
Take the following courses for a total of 6 credits:

ARCH 5671 - Historic Preservation (3.0 cr)
ARCH 5673 - Historic Property Research and Documentation (3.0 cr)

Heritage Conservation and Preservation Electives
Take 2 courses from the following list for at least 6 credits:
ARCH 5410 - Topics in Architectural History (3.0 cr)
ARCH 5411 - Principles of Design Theory (3.0 cr)
ARCH 5412 - Architecture: A Global and Cultural History (3.0 cr)
ARCH 5670 - Topics in Historic Preservation (1.0 - 3.0 cr)
ARCH 5672 - Historic Building Conservation (3.0 cr)
ARCH 5674 - World Heritage Conservation (3.0 cr)
ARCH 5676 - Economics of Heritage Preservation (3.0 cr)
ARCH 5677 - Preservation of the Vernacular Built Environment and Cultural Landscape (3.0 cr)
ARCH 5678 - Preservation & Sustainability (3.0 cr)

Architecture Electives
Take at least 6 ARCH elective credits, in consultation with the advisor or director of graduate studies.
Take 6 - 7 credit(s) from the following:
- ARCH 5441 - Minnesota: Architecture and Landscapes (3.0 cr)
- ARCH 5711 - Theory and Principles of Urban Design (3.0 cr)
- ARCH 4435 - History of American Architecture (3.0 cr)
- ARCH 5609 - Development and Implementation of Research (3.0 cr)

Electives Outside Architecture
Take at least 6 credit(s) outside the major, in consultation with the advisor or director of graduate studies.
Take 6 - 7 credit(s) from the following:
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
- LA 5514 - Making the Mississippi (3.0 cr)
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- PA 5221 - Private Sector Development (3.0 cr)
- PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)
- MST 5011 - Museum History and Philosophy (3.0 cr)
- MST 5012 - Museum Practices (3.0 cr)

Plan A Requirements
Take 10 master's thesis credits.
ARCH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B Requirements
Take an additional 9 to 10 credits, in consultation with the advisor or director of graduate studies.
Take 9 - 10 credit(s) from the following:
- ARCH 5441 - Minnesota: Architecture and Landscapes (3.0 cr)
- ARCH 5711 - Theory and Principles of Urban Design (3.0 cr)
- ARCH 5435 - History of American Architecture (3.0 cr)
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
- LA 5514 - Making the Mississippi (3.0 cr)
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- PA 5221 - Private Sector Development (3.0 cr)
- PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)
- MST 5011 - Museum History and Philosophy (3.0 cr)
- MST 5012 - Museum Practices (3.0 cr)

Metropolitan Design
This sub-plan is limited to students completing the program under Plan A, Plan B, or Plan C.

The metropolitan design track of the architecture MS is an advanced program intended for individuals who are keenly interested in the study of cities and their metropolitan regions. The track combines strong design instruction supported by applied research courses in urban design history and theory. The objective is to train students to work across a large range of urban scales and become familiar with the social, ecological, economic, and political interactions that eventually shape the quality of city living. It is open to professionals from the design disciplines and provides concurrent options for graduate students enrolled in the M.Arch and MLA professional programs. Concurrent students must graduate from the Architecture MS (metropolitan design track) after they have successfully completed their professional programs.

Required Coursework
Take the following courses for a total of 12 credits:
ARCH 5711 - Theory and Principles of Urban Design (3.0 cr)
ARCH 5721 - Case Studies in Urban Design (3.0 cr)
ARCH 8255 - Graduate Architectural Design V (6.0 cr)

Electives Outside Architecture
Take at least 6 credits outside the major, in consultation with the advisor or director of graduate studies.
Take 6 - 7 credit(s) from the following:
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)
- HSG 5463 - Housing Policy (3.0 cr)
- LA 5405 - Interdisciplinary Studies in Landscape Architecture (1.0 - 6.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- PA 5721 - Energy Systems and Policy (3.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5723 - Water Policy (3.0 cr)
- PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5212 - Managing Urban Growth and Change (3.0 cr)
- PA 5231 - Transit Planning and Management (3.0 cr)
- PA 5261 - Housing Policy (3.0 cr)
- PA 5802 - Global Economic Policy (3.0 cr)
- PA 8202 - Networks and Places: Transportation, Land Use, and Design (4.0 cr)

Remaining Electives
Take elective credits from the following list, in consultation with the advisor or director of graduate studies, to meet minimum major and total course credit requirements:
Take 6 - 7 credit(s) from the following:
- ARCH 5410 - Topics in Architectural History (3.0 cr)
- ARCH 5441 - Minnesota: Architecture and Landscapes (3.0 cr)
- ARCH 5731 - Territorial City (3.0 cr)
- ARCH 5671 - Historic Preservation (3.0 cr)
- ARCH 5361 - 3-D Computer Architectural Modeling and Design (3.0 cr)
- ARCH 5750 - Topics in Urban Design (1.0 - 4.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)
- LA 5405 - Interdisciplinary Studies in Landscape Architecture (1.0 - 6.0 cr)
- ARCH 8561 - Sustainable Design Theory and Practice (3.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- PA 5721 - Energy Systems and Policy (3.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5723 - Water Policy (3.0 cr)
- PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5212 - Managing Urban Growth and Change (3.0 cr)
- PA 5231 - Transit Planning and Management (3.0 cr)
- PA 5261 - Housing Policy (3.0 cr)
- PA 5802 - Global Economic Policy (3.0 cr)
- PA 8202 - Networks and Places: Transportation, Land Use, and Design (4.0 cr)

Plan A Requirements
Take 10 master's thesis credits.
ARCH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Research Practices
This sub-plan is limited to students completing the program under Plan C.

The Research Practices track addresses two goals: providing a structured path to licensure totaling seven years, and integrating research with practice.

MS-RP students are required to maximize their progress toward completing the Architectural Experience Program (AXP) during their MS program. This means work in a firm or other AXP setting is required while enrolled in the program, including each semester and summer between semesters. Exceptions will be made for extraordinary circumstances (such as grant-funded research or personal
situation).

**Required Coursework**
Take the following courses for a total of 18 credits:
ARCH 5609 - Development and Implementation of Research (3.0 cr)
ARCH 5621 - Professional Practice in Architecture (3.0 cr)
ARCH 5651 - Building Stories (3.0 cr)
ARCH 5686 - Research Practices Final Project: Research into Practice (4.0 cr)
ARCH 5687 - Research Practices Final Project: Practice into Research (4.0 cr)
ARCH 5688 - Research Practices Final Project: Representation of Case Studies (1.0 cr)

**Required Practicum**
Take the following course twice:
ARCH 5630 - Practicum: Advanced Issues in Practice (3.0 cr)

**Electives**
Take two 3-credit elective courses from architecture or non-architecture offerings, in consultation with the adviser or director of graduate studies.
ARCH 5xxx
ARCH 8xxx
xxxx 5xxx
xxxx 6xxx
xxxx 7xxx
xxxx 8xxx
Twin Cities Campus
Design M.A.
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The design graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the arts and social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

Applications submitted to the design graduate program specify a track and degree objective. Formal tracks are:
- Apparel studies (including dress, history, and culture; product development; and retail merchandising and consumer studies)
- Graphic design
- Housing studies
- Interior design

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Eligibility requirements are located on the track pages of the design graduate program website:
http://dha.design.umn.edu/programs/grad.

Special Application Requirements:
Application requirements: http://dha.design.umn.edu/programs/grad/admissions.html

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language
Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 28 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students may be required to complete additional credits upon recommendation of their committee.

**Design Program Core Requirements**

DES 8181 - Research Ethics (1.0 cr)

**Related Field Coursework**

Students are required to take a minimum of 6 credits in a related field. Courses are selected with the approval of the advisor and committee.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Apparel Studies**

The apparel studies track advances both theoretical knowledge and applications for textile and apparel products and their relationship to human behavior using a design lens. Students may focus on product development; dress, history, and culture; or retail merchandising and consumer studies. Within each of these areas of emphasis within the track, the student completes related coursework as well as research or creative production that culminates in a thesis. The MA degree is focused on the arts and humanities and is appropriate for the dress, history, and culture emphasis.

**Evaluation and Analysis Coursework**

Students are required to take a minimum of 6 credits in evaluation and analysis. Students may take other courses with the approval of the advisor and committee.

Take 6 or more credit(s) from the following:

- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)

**Concentration**

**Dress, History, and Culture**

**Theory and Philosophy Coursework**

Students take a minimum of 3 credits in this category.

DES 8164 - Innovation Theory and Analysis (3.0 cr)

or DES 8112 - Design Theory (3.0 cr)

**Plan A Requirements**

Take 8 or more credit(s) from the following:

- APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
- APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)
- APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
- APST 8193 - Directed Study (1.0 - 3.0 cr)
• **APST 8267** - Dress and Culture (3.0 cr)
• **APST 8268** - Behavioral Aspects of Dress (3.0 cr)
• **DES 5165** - Design and Globalization (3.0 cr)
• **DES 8112** - Design Theory (3.0 cr)
• **DES 8113** - Teaching and Assessment (2.0 cr)
• **DES 8115** - Grant Writing (2.0 cr)
• **DES 8164** - Innovation Theory and Analysis (3.0 cr)
• **DES 8166** - Material Culture and Design (3.0 cr)
• **DES 8167** - Aesthetics of Design (3.0 cr)

**Thesis credits**
Students take a minimum of 10 thesis credits.
• **DES 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

or **Plan B Requirements**
All Plan B Master's students are required to register for DES 8222, Plan B Master's Project, the last semester of the program. Take 15 or more credit(s) from the following:
• **APST 5193** - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• **APST 5218** - Fashion, Design, and the Global Industry (3.0 cr)
• **APST 8192** - Readings in Apparel Studies (1.0 - 3.0 cr)
• **APST 8193** - Directed Study (1.0 - 3.0 cr)
• **APST 8267** - Dress and Culture (3.0 cr)
• **APST 8268** - Behavioral Aspects of Dress (3.0 cr)
• **DES 5165** - Design and Globalization (3.0 cr)
• **DES 8112** - Design Theory (3.0 cr)
• **DES 8113** - Teaching and Assessment (2.0 cr)
• **DES 8115** - Grant Writing (2.0 cr)
• **DES 8164** - Innovation Theory and Analysis (3.0 cr)
• **DES 8166** - Material Culture and Design (3.0 cr)
• **DES 8167** - Aesthetics of Design (3.0 cr)

**Plan B Master's Project**
Students take a minimum of 3 credits in this category.
• **APST 8222** - Plan B Master's Project (3.0 cr)

-OR-

**Product Development**

**Theory and Philosophy Coursework**
Students take a minimum of 3 credits in this category.
• **DES 8112** - Design Theory (3.0 cr)
• **DES 8164** - Innovation Theory and Analysis (3.0 cr)

**Plan A Requirements**
Take 8 or more credit(s) from the following:
• **APST 5193** - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• **APST 5218** - Fashion, Design, and the Global Industry (3.0 cr)
• **APST 5224** - Functional Clothing Design (4.0 cr)
• **APST 8192** - Readings in Apparel Studies (1.0 - 3.0 cr)
• **APST 8193** - Directed Study (1.0 - 3.0 cr)
• **DES 5185** - Human Factors in Design (3.0 cr)
• **DES 8113** - Teaching and Assessment (2.0 cr)
• **DES 8114** - Design Studio (4.0 cr)
• **DES 8115** - Grant Writing (2.0 cr)
• **DES 8151** - Product Development: Theory and Practice (3.0 cr)
• **DES 8166** - Material Culture and Design (3.0 cr)
• **DES 8167** - Aesthetics of Design (3.0 cr)
• **GDES 8361** - Color, Design, and Human Perception (3.0 cr)

**Thesis Credits**
Students take a minimum of 10 thesis credits.
• **DES 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

or **Plan B Requirements**
Plan B Master's students are required to take DES 8222, Master's Plan B Project, the final semester of the program. Take 15 or more credit(s) from the following:
• **APST 5193** - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• **APST 5218** - Fashion, Design, and the Global Industry (3.0 cr)
• **APST 5224** - Functional Clothing Design (4.0 cr)
• **APST 8192** - Readings in Apparel Studies (1.0 - 3.0 cr)
• **APST 8193** - Directed Study (1.0 - 3.0 cr)
• **DES 5185** - Human Factors in Design (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8114 - Design Studio (4.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)

Plan B Master's Project
Students take a minimum of 3 credits in this category.
• APST 8222 - Plan B Master's Project (3.0 cr)

OR

Retail Merchandising and Consumer Studies

Theory and Philosophy Coursework
APST 8272 - Digital Consumers: Theories in Retail and Consumer Studies (3.0 cr)

Plan A Requirements
Take 8 or more credit(s) from the following:
• APST 5117 - Retail Environments and Human Behavior (3.0 cr)
• APST 5123 - Living in a Consumer Society (3.0 cr)
• APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
• APST 8193 - Directed Study (1.0 - 3.0 cr)
• APST 8267 - Dress and Culture (3.0 cr)
• APST 8268 - Behavioral Aspects of Dress (3.0 cr)
• APST 8271 - Retailing: Strategic Perspectives (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)

Thesis Credits
Students take a minimum of 10 thesis credits.
• DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

OR

Plan B Requirements
Plan B Master's students are required to take APST 8222, Master's Plan B Project, the final semester of the program. Take 15 or more credit(s) from the following:
• APST 5117 - Retail Environments and Human Behavior (3.0 cr)
• APST 5123 - Living in a Consumer Society (3.0 cr)
• APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
• APST 8193 - Directed Study (1.0 - 3.0 cr)
• APST 8267 - Dress and Culture (3.0 cr)
• APST 8268 - Behavioral Aspects of Dress (3.0 cr)
• APST 8271 - Retailing: Strategic Perspectives (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)

Plan B Master's Project
Students take a minimum of 3 credits in this category.
• APST 8222 - Plan B Master's Project (3.0 cr)

Graphic Design
The track in graphic design focuses on design theory, process, and methods related to design practice and research. Potential areas of study include graphic design history, theory, and critical narrative; design creativity; color and design; user-centered design; design authorship; data visualization; and interactive design.

Theory and Philosophy Coursework
Students take a minimum of 3 credits in this category.
• DES 8112 - Design Theory (3.0 cr)

OR

DES 8164 - Innovation Theory and Analysis (3.0 cr)

Evaluation and Analysis Coursework
Students take a minimum of 6 credits in this category.
DES 8102 - Quantitative Research Methods (3.0 cr)
or DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
or GDES 5388 - Graphic Design Research (3.0 cr)

Concentration

Plan A Requirements
Students are required to take DES 8114, and GDES 8361 or GDES 8362.
Take 8 or more credit(s) from the following:
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8114 - Design Studio (4.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• GDES 4131W - History of Graphic Design [WI] (4.0 cr)
• GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
• GDES 4345 - Advanced Typography (4.0 cr)
• GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
• GDES 5311 - Illustration (3.0 cr)
• GDES 5341 - Interactive Design (3.0 cr)
• GDES 5342 - Advanced Web Design (3.0 cr)
• GDES 5371 - Data Visualization Studio (3.0 cr)
• GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
• GDES 5383 - Digital Illustration and Animation (3.0 cr)
• GDES 5386 - Fundamentals of Game Design (3.0 cr)
• GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
• GDES 8193 - Directed Study (1.0 - 3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

Thesis Credits
Students take a minimum of 10 thesis credits.
• DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B Requirements
Students are required to take DES 8114, and GDES 8361 or GDES 8362. Plan B Master's students are required to take GDES 8222, Plan B Master's Project, the last semester of the program.
Take 15 or more credit(s) from the following:
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8114 - Design Studio (4.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• GDES 4131W - History of Graphic Design [WI] (4.0 cr)
• GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
• GDES 4345 - Advanced Typography (4.0 cr)
• GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
• GDES 5311 - Illustration (3.0 cr)
• GDES 5341 - Interactive Design (3.0 cr)
• GDES 5342 - Advanced Web Design (3.0 cr)
• GDES 5371 - Data Visualization Studio (3.0 cr)
• GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
• GDES 5383 - Digital Illustration and Animation (3.0 cr)
• GDES 5386 - Fundamentals of Game Design (3.0 cr)
• GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
• GDES 8193 - Directed Study (1.0 - 3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

Plan B Master's Project
Students take a minimum of 3 credits in this category.
• GDES 8222 - Plan B Master's Project (3.0 cr)

Housing Studies
The housing studies track advances both theoretical and applied knowledge in the housing field. Through research experiences, students are prepared to assist people and communities in addressing housing-related issues. Courses emphasize human needs and behavior, analysis of designed environments, policy and community development, and housing of specific subpopulations such as the elderly or low-income families with children.

Theory and Philosophy: Required Course
HSG 8467 - Theoretical Perspectives in Housing Studies (3.0 cr)

**Evaluation and Analysis Coursework**
Students take a minimum of 6 credits in this category.
Take 6 or more credit(s) from the following:
- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)

**Concentration**

**Plan A Requirements**
8 credits are required, including at least two courses from the following: HSG 5463, HSG 5467, and HSG 8463.
Take 8 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- HSG 4461 - Housing Development and Management (4.0 cr)
- HSG 4465 - Housing in a Global Perspective (3.0 cr)
- HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
- HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
- HSG 5462 - Housing and Community Development (3.0 cr)
- HSG 5463 - Housing Policy (3.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
- HSG 8170 - Topics in Housing Studies (1.0 - 3.0 cr)
- HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
- HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
- HSG 8193 - Directed Study (1.0 - 3.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)

**Thesis Credits**
Students take a minimum of 10 credits in this category.
DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

*OR*

**Plan B Requirements**
Students select at least two of the following courses: HSG 5463, HSG 5467, and HSG 8463.
Take 15 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- HSG 4461 - Housing Development and Management (4.0 cr)
- HSG 4465 - Housing in a Global Perspective (3.0 cr)
- HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
- HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
- HSG 5462 - Housing and Community Development (3.0 cr)
- HSG 5463 - Housing Policy (3.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
- HSG 8170 - Topics in Housing Studies (1.0 - 3.0 cr)
- HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
- HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
- HSG 8193 - Directed Study (1.0 - 3.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)

**Plan B Master's Project**
HSG 8222 - Plan B Master's Project (3.0 cr)

**Interior Design**
Graduate study in the interior design track emphasizes the theory, research, and specialized practice components of design as applied to people's health, safety, and welfare in the interior environment, including design education, sustainability, social/cultural issues, aspects of professional practice, and facilities research (educational, office, criminal justice, and residential). Students are prepared for teaching and research positions as well as design specializations within the profession.

**Theory and Philosophy Coursework**
- DES 8112 - Design Theory (3.0 cr)
- DES 8164 - Innovation Theory and Analysis (3.0 cr)
- DES 8166 - Material Culture and Design (3.0 cr)

**Evaluation and Analysis Coursework**
Students should take a minimum of six credits. Statistics course is required and either DES 8102 or DES 8103.

Take 6 or more credit(s) from the following:
- **DES 8102** - Quantitative Research Methods (3.0 cr)
- **DES 8103** - Qualitative and Mixed Methods Research (3.0 cr)
- **EPSY 5261** - Introductory Statistical Methods (3.0 cr)
- **EPSY 5262** - Intermediate Statistical Methods (3.0 cr)
- **EPSY 8252** - Statistical Methods in Education II (3.0 cr)
- **EPSY 8266** - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- **EPSY 8267** - Applied Multivariate Analysis (3.0 cr)

**Concentration**

Take 8 or more credit(s) from the following:
- **DES 5165** - Design and Globalization (3.0 cr)
- **DES 5168** - Evidence-Based Design (3.0 cr)
- **DES 5185** - Human Factors in Design (3.0 cr)
- **DES 8113** - Teaching and Assessment (2.0 cr)
- **DES 8115** - Grant Writing (2.0 cr)
- **IDES 8192** - Readings in Interior Design (1.0 - 3.0 cr)
- **IDES 8193** - Directed Study (1.0 - 3.0 cr)
- **GDES 8361** - Color, Design, and Human Perception (3.0 cr)

**Thesis Credits**
Students take a minimum of 10 credits in this category.

- **DES 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus
Design M.F.A.
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 60
• This program does not require summer semesters for timely completion.
• Degree: Master of Fine Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The design graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the arts and social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

Applications submitted to the design graduate program specify the track and degree objective.

The MFA is available in the graphic design track only.

The track in graphic design focuses on design theory, process, and methods related to design practice and research. Potential areas of study include graphic design history, theory, and critical narrative; design creativity; color and design; user-centered design; design authorship; data visualization; and interactive design.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Eligibility requirements are located on the track pages of the design graduate program website: http://dha.design.umn.edu/programs/grad.

Special Application Requirements:
Application requirements: http://dha.design.umn.edu/programs/grad/admissions.html

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 52 major credits and 8 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: MFA coursework and research culminates in a creative thesis, which includes a paper and extensive creative project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students may be required to complete additional credits upon recommendation of their committee.

Design Program Core Requirement

DES 8181 - Research Ethics (1.0 cr)

Related Field

Students are required to take a minimum of 8 credits in a related field. Courses are selected with the approval of the advisor and committee.

Theory and Philosophy

Take 6 or more credit(s) from the following:
- DES 8112 - Design Theory (3.0 cr)
- DES 8164 - Innovation Theory and Analysis (3.0 cr)

Evaluation and Analysis

Take 6 or more credit(s) from the following:
- GDES 5388 - Graphic Design Research (3.0 cr)
- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)

Concentration

All students are required to take DES 8114, GDES 8361, and GDES 8362.

Take 27 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8114 - Design Studio (4.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- GDES 4131W - History of Graphic Design [WI] (4.0 cr)
- GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
- GDES 4345 - Advanced Typography (4.0 cr)
- GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
- GDES 5311 - Illustration (3.0 cr)
- GDES 5341 - Interactive Design (3.0 cr)
- GDES 5342 - Advanced Web Design (3.0 cr)
- GDES 5371 - Data Visualization Studio (3.0 cr)
- GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
- GDES 5383 - Digital Illustration and Animation (3.0 cr)
- GDES 5386 - Fundamentals of Game Design (3.0 cr)
- GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
- GDES 8193 - Directed Study (1.0 - 3.0 cr)
- GDES 8361 - Color, Design, and Human Perception (3.0 cr)
- GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

MFA Creative Thesis Credits
Take 12 credits or more of the following:
GDES 8990 - MFA Creative Thesis (6.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Graphic Design
All Design MMFA students must complete the graphic design track. See program requirements above.
Twin Cities Campus
Design M.S.
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 34
• This program does not require summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The design graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the arts and social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

Applications submitted to the design graduate program specify the track and degree objective.

Formal tracks are:
- Apparel studies (including dress, history, and culture; product development; and retail merchandising and consumer studies)
- Graphic design
- Housing studies
- Interior design

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Eligibility requirements are located on the track pages of the design graduate program website:
http://dha.design.umn.edu/programs/grad.

Special Application Requirements:
Application requirements: http://dha.design.umn.edu/programs/grad/admissions.html

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 144
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

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Information current as of August 31, 2018
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 28 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students may be required to complete additional credits upon recommendation of their committee.

**Design Program Core Requirement**

DES 8181 - Research Ethics (1.0 cr)

**Related Field Coursework**

Students are required to take a minimum of 6 credits in a related field. Courses are selected with the approval of the advisor and committee.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Apparel Studies**

The apparel studies track advances both theoretical knowledge and applications for textile and apparel products and their relationship to human behavior using a design lens. Students may focus on product development; dress, history, and culture; or retail merchandising and consumer studies. Within each of these areas of emphasis within the track, the student completes related coursework as well as research or creative production that culminates in a thesis. The MS degree is focused in a scientific, social science or technical direction and is appropriate for the product development and the retail merchandising and consumer studies emphasis areas.

**Evaluation and Analysis Coursework**

Students are required to take a minimum of 6 credits in evaluation and analysis.

Students may take other courses with the approval of the advisor and committee.

Take 6 or more credit(s) from the following:

- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)

**Concentration**

**Dress, History, and Culture**

**Theory and Philosophy Coursework**

Students take a minimum of 3 credits in this category.

- DES 8164 - Innovation Theory and Analysis (3.0 cr)
- or DES 8112 - Design Theory (3.0 cr)

**Plan A Requirements**

Take 8 or more credit(s) from the following:

- APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
- APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
• APST 8193 - Directed Study (1.0 - 3.0 cr)
• APST 8267 - Dress and Culture (3.0 cr)
• APST 8268 - Behavioral Aspects of Dress (3.0 cr)
• DES 5165 - Design and Globalization (3.0 cr)
• DES 8112 - Design Theory (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8164 - Innovation Theory and Analysis (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)

**Thesis credits**
Students take a minimum of 10 thesis credits.

• DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or

**Plan B Requirements**
All Plan B Master's students are required to register for DES 8222 Plan B Master's Project the last semester of the program. Take 15 or more credit(s) from the following:

• APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
• APST 8193 - Directed Study (1.0 - 3.0 cr)
• APST 8267 - Dress and Culture (3.0 cr)
• APST 8268 - Behavioral Aspects of Dress (3.0 cr)
• DES 5165 - Design and Globalization (3.0 cr)
• DES 8112 - Design Theory (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8164 - Innovation Theory and Analysis (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)

**Plan B Master's Project**
Students take a minimum of 3 credits in this category.

• APST 8222 - Plan B Master's Project (3.0 cr)

-OR-

**Product Development**
**Theory and Philosophy Coursework**
Students take a minimum of 3 credits in this category.

DES 8112 - Design Theory (3.0 cr)
or
DES 8164 - Innovation Theory and Analysis (3.0 cr)

**Plan A Requirements**
Take 8 or more credit(s) from the following:

• APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)
• APST 5224 - Functional Clothing Design (4.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
• APST 8193 - Directed Study (1.0 - 3.0 cr)
• DES 5185 - Human Factors in Design (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8114 - Design Studio (4.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• DES 8166 - Material Culture and Design (3.0 cr)
• DES 8167 - Aesthetics of Design (3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)

**Thesis Credits**
Students take a minimum of 10 thesis credits.

• DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or

**Plan B Requirements**
Plan B Master's students are required to take DES 8222 Master's Plan B Project the final semester of the program. Take 15 or more credit(s) from the following:

• APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)
• APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)
• APST 5224 - Functional Clothing Design (4.0 cr)
• APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)
- **APST 8193** - Directed Study (1.0 - 3.0 cr)
- **DES 5185** - Human Factors in Design (3.0 cr)
- **DES 8113** - Teaching and Assessment (2.0 cr)
- **DES 8114** - Design Studio (4.0 cr)
- **DES 8115** - Grant Writing (2.0 cr)
- **DES 8151** - Product Development: Theory and Practice (3.0 cr)
- **DES 8166** - Material Culture and Design (3.0 cr)
- **DES 8167** - Aesthetics of Design (3.0 cr)
- **GDES 8361** - Color, Design, and Human Perception (3.0 cr)

**Plan B Master's Project**

Students take a minimum of 3 credits in this category.

- **APST 8222** - Plan B Master's Project (3.0 cr)

** Retail Merchandising and Consumer Studies**

**Theory and Philosophy Coursework**

- **APST 8272** - Digital Consumers: Theories in Retail and Consumer Studies (3.0 cr)

**Plan A Requirements**

Take 8 or more credit(s) from the following:

- **APST 5117** - Retail Environments and Human Behavior (3.0 cr)
- **APST 5123** - Living in a Consumer Society (3.0 cr)
- **APST 5193** - Directed Study in Apparel Studies (1.0 - 4.0 cr)
- **APST 8192** - Readings in Apparel Studies (1.0 - 3.0 cr)
- **APST 8193** - Directed Study (1.0 - 3.0 cr)
- **APST 8267** - Dress and Culture (3.0 cr)
- **APST 8268** - Behavioral Aspects of Dress (3.0 cr)
- **APST 8271** - Retailing: Strategic Perspectives (3.0 cr)
- **DES 8113** - Teaching and Assessment (2.0 cr)
- **DES 8115** - Grant Writing (2.0 cr)
- **DES 8151** - Product Development: Theory and Practice (3.0 cr)
- **DES 8166** - Material Culture and Design (3.0 cr)
- **DES 8167** - Aesthetics of Design (3.0 cr)

**Thesis Credits**

Students take a minimum of 10 thesis credits.

- **DES 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

**or Plan B Requirements**

Plan B Master's students are required to take ApSt 8222 Master's Plan B Project the final semester of the program.

Take 15 or more credit(s) from the following:

- **APST 5117** - Retail Environments and Human Behavior (3.0 cr)
- **APST 5123** - Living in a Consumer Society (3.0 cr)
- **APST 5193** - Directed Study in Apparel Studies (1.0 - 4.0 cr)
- **APST 8192** - Readings in Apparel Studies (1.0 - 3.0 cr)
- **APST 8193** - Directed Study (1.0 - 3.0 cr)
- **APST 8267** - Dress and Culture (3.0 cr)
- **APST 8268** - Behavioral Aspects of Dress (3.0 cr)
- **APST 8271** - Retailing: Strategic Perspectives (3.0 cr)
- **DES 8113** - Teaching and Assessment (2.0 cr)
- **DES 8115** - Grant Writing (2.0 cr)
- **DES 8151** - Product Development: Theory and Practice (3.0 cr)
- **DES 8166** - Material Culture and Design (3.0 cr)
- **DES 8167** - Aesthetics of Design (3.0 cr)

**Plan B Master's Project**

Students take a minimum of 3 credits in this category.

- **APST 8222** - Plan B Master's Project (3.0 cr)

**Graphic Design**

The track in graphic design focuses on design theory, process, and methods related to design practice and research. Potential areas of study include graphic design history, theory, and critical narrative; design creativity; color and design; design authorship; data visualization; and interactive design.

**Theory and Philosophy Coursework**

Students take a minimum of 3 credits in this category.

- **DES 8112** - Design Theory (3.0 cr)

**Evaluation and Analysis Coursework**

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Information current as of August 31, 2018
Students take a minimum of 6 credits in this category.

DES 8102 - Quantitative Research Methods (3.0 cr)
or DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
or GDES 5388 - Graphic Design Research (3.0 cr)

Concentration

Plan A Requirements
Students are required to take DES 8114, and GDES 8361 or GDES 8362.
Take 8 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8114 - Design Studio (4.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- GDES 4131W - History of Graphic Design [WI] (4.0 cr)
- GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
- GDES 4345 - Advanced Typography (4.0 cr)
- GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
- GDES 5311 - Illustration (3.0 cr)
- GDES 5341 - Interactive Design (3.0 cr)
- GDES 5342 - Advanced Web Design (3.0 cr)
- GDES 5371 - Data Visualization Studio (3.0 cr)
- GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
- GDES 5383 - Digital Illustration and Animation (3.0 cr)
- GDES 5386 - Fundamentals of Game Design (3.0 cr)
- GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
- GDES 8193 - Directed Study (1.0 - 3.0 cr)
- GDES 8361 - Color, Design, and Human Perception (3.0 cr)
- GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

• Thesis Credits
Students take a minimum of 10 thesis credits.
- DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B Requirements
Students are required to take DES 8114 and GDES 8361 or GDES 8362.
Take 15 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8114 - Design Studio (4.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- GDES 4131W - History of Graphic Design [WI] (4.0 cr)
- GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
- GDES 4345 - Advanced Typography (4.0 cr)
- GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
- GDES 5311 - Illustration (3.0 cr)
- GDES 5341 - Interactive Design (3.0 cr)
- GDES 5342 - Advanced Web Design (3.0 cr)
- GDES 5371 - Data Visualization Studio (3.0 cr)
- GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
- GDES 5383 - Digital Illustration and Animation (3.0 cr)
- GDES 5386 - Fundamentals of Game Design (3.0 cr)
- GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
- GDES 8193 - Directed Study (1.0 - 3.0 cr)
- GDES 8361 - Color, Design, and Human Perception (3.0 cr)
- GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

• Plan B Master's Project
Students take a minimum of 3 credits in this category the last semester of the program.
- GDES 8222 - Plan B Master's Project (3.0 cr)

Housing Studies
The housing studies track advances both theoretical and applied knowledge in the housing field. Through research experiences, students are prepared to assist people and communities in addressing housing-related issues. Courses emphasize human needs and behavior, analysis of designed environments, policy and community development, and housing of specific subpopulations such as the elderly or low-income families with children.

Theory and Philosophy: Required Course
HSG 8467 - Theoretical Perspectives in Housing Studies (3.0 cr)

**Evaluation and Analysis Coursework**

Students take a minimum of 6 credits in this category.

Take 6 or more credit(s) from the following:

- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)

**Concentration**

**Plan A Requirements**

Students take a total of at least 8 credits from this list; at least two courses must be chosen from the following: HSG 5463, HSG 5467, and HSG 8463.

Take 8 or more credit(s) from the following:

- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- HSG 4461 - Housing Development and Management (4.0 cr)
- HSG 4465 - Housing in a Global Perspective (3.0 cr)
- HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
- HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
- HSG 5462 - Housing and Community Development (3.0 cr)
- HSG 5463 - Housing Policy (3.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
- HSG 8170 - Topics in Housing Studies (1.0 - 3.0 cr)
- HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
- HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
- HSG 8193 - Directed Study (1.0 - 3.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)

**Thesis Credits**

Students take a minimum of 10 credits in this category.

DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

**Plan B Requirements**

Students take a total of at least 15 credits from this list; at least two courses must be chosen from the following: HSG 5463, HSG 5467, and HSG 8463.

Take 15 or more credit(s) from the following:

Take 15 or more credit(s) from the following:

- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- HSG 4461 - Housing Development and Management (4.0 cr)
- HSG 4465 - Housing in a Global Perspective (3.0 cr)
- HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
- HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
- HSG 5462 - Housing and Community Development (3.0 cr)
- HSG 5463 - Housing Policy (3.0 cr)
- HSG 5467 - Housing and the Social Environment (4.0 cr)
- HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
- HSG 8170 - Topics in Housing Studies (1.0 - 3.0 cr)
- HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
- HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
- HSG 8193 - Directed Study (1.0 - 3.0 cr)
- HSG 8463 - Housing: Race and Class (3.0 cr)

**Plan B Master's Project**

Students take a minimum of 3 credits the final semester of the program.

- HSG 8222 - Plan B Master's Project (3.0 cr)

**Interior Design**

This sub-plan is limited to students completing the program under Plan A.

Graduate study in the interior design track emphasizes the theory, research, and specialized practice components of design as applied to people's health, safety, and welfare in the interior environment, including design education, sustainability, social/cultural issues, aspects of professional practice, and facilities research (educational, office, criminal justice, and residential). Students are prepared for
teaching and research positions as well as design specializations within the profession.

**Theory and Philosophy Coursework**
- DES 8112 - Design Theory (3.0 cr)
- or DES 8164 - Innovation Theory and Analysis (3.0 cr)
- or DES 8166 - Material Culture and Design (3.0 cr)

**Evaluation and Analysis Coursework**
Students should take a minimum of six credits. A statistics course is required and either DES 8102 or DES 8103.

Take 6 or more credit(s) from the following:
- DES 8102 - Quantitative Research Methods (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)

**Concentration**
Take 8 or more credit(s) from the following:
- DES 5165 - Design and Globalization (3.0 cr)
- DES 5168 - Evidence-Based Design (3.0 cr)
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
- IDES 8192 - Readings in Interior Design (1.0 - 3.0 cr)
- IDES 8193 - Directed Study (1.0 - 3.0 cr)
- GDES 8361 - Color, Design, and Human Perception (3.0 cr)

**Thesis Credits**
Students take a minimum of 10 credits in this category.
- DES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus

Design Minor
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The design graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the arts and social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Students select a minimum of 9 credits in consultation with their advisor and the director of graduate studies for the design graduate program.

Doctoral
Students select a minimum of 12 credits in consultation with their advisor and the director of graduate studies for the design graduate program.
Twin Cities Campus
Design Ph.D.
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 64
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The design graduate program focuses on the study of relationships between humans and their designed environments. This focus is based on the assumption that design and analysis of environments contributes to the improvement of the human condition. The program addresses theory, research, and application, using a shared disciplinary base from the arts and social and behavioral sciences. The goal of the program is for students to analyze, evaluate, and integrate theoretical frameworks related to humans and their designed environments.

Applications submitted to the design graduate program specify a track and degree objective.

Formal tracks are:
Apparel studies (including dress, history, and culture; product development; and retail merchandising and consumer studies)
Graphic design
Housing studies
Interior design (including evidence-based design)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Eligibility requirements are located on the track pages of the design graduate program website: http://dha.design.umn.edu/programs/grad.

Special Application Requirements:
Application requirements: http://dha.design.umn.edu/programs/grad/admissions.html

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 144
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of August 31, 2018
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
28 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students may be required to complete additional credits upon recommendation of their committee.

Design Program Core Requirements
DES 8181 - Research Ethics (1.0 cr)

Related Field Coursework
Students are required to take a minimum of 12 credits in a related field. Courses are selected with the approval of the advisor and committee.

Doctoral Dissertation Credits
Students take a minimum of 24 credits of DES 8888. With the permission of the advisor, up to 10 credits may be taken prior to passing the preliminary oral examination.
DES 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Apparel Studies
The apparel studies track advances both theoretical knowledge and applications for apparel and worn products and their relationship to human behavior. Students may focus on product development; dress, history, and culture; or retail merchandising and consumer studies. Within each of these areas of emphasis within the track, the student completes related coursework as well as research or creative production that culminates in a thesis.

Evaluation and Analysis Coursework
Students are required to take a minimum of 9 credits in evaluation and analysis, including 3 credits in statistics.
DES 8102 - Quantitative Research Methods (3.0 cr)
DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
Statistics
Take 3 or more credit(s) from the following:
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)

Concentration
Dress, History, and Culture
Theory and Philosophy Coursework
Students take a minimum of 6 credits in this category.

**DES 8164 - Innovation Theory and Analysis (3.0 cr)**

**DES 8112 - Design Theory (3.0 cr)**

**Dress, History, and Culture Concentration Coursework**

Take 12 or more credit(s) from the following:

- **APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)**
- **APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)**
- **APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)**
- **APST 8193 - Directed Study (1.0 - 3.0 cr)**
- **APST 8267 - Dress and Culture (3.0 cr)**
- **APST 8268 - Behavioral Aspects of Dress (3.0 cr)**
- **DES 5165 - Design and Globalization (3.0 cr)**
- **DES 8112 - Design Theory (3.0 cr)**
- **DES 8113 - Teaching and Assessment (2.0 cr)**
- **DES 8115 - Grant Writing (2.0 cr)**
- **DES 8164 - Innovation Theory and Analysis (3.0 cr)**
- **DES 8166 - Material Culture and Design (3.0 cr)**
- **DES 8167 - Aesthetics of Design (3.0 cr)**

**OR**

**Product Development**

**Design Theory and Philosophy Coursework**

Students take a minimum of 6 credits in this category.

**DES 8112 - Design Theory (3.0 cr)**

**DES 8164 - Innovation Theory and Analysis (3.0 cr)**

**Product Development Concentration Coursework**

Take 12 or more credit(s) from the following:

- **APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)**
- **APST 5218 - Fashion, Design, and the Global Industry (3.0 cr)**
- **APST 5224 - Functional Clothing Design (4.0 cr)**
- **APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)**
- **APST 8193 - Directed Study (1.0 - 3.0 cr)**
- **DES 5185 - Human Factors in Design (3.0 cr)**
- **DES 8113 - Teaching and Assessment (2.0 cr)**
- **DES 8114 - Design Studio (4.0 cr)**
- **DES 8115 - Grant Writing (2.0 cr)**
- **DES 8151 - Product Development: Theory and Practice (3.0 cr)**
- **DES 8166 - Material Culture and Design (3.0 cr)**
- **DES 8167 - Aesthetics of Design (3.0 cr)**
- **GDES 8361 - Color, Design, and Human Perception (3.0 cr)**

**OR**

**Retail Merchandising and Consumer Studies**

**Design Theory and Philosophy Coursework**

Students take a minimum of 6 credits in this category.

**APST 8272 - Digital Consumers: Theories in Retail and Consumer Studies (3.0 cr)**

Take 3 or more credit(s) from the following:

- **APST 8268 - Behavioral Aspects of Dress (3.0 cr)**
- **DES 8112 - Design Theory (3.0 cr)**
- **DES 8164 - Innovation Theory and Analysis (3.0 cr)**

**Retail Merchandising and Consumer Studies Concentration Coursework**

Take 12 or more credit(s) from the following:

- **APST 5117 - Retail Environments and Human Behavior (3.0 cr)**
- **APST 5123 - Living in a Consumer Society (3.0 cr)**
- **APST 5193 - Directed Study in Apparel Studies (1.0 - 4.0 cr)**
- **APST 8192 - Readings in Apparel Studies (1.0 - 3.0 cr)**
- **APST 8193 - Directed Study (1.0 - 3.0 cr)**
- **APST 8267 - Dress and Culture (3.0 cr)**
- **APST 8268 - Behavioral Aspects of Dress (3.0 cr)**
- **APST 8271 - Retailing: Strategic Perspectives (3.0 cr)**
- **DES 8113 - Teaching and Assessment (2.0 cr)**
- **DES 8115 - Grant Writing (2.0 cr)**
- **DES 8151 - Product Development: Theory and Practice (3.0 cr)**
- **DES 8166 - Material Culture and Design (3.0 cr)**
- **DES 8167 - Aesthetics of Design (3.0 cr)**
Graphic Design
The track in graphic design focuses on design theory, process, and methods related to design practice and research. Potential areas of study include graphic design history, theory, and critical narrative; design creativity; color and design; user-centered design; design authorship; data visualization; and interactive design.

Theory and Philosophy Coursework
Students take a minimum of 6 credits in this category.
DES 8112 - Design Theory (3.0 cr)
or DES 8164 - Innovation Theory and Analysis (3.0 cr)

Evaluation and Analysis Coursework
Students take a minimum of 9 credits in this category, including 3 credits in statistics.
Take 6 or more credit(s) from the following:
• DES 8102 - Quantitative Research Methods (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• GDES 5388 - Graphic Design Research (3.0 cr)

Statistics
Take 3 or more credit(s) from the following:
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)

Graphic Design Concentration Coursework
Students are required to take GDES 8361 and GDES 8362.
Take 12 or more credit(s) from the following:
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8114 - Design Studio (4.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• GDES 4131W - History of Graphic Design [WI] (4.0 cr)
• GDES 4330 - Surface Fabric Design Workshop (4.0 cr)
• GDES 4345 - Advanced Typography (4.0 cr)
• GDES 5193 - Directed Study in Graphic Design (1.0 - 4.0 cr)
• GDES 5311 - Illustration (3.0 cr)
• GDES 5341 - Interactive Design (3.0 cr)
• GDES 5342 - Advanced Web Design (3.0 cr)
• GDES 5371 - Data Visualization Studio (3.0 cr)
• GDES 5372 - Data Visualization for Interactive Platforms (3.0 cr)
• GDES 5383 - Digital Illustration and Animation (3.0 cr)
• GDES 5386 - Fundamentals of Game Design (3.0 cr)
• GDES 8192 - Readings in Graphic Design (1.0 - 3.0 cr)
• GDES 8193 - Directed Study (1.0 - 3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

Housing Studies
Housing studies is a multidisciplinary track that draws from a variety of theoretical perspectives. Students are trained in a variety of research methodologies. Coursework and research experiences combine to further understanding of the innovative approaches to the development of housing and related programs. With expertise in housing studies and research methods, graduates build careers in higher education, state and federal agencies, nonprofit community organizations, and government.

Theory and Philosophy Coursework
Students are required to take a total of 6 credits in this category, including HSG 8467. Students select one additional course in theory and philosophy with the approval of the advisor and committee.
HSG 8467 - Theoretical Perspectives in Housing Studies (3.0 cr)

Evaluation and Analysis Coursework
Students take a minimum of 9 credits in this category, including a minimum of 3 credits in statistics.
DES 8102 - Quantitative Research Methods (3.0 cr)
DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)

Statistics
Take 3 or more credit(s) from the following:
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)

Housing Studies Concentration Coursework
HSG 5463, HSG 5467, and HSG 8463 are required.
Take 12 or more credit(s) from the following:
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• HSG 4461 - Housing Development and Management (4.0 cr)
• HSG 4465 - Housing in a Global Perspective (3.0 cr)
• HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
• HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
• HSG 5462 - Housing and Community Development (3.0 cr)
• HSG 5463 - Housing Policy (3.0 cr)
• HSG 5467 - Housing and the Social Environment (4.0 cr)
• HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
• HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
• HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
• HSG 8193 - Directed Study (1.0 - 3.0 cr)
• HSG 8463 - Housing: Race and Class (3.0 cr)

Interior Design
Graduate study in the interior design track emphasizes the theory, research, and specialized practice components of design as applied to people's health, safety, and welfare in the interior environment, including design education, sustainability, social/cultural issues, aspects of professional practice, and facilities research (educational, office, criminal justice, and residential). Students are prepared for teaching and research positions as well as design specializations within the profession.

Theory and Philosophy Coursework
Students take DES 8112 and choose either DES 8164 or DES 8166 for a total of 6 credits in this category.
• DES 8112 - Design Theory (3.0 cr)
  Take 3 or more credit(s) from the following:
  • DES 8164 - Innovation Theory and Analysis (3.0 cr)
  • DES 8166 - Material Culture and Design (3.0 cr)

Evaluation and Analysis Coursework
Students take a minimum of 9 credits in this category, including a minimum of 3 credits in statistics.
• DES 8102 - Quantitative Research Methods (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
Statistics
• Take 3 or more credit(s) from the following:
  • EPSY 5261 - Introductory Statistical Methods (3.0 cr)
  • EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
  • EPSY 8252 - Statistical Methods in Education II (3.0 cr)
  • EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
  • EPSY 8267 - Applied Multivariate Analysis (3.0 cr)

Interior Design Concentration Coursework
Take 12 or more credit(s) from the following:
• DES 5165 - Design and Globalization (3.0 cr)
• DES 5166 - Evidence-Based Design (3.0 cr)
• DES 5185 - Human Factors in Design (3.0 cr)
• DES 8113 - Teaching and Assessment (2.0 cr)
• DES 8115 - Grant Writing (2.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• IDES 8192 - Readings in Interior Design (1.0 - 3.0 cr)
• IDES 8193 - Directed Study (1.0 - 3.0 cr)
Ecological Restoration in Landscape Architecture Minor

College of Design

Link to a list of faculty for this program.

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 10
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Restoration, conservation, and ecological design projects have become an increasingly important component of the practice of landscape architecture and natural resource management. It is critical for students interested in the design and management of natural lands, water management landscapes, landscape reclamation, and other restoration project types to gain exposure to the issues associated with ecological restoration projects. This minor focuses on the applied practice of restoration with an emphasis on restoration management and design and the skills needed to lead successful projects.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Master's Minor Requirements
- ESPM 5071 - Ecological Restoration (4.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- LA 5576 - Ecological Restoration Project Planning and Management (3.0 cr)
Heritage Studies and Public History M.H.S.P.H.

Contact Information:
School of Architecture
College of Design
Room 101 Rapson Hall
89 Church St SE
Minneapolis, MN 55455-0811

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 37
- This program does not require summer semesters for timely completion.
- Minnesota Historical Society History Center
- Degree: Master of Heritage Studies & Public History

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Heritage studies and public history (HSPH) are the publicly engaged and community-accountable practices of historical scholarship, whether it is based in archival research, archaeology, material culture studies, architecture, preservation, or landscape studies. Although such a commitment to public interpretation, education, and preservation is part of all these disciplines, it is of tremendous benefit to heritage professionals to understand the connections and common issues in all of these perspectives, because the heritage field is increasingly characterized by such interdisciplinary integration.

The goal of this graduate program is to provide heritage and public history professionals this broader view, increasing their resource base and network of expertise. The program takes advantage of the deep scholarly expertise in these fields at the University of Minnesota, as well as the Minnesota Historical Society's extensive resources and expertise, to offer unparalleled training in the theory and methods of heritage and public history studies at the graduate level. The program will combine rigorous scholarly training with hands-on professional development, preparing graduates for positions in major public history and heritage institutions in Minnesota and elsewhere. The program will also train future generations of scholars and practitioners in the field to develop new, innovative, and entrepreneurial forms of historical interpretation in service of the public good.

Students are expected to acquire both general and specialized sets of perspectives and skills. Some required courses are designed to instill breadth and cohort connections; others are designed to build expertise in specific arenas of the heritage field, represented by the program tracks. Students will engage in experiential learning through embedded (credited) internships, and the design and execution of a community-engaged project.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Prospective applicants are encouraged to consult the degree programs section of the School of Architecture website for additional information: http://arch.design.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Plan B: Plan B requires 31 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The Plan B option is available only to students pursuing the archaeological heritage track. The Plan B project is identified and planned in consultation with the adviser and the Archaeology Department at the Minnesota Historical Society.

Plan C: Plan C requires 31 major credits and 6 credits outside the major. The final exam is no required. A capstone project is required.

Capstone Project: This course will operate as a workshop, drawing together a cohort of students, working individually or as part of a team, to craft independent heritage studies and public history research projects under the supervision of a faculty instructor. Projects may be based in archival research, public exhibitions, archaeology, material culture studies and preservation, architecture and preservation, or landscape studies. Consistent with the values of the program, projects shall have multidisciplinary perspectives, broadly consider aspects of diversity, and will be accountable to some stakeholder(s) identified by the students.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Core Coursework (13 credits)
All students must complete the following core courses. Take HSPH 8005 every fall and spring for 2 years for a total of 4 credits.

- HSPH 8001 - Who Owns the Past? Common Concerns and Big Questions in Heritage and Public History (3.0 cr)
- HSPH 8002 - Core Practices in Heritage Studies and Public History (3.0 cr)
- HSPH 8003 - Race and Indigeneity in Heritage Representation (3.0 cr)
- HSPH 8005 - Leadership and Future of Historical Organizations (1.0 cr)

Outside Coursework (6 credits)
All students must complete at least 6 credits outside the major, chosen in consultation with the adviser or director of graduate studies.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Archaeological Heritage
This sub-plan is limited to students completing the program under Plan B or Plan C.

Archaeological Heritage Track (18 credits)
The archaeological heritage track offers both the Plan B and Plan C options. Students are expected to identify their chosen option, in consultation with the adviser or director of graduate studies, by end of their second year in the program.

Required Archaeological Heritage Track Coursework (6 credits)
Take the following courses for a total of 6 credits:

- HSPH 8004 - Capstone in Heritage Studies and Public History (3.0 cr)
- ANTH 5448 - Applied Heritage Management (3.0 cr)

Electives (6 credits)
Students must complete at least 6 additional elective credits, selected in consultation with the advisor or director of graduate studies.

Plan Options

Plan B Requirements
Take 6 credits of HSPH 8101. At least 3 of the 6 credits must be applied to the Plan B project, with the remaining 3 assigned in consultation with the advisor or director of graduate studies.

HSPH 8101 - Internship (3.0 cr)

-OR-

Plan C Requirements
Take HSPH 8101 twice, to complete two separate internships, for a total of 6 credits.

HSPH 8101 - Internship (3.0 cr)
Twin Cities Campus
Heritage Studies and Public History Minor
School of Architecture
College of Design

Link to a list of faculty for this program.

Contact Information:
College of Design
School of Architecture
101 Rapson Hall
89 Church Street SE
Minneapolis, MN 55455-0811
Email: donofrio@umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Heritage Studies and Public History (HSPH) are the publicly engaged and community-accountable practices of historical scholarship, whether based in archival research, archaeology, material culture studies, architecture, preservation, or landscape studies. Although such a commitment to public interpretation, education, and preservation is part of all these disciplines, it is of tremendous benefit to heritage professionals to understand the connections and common issues in all of these perspectives, because the heritage field is increasingly characterized by such interdisciplinary integration. The masters level minor is intended for students who are in programs preparing them for work in the heritage field, such as anthropology, art history, architecture/historic preservation, urban and regional planning, history, American studies, and other allied fields. The doctoral minor is intended for students who plan to work in heritage/public history positions outside of academia, or to be academic scholars whose work includes community-engaged research. The HSPH program and grad minor take advantage of the deep scholarly expertise in these fields at the University of Minnesota, as well as the Minnesota Historical Societys extensive resources and expertise, to offer unparalleled training in the theory and methods of heritage and public history studies at the graduate level.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Core Coursework
All students pursuing the heritage studies and public history minor must complete the following core courses for a total of six credits.
HSPH 8001 - Who Owns the Past? Common Concerns and Big Questions in Heritage and Public History (3.0 cr)
HSPH 8003 - Race and Indigeneity in Heritage Representation (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.
Masters
Take additional HSPH-affiliated coursework, in consultation with the HSPH director of graduate studies, to complete the 9-credit minimum for the master's-level minor. Coursework must be from a discipline other than the major field.

Doctoral
Take additional HSPH-affiliated coursework, in consultation with the HSPH director of graduate studies, to complete the 12-credit minimum for the doctoral-level minor. Coursework must be from a discipline other than the major field.
Twin Cities Campus
Housing Studies Postbaccalaureate Certificate
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108
Email: dhagrad@umn.edu
Website: http://dha.cdes.umn.edu/programs/grad/prospective/admissions/housingstudiescertificateprogram.htm

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Housing Studies PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The housing studies certificate is designed for individuals interested, or currently working, in housing related professions to expand their knowledge in areas including housing and community development, housing policy, and the residential environments.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Some elective courses require prerequisites that may be waived with instructor permission according to University policy.

Required Course
- HSG 5471 - Housing Studies Certificate Seminar (2.0 cr)

Elective Courses
Take 13 or more credit(s) from the following:
- DES 8113 - Teaching and Assessment (2.0 cr)
- DES 8115 - Grant Writing (2.0 cr)
• HSG 4461 - Housing Development and Management (4.0 cr)
• HSG 4465 - Housing in a Global Perspective (3.0 cr)
• HSG 5170 - Topics in Housing Studies (1.0 - 4.0 cr)
• HSG 5193 - Directed Study in Housing Studies (1.0 - 4.0 cr)
• HSG 5462 - Housing and Community Development (3.0 cr)
• HSG 5463 - Housing Policy (3.0 cr)
• HSG 5467 - Housing and the Social Environment (4.0 cr)
• HSG 5481 - Promoting Independence in Housing and Community (3.0 cr)
• HSG 8170 - Topics in Housing Studies (1.0 - 3.0 cr)
• HSG 8180 - Professional Seminar (1.0 - 2.0 cr)
• HSG 8192 - Readings in Housing Studies (1.0 - 3.0 cr)
• HSG 8193 - Directed Study (1.0 - 3.0 cr)
• HSG 8463 - Housing: Race and Class (3.0 cr)
• HSG 8467 - Theoretical Perspectives in Housing Studies (3.0 cr)
Human Factors and Ergonomics M.S.

DHA Human Factors and Ergonomics

College of Design

Link to a list of faculty for this program.

Contact Information:
Human Factors and Ergonomics Graduate Program, c/o DHA, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: HFEgrad@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human factors and ergonomics (HFE) is the study of how to make technological systems safe, effective, and easy and enjoyable to use. The graduate program offers interdisciplinary coursework that addresses human performance and how it can be enhanced through design of tools, systems, working environments, processes, and organizations. HFE has applications ranging from clothing and living spaces to business processes, the design of health care processes and technology, computer interfaces, and aircraft cockpits.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 96
  - Internet Based - Listening Score: 24
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 24
  - Internet Based - Speaking Score: 24

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan C: Plan C requires 30 major credits and 0 credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

**Required Courses (8 credits)**

All students are required to complete the following:

**Research Methods Core (8 credits)**
- PSY 8814 - Analysis of Psychological Data (4.0 cr)
- PSY 8815 - Analysis of Psychological Data (4.0 cr)

**Research Ethics**

In addition to the following course, students have online options to complete the research ethics requirement. See program Research Ethics page for more information: [http://humanfactors.design.umn.edu/research_ethics.html](http://humanfactors.design.umn.edu/research_ethics.html)

Take 0 or more credit(s) from the following:
- DES 8181 - Research Ethics (1.0 cr)

**Plans**

**Plan A**

**Plan A Coursework**

Take courses from each component as follows: Human Factors Fundamentals (3 credits), Cognitive Human Factors (3 credits), and Physical Human Factors (3 credits). To complete the 20-credit minimum, select coursework from approved electives.

**Human Factors Fundamentals (3 credits)**

Take 3 or more credit(s) from the following:
- DES 5185 - Human Factors in Design (3.0 cr)
- HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
- HUMF 5211 - Human Factors and Work Analysis (4.0 cr)
- HUMF 5874 - Service Design: Designing complex systems to improve service delivery (4.0 cr)

**Cognitive Human Factors (3 credits)**

Take 3 or more credit(s) from the following:
- CGSC 8000 - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)
- EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
- IDSC 8721 - Behavioral Decision Theory (3.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- PSY 5031W - Perception [WI] (3.0 cr)
- PSY 5037 - Psychology of Hearing (3.0 cr)
- PSY 5062 - Cognitive Neuropsychology (3.0 cr)
- PSY 5064 - Brain and Emotion (3.0 cr)
- PSY 8041 - Proseminar in Perception (3.0 cr)
- PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)
- PSY 8201 - Social Cognition (3.0 cr)

**Physical Human Factors (3 credits)**

Take 3 or more credit(s) from the following:
- KIN 4133 - Perceptual-Motor Control and Learning (3.0 cr)
- KIN 4136 - Embodied Cognition (3.0 cr)
- KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)
- KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 8135 - Human Kinematics (3.0 cr)

**Approved Electives**

Select courses from the following approved electives to complete the 20-credit minimum:

Take 0 or more credit(s) from the following:

**User Interface Design**

Take 0 or more credit(s) from the following:
- CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
- CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
- NURS 7118 - Human Factors and Human-Computer Interaction in Health Informatics (3.0 cr)
- WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)
- WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)

**Statistics**

Psy 8960: Select Multivariate Statistics for Social Scientists section only.

Take 0 or more credit(s) from the following:
• PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
• PUBH 7406 - Advanced Regression and Design (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)

Designing Experiments
Take 0 or more credit(s) from the following:
• STAT 5303 - Designing Experiments (4.0 cr)

Research Methods
Take 0 or more credit(s) from the following:
• ANTH 4035 - Ethnographic Research Methods (3.0 cr)
• KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
• PUBH 6341 - Epidemiologic Methods I (3.0 cr)
• PUBH 6342 - Epidemiologic Methods II (3.0 cr)
• PUBH 6343 - Epidemiologic Methods III (4.0 cr)

Human Factors
Take 0 or more credit(s) from the following:
• CSCI 5125 - Collaborative and Social Computing (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 8117 - Understanding the Social Web (3.0 cr)
• DES 5165 - Design and Globalization (3.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• HUMF 8001 - Special Topics: Human Factors/Ergonomics (2.0 - 3.0 cr)
• HUMF 8002 - Proseminar in Human Factors/Ergonomics (1.0 cr)
• PSY 5501 - Vocational and Occupational Health Psychology (3.0 cr)
• PSY 5708 - Organizational Psychology (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
• PUBH 6470 - SAS Procedures and Data Analysis (3.0 cr)
• SOC 8412 - Social Network Analysis: Theory and Methods (3.0 cr)
• CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
• IDSC 8722 - Heuristic Decision Making (2.0 cr)
• MKTG 8813 - Consumer Judgment and Decision Making I (2.0 cr)
• PUBH 6806 - Principles of Public Health Research (2.0 cr)

Thesis Credits
Take at least 10 master's thesis credits.
HUMF 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan C

Plan C Coursework
Take courses from each component as follows: Human Factors Fundamentals (3 credits), Cognitive Human Factors (3 credits), Physical Human Factors (3 credits), and 50% Project-based (2 3-credit courses for 6 credits). To complete the 30-credit minimum, select coursework from approved electives.

Human Factors Fundamentals (3 credits)
Take 3 or more credit(s) from the following:
• DES 5185 - Human Factors in Design (3.0 cr)
• HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• HUMF 5211 - Human Factors and Work Analysis (4.0 cr)
• HUMF 5874 - Service Design: Designing complex systems to improve service delivery (4.0 cr)

Cognitive Human Factors (3 credits)
Take 3 or more credit(s) from the following:
• CGSC 8000 - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)
• EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
• IDSC 8721 - Behavioral Decision Theory (3.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5031W - Perception [WI] (3.0 cr)
• PSY 5037 - Psychology of Hearing (3.0 cr)
• PSY 5062 - Cognitive Neuropsychology (3.0 cr)
• PSY 5064 - Brain and Emotion (3.0 cr)
• PSY 8041 - Proseminar in Perception (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
Physical Human Factors (3 credits)
Take 3 or more credit(s) from the following:
• KIN 4133 - Perceptual-Motor Control and Learning (3.0 cr)
• KIN 4136 - Embodied Cognition (3.0 cr)
• KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
• KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)
• KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
• KIN 8211 - Seminar: Perception and Action (3.0 cr)
• RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
• RSC 8135 - Human Kinematics (3.0 cr)

50% Project-Based Coursework (6 credits)
Take 2 courses for at least 6 credits:
Take 6 or more credit(s) from the following:
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• DES 5185 - Human Factors in Design (3.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• HUMF 5874 - Service Design: Designing complex systems to improve service delivery (4.0 cr)
• WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)

Approved Electives
Select courses from the following approved electives to complete the 30-credit minimum:
Take 0 or more credit(s) from the following:
User Interface Design
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
• NURS 7118 - Human Factors and Human-Computer Interaction in Health Informatics (3.0 cr)
• WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)
• WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)

Statistics
• PSY 8960: Select Multivariate Statistics for Social Scientists section only.
Take 0 or more credit(s) from the following:
• PUBH 7406 - Advanced Regression and Design (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)

Designing Experiments
• STAT 5303 - Designing Experiments (4.0 cr)

Research Methods
• ANTH 4035 - Ethnographic Research Methods (3.0 cr)
• KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
• PUBH 6341 - Epidemiologic Methods I (3.0 cr)
• PUBH 6342 - Epidemiologic Methods II (3.0 cr)
• PUBH 6343 - Epidemiologic Methods III (4.0 cr)

Human Factors
• CSCI 5125 - Collaborative and Social Computing (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 8117 - Understanding the Social Web (3.0 cr)
• DES 5165 - Design and Globalization (3.0 cr)
• DES 8151 - Product Development: Theory and Practice (3.0 cr)
• GDES 8361 - Color, Design, and Human Perception (3.0 cr)
• HUMF 8001 - Special Topics: Human Factors/Ergonomics (2.0 - 3.0 cr)
• HUMF 8002 - Proseminar in Human Factors/Ergonomics (1.0 cr)
• PSY 5501 - Vocational and Occupational Health Psychology (3.0 cr)
• PSY 5708 - Organizational Psychology (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
• PUBH 6470 - SAS Procedures and Data Analysis (3.0 cr)
• SOC 8412 - Social Network Analysis: Theory and Methods (3.0 cr)
• CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
• IDSC 8722 - Heuristic Decision Making (2.0 cr)
• MKTG 8813 - Consumer Judgment and Decision Making I (2.0 cr)
• PUBH 6806 - Principles of Public Health Research (2.0 cr)
Twin Cities Campus
Human Factors and Ergonomics Minor
DHA Human Factors and Ergonomics
College of Design

Link to a list of faculty for this program.

Contact Information:
Human Factors and Ergonomics Graduate Program, c/o DHA, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: HFEgrad@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human factors and ergonomics (HFE) is the study of how to make technological systems safe, effective, and easy and enjoyable to use. The graduate program offers interdisciplinary coursework that addresses human performance and how it can be enhanced through design of tools, systems, working environments, processes, and organizations. HFE has applications ranging from clothing and living spaces to business processes, the design of health care processes and technology, computer interfaces, and aircraft cockpits. The minor is available to master’s and doctoral students.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Any University of Minnesota graduate student in good standing is eligible to apply. Students discuss appropriate coursework with their advisers and the Director of Graduate Studies for Human Factors and Ergonomics. A GPA of 3.0 is required for good standing in the minor.

Master’s students are required to take 9 credits to fulfill the minor.
Doctoral students are required to take 12 credits to fulfill the minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Students select a minimum of 9 credits in consultation with their advisor and the director of graduate studies for the human factors and ergonomics graduate program.
Doctoral
Students select a minimum of 12 credits in consultation with their advisor and the director of graduate studies for the human factors and ergonomics graduate program.
Twin Cities Campus

Human Factors and Ergonomics Ph.D.
DHA Human Factors and Ergonomics
College of Design

Link to a list of faculty for this program.

Contact Information:
Human Factors and Ergonomics Graduate Program, c/o DHA, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108.
Email: HFEgrad@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human factors and ergonomics (HFE) is the study of how to make technological systems safe, effective, and easy and enjoyable to use. The graduate program offers interdisciplinary coursework that addresses human performance and how it can be enhanced through design of tools, systems, working environments, processes, and organizations. HFE has applications ranging from clothing and living spaces to business processes, the design of healthcare processes and technology, computer interfaces, and aircraft cockpits.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 96
  - Internet Based - Listening Score: 24
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 24
  - Internet Based - Speaking Score: 24

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
42 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

**Program Requirements**

**Research Methods Core (8 credits)**
Take the following courses for a total of 8 credits:
- PSY 8814 - Analysis of Psychological Data (4.0 cr)
- PSY 8815 - Analysis of Psychological Data (4.0 cr)

**Research Ethics (0-1 credits)**
In addition to course listed below, online options are available to complete the research ethics requirement. See program Research Ethics page for more information: [http://humanfactors.design.umn.edu/research_ethics.html](http://humanfactors.design.umn.edu/research_ethics.html)
Take 0 or more credit(s) from the following:
- DES 8181 - Research Ethics (1.0 cr)

**Additional Research Methods Course (3-4 credits)**
Take one additional course in research methods from the following:

**Statistics**
Take 0 or more credit(s) from the following:
- PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)

**or Designing Experiments**
Take 0 or more credit(s) from the following:
- STAT 5303 - Designing Experiments (4.0 cr)

**or Research Methods**
Take 0 or more credit(s) from the following:
- ANTH 4035 - Ethnographic Research Methods (3.0 cr)
- KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6343 - Epidemiologic Methods III (4.0 cr)

**Component Courses (9 Credits)**
Take at least one 3-credit course from each of the following components for a total of 9 credits.

**Human Factors Fundamentals**
Take at least 3 credits from the following:
- DES 5185 - Human Factors in Design (3.0 cr)
- HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
- HUMF 5211 - Human Factors and Work Analysis (4.0 cr)
- HUMF 5874 - Service Design: Designing complex systems to improve service delivery (4.0 cr)

**Cognitive Human Factors**
Take at least 3 credits from the following:
- CGSC 8000 - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)
- EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
- IDS 8721 - Behavioral Decision Theory (3.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- PSY 5031W - Perception [WI] (3.0 cr)
- PSY 5037 - Psychology of Hearing (3.0 cr)
- PSY 5062 - Cognitive Neuropsychology (3.0 cr)
- PSY 5064 - Brain and Emotion (3.0 cr)
- PSY 8041 - Proseminar in Perception (3.0 cr)
- PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)
- PSY 8201 - Social Cognition (3.0 cr)

**Physical Human Factors**
Take at least 3 credits from the following:
- KIN 4133 - Perceptual-Motor Control and Learning (3.0 cr)
- KIN 4136 - Embodied Cognition (3.0 cr)
- KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)
- KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 8135 - Human Kinematics (3.0 cr)

**Electives**
Take remaining credits from the following, in consultation with the advisor, to complete the 42 course credits required.

**User Interface Design**
- CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
- CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
- NURS 7118 - Human Factors and Human-Computer Interaction in Health Informatics (3.0 cr)
- WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)
- WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)

**Human Factors**
- CSCI 5125 - Collaborative and Social Computing (3.0 cr)
- CSCI 5609 - Visualization (3.0 cr)
- CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
- CSCI 8117 - Understanding the Social Web (3.0 cr)
- DES 5165 - Design and Globalization (3.0 cr)
- DES 8151 - Product Development: Theory and Practice (3.0 cr)
- GDES 8361 - Color, Design, and Human Perception (3.0 cr)
- HUMF 8001 - Special Topics: Human Factors/Ergonomics (2.0 - 3.0 cr)
- HUMF 8002 - Proseminar in Human Factors/Ergonomics (1.0 cr)
- MKTG 8813 - Consumer Judgment and Decision Making I (2.0 cr)
- PSY 5501 - Vocational and Occupational Health Psychology (3.0 cr)
- PSY 5708 - Organizational Psychology (3.0 cr)
- PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
- PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
- PUBH 6470 - SAS Procedures and Data Analysis (3.0 cr)
- SCC 8412 - Social Network Analysis: Theory and Methods (3.0 cr)
- CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
- IDSC 8722 - Heuristic Decision Making (2.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)

**Thesis Credits**
Take at least 24 doctoral thesis credits.

- HUMF 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Landscape Architecture M.L.A.
Landscape Architecture
College of Design

Link to a list of faculty for this program.

Contact Information:
Department of Landscape Architecture, 144 Rapson Hall, 89 Church Street SE, Minneapolis, MN 55455 (612-625-6860)
Email: ladesk@umn.edu
Website: http://landarch.design.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 58 to 89
- This program does not require summer semesters for timely completion.
- Degree: Master of Landscape Architecture

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of landscape architecture (MLA) is a first-professional degree required for students who wish to become licensed professional landscape architects. The program is accredited by the national Landscape Architecture Accreditation Board (LAAB). The curriculum introduces students to the practice and discipline of landscape architecture, providing them with the artistic, technical, cognitive, and communication skills, in addition to the scientific and aesthetic knowledge, necessary to practice in the profession and in related environmental fields. Students are encouraged to select from electives offered to develop a special focus or to explore more areas in depth.

The MLA program (MLA I) is a three-year, 89-credit degree. Coursework exposes students to the broad field of landscape architecture as both a discipline and a profession. Classes are collaborative in nature and challenge students to delve into landscape issues that cut across multiple systems and scales. Because the core of the curriculum is six design studios, organized in a sequential framework, a commitment to three successive years in the program is essential.

Applicants with accredited professional baccalaureate degrees in landscape architecture or architecture may be considered for the advanced-standing MLA degree (MLA II). The MLA II requires at least 58 credits of design studio, research methods, and elective courses.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
MLA program applicants must have completed a baccalaureate degree.

Special Application Requirements:
Students are admitted for fall semester only. MLA program applicants must apply by January 15, for entry the following fall, to receive first consideration for admission, fellowships, and assistantships. In addition to the University's admission requirements, applicants must submit an electronic portfolio in 8.5 x 11 PDF format. GRE scores are not required; however, they can be helpful to applicants seeking national fellowships such as the Fulbright Scholarship. Please refer to the MLA website for detailed information regarding department specific application requirements and procedures, including a downloadable checklist, at http://landarch.design.umn.edu/prog/index.html.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 86
- IELTS
  - Total Score: 6.5
- MELAB
Program Requirements

Plan C: Plan C requires 52 to 83 major credits and 6 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: See department for more details.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Core Coursework
All MLA students must take the following courses for a total of 36 credits:
LA 5131 - Geospatial Data Analysis and Design (3.0 cr)
LA 5202 - Landscape Analysis Workshop (1.0 cr)
LA 8201 - Designing Landscapes for Dwelling and Settlement (6.0 cr)
LA 8773 - Landscape Infrastructure and Systems III (3.0 cr)
LA 8206 - Making Urban Landscape Space (6.0 cr)
LA 8301 - Landscape Infrastructure and Systems IV (3.0 cr)
LA 8302 - Professional Practice (3.0 cr)
LA 8554 - Project Programming (2.0 cr)
LA 8774 - Landscape Infrastructure and Systems V (3.0 cr)
LA 8775 - Landscape Infrastructure and Systems VI (3.0 cr)
LA 8555 - Advanced Landscape Planning and Design (6.0 cr)

Outside Coursework
All MLA students must take at least 6 credits outside landscape architecture, in consultation with their advisor.

MLA I and MLA II Program Options

MLA I Requirements
Additional Course Requirements
MLA I students must take the following courses for 32 credits:
LA 5201 - Making Landscape Spaces and Types (6.0 cr)
LA 5376 - Representation I (4.0 cr)
LA 5413 - Introduction to Landscape Architectural History (3.0 cr)
LA 5771 - Landscape Infrastructure and Systems I (3.0 cr)
LA 5203 - Ecological Dimensions of Space Making (6.0 cr)
LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
LA 5377 - Representation II (4.0 cr)
LA 5772 - Landscape Infrastructure Systems II (3.0 cr)
MLA I students may participate in the Cities on the Water study abroad option, with the approval of their advisor and the director of graduate studies. Students choosing the study abroad option take 8 credits of LA 8207, 3 credits of LA 5405, and 4 additional credits in consultation with their advisor for a total of 15 credits. Students who do not choose the study abroad option take LA 8205 for 6 credits plus 9 credits of electives for a total of 15 credits.
LA 8207 - Cities on Water International Workshop (6.0 cr)
LA 5405 - Interdisciplinary Studies in Landscape Architecture (1.0 - 6.0 cr)

OR
LA 8205 - Urban Form Options: Landscape Architecture Studio (6.0 cr)

Landscape Architecture Electives
MLA I students not choosing to study abroad take at least 9 elective credits. Credits are selected in consultation with the advisor.
LA 5xxx
LA 8xxx

-OR-

MLA II Requirements
MLA II students may participate in the Cities on the Water study abroad option, with the approval of their advisor and the director of graduate studies. Students choosing the study abroad option take 8 credits of LA 8207, 3 credits of LA 5405, and 4 additional credits in consultation with their advisor for a total of 15 credits; those not choosing to study abroad take 6 credits of LA 8205, 4 credits of LA 5377 and 6 credits of electives for a total of 16 credits.
LA 8207 - Cities on Water International Workshop (6.0 cr)
LA 5405 - Interdisciplinary Studies in Landscape Architecture (1.0 - 6.0 cr)
Or LA 8205 - Urban Form Options: Landscape Architecture Studio (6.0 cr)
LA 5377 - Representation II (4.0 cr)

**Landscape Architecture Electives**
MLA II students not choosing to study abroad take at least 6 elective credits. Credits are selected in consultation with the advisor.
LA 5xxx
LA 8xxx

**Joint- or Dual-degree Coursework:** MLA/MS-Architecture
Student may take a total of 24 credits in common among the academic programs.
Twin Cities Campus
Landscape Architecture M.S.

Contact Information:
Department of Landscape Architecture, 144 Rapson Hall, 89 Church Street SE, Minneapolis, MN 55455 (612-625-6860; fax: 612-625-0710)
Website: http://landarch.design.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MS is for students with a clear focus in research related to landscape architecture. MS students build expertise related to the practice of landscape architecture as they learn how to conduct research. Students specialize within areas of faculty expertise, which may include art and landscape architecture, landscape ecology, landscape architectural history and theory, park and recreation design, rural and suburban landscape planning, transportation, planning of world heritage sites, and urban design.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.8
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 6 major credits, 14 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.
Coursework Requirements

Landscape Architecture Electives
Take 6 or more credit(s) from the following:
• LA 5xxx
• LA 8xxx

Interest Area Electives
Choose elective credits, in consultation with the advisor, from coursework outside landscape architecture.
Take 6 or more credit(s) from the following:
• xxxx 5xxx
• xxxx 6xxx
• xxxx 7xxx
• xxxx 8xxx

Remaining Electives
Choose remaining credits in consultation with the advisor.
Take 8 or more credit(s) from the following:
• xxxx 5xxx
• xxxx 6xxx
• xxxx 7xxx
• xxxx 8xxx

Thesis credits
Take 10 master's thesis credits.
LA 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus

Landscape Architecture Minor

Landscape Architecture

College of Design

Link to a list of faculty for this program.

Contact Information:
Department of Landscape Architecture, University of Minnesota, 144 Rapson Hall, 89 Church Street SE, Minneapolis, MN 55455 (612-625-6860; fax: 612-625-0710)
Email: galand@umn.edu
Website: http://landarch.design.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in landscape architecture develop professional design skills through courses that address the increasingly complex relationships between art, ecology, and community that influence and inform design on the land. Courses emphasize three principal areas of study: 1) landscape architecture as a means to add to the aesthetic richness of our culture and environment--helping us to better understand ourselves and our place in the world; 2) integration of biological, geophysical, and ecological processes into lasting, meaningful, and systemically rigorous landscape architecture that sustains and protects the health of people and the ecosystems on which they depend; and 3) design for urban and suburban places and people, with emphasis on gaining knowledge and experience through direct engagement with clients and the public in order to address the problems and opportunities of the metropolitan core of cities.

Program Delivery
This program is available:
  • via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor requirements are determined in consultation with the Landscape Architecture director of graduate studies.

Required Course
Take the following required course for 3 credits:
LA 5413 - Introduction to Landscape Architectural History (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Electives
Take at least 6 credits from the following:
LA 5003 - Climate Change Adaptation (3.0 cr)
LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
LA 5514 - Making the Mississippi (3.0 cr)
LA 5755 - Infrastructure, Natural Systems and the Space of Inhabited Landscapes (3.0 cr)
LA 5771 - Landscape Infrastructure and Systems I (3.0 cr)
LA 8301 - Landscape Architecture: Research Issues and Methods (3.0 cr)

Doctoral

Electives

Take at least 9 credits from the following:
LA 5003 - Climate Change Adaptation (3.0 cr)
LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
LA 5514 - Making the Mississippi (3.0 cr)
LA 5755 - Infrastructure, Natural Systems and the Space of Inhabited Landscapes (3.0 cr)
LA 5771 - Landscape Infrastructure and Systems I (3.0 cr)
LA 8301 - Landscape Architecture: Research Issues and Methods (3.0 cr)
Twin Cities Campus
Metropolitan Design Postbaccalaureate Certificate
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
College of Design, Metropolitan Design Program, 1 Rapson Hall, 89 Church Street SE, Minneapolis, MN 55455 (625-9000; fax: 626-0600)
Email: mdc@umn.edu
Website: http://www.designcenter.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 21
- This program does not require summer semesters for timely completion.
- Degree: Metropolitan Design PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The metropolitan design certificate at the College of Design prepares students with the essential knowledge and understanding of the city within the complexities of the 21st-century metropolis. As suburban development is losing some of its past seductions, traditional cities are being transformed to accommodate the return to city living, an American counter-trend that requires the integrative approach of many fields of knowledge.

The certificate is open to graduate students in the College of Design and graduate students from other colleges with related urban planning programs are welcome to apply. The certificate is a two-semester, 21-credit course sequence within existing master's degrees at the College of Design. It is strongly recommended that the required urban design courses should be taken in sequence.

Interested students should enroll during the second semester (spring) of graduate studies. It is recommended that students make a decision to enroll in the certificate early so that the completion of courses can be made within the time required for completion of the professional degree.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
An application is required including a 2-page statement of interest in the program, university transcripts, and a portfolio of design work (no more 10 pages). Other students not from the College of Design should submit comparable graphic examples and two written papers.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Coursework

Required Courses
ARCH 5711 - Theory and Principles of Urban Design (3.0 cr)
ARCH 5721 - Case Studies in Urban Design (3.0 cr)
ARCH 8255 - Graduate Architectural Design V (6.0 cr)

Electives
Take 9 or more credit(s) from the following:
• ARCH 5361 - 3-D Computer Architectural Modeling and Design (3.0 cr)
• ARCH 5441 - Minnesota: Architecture and Landscapes (3.0 cr)
• ARCH 5671 - Historic Preservation (3.0 cr)
• ARCH 5731 - Territorial City (3.0 cr)
• ARCH 8561 - Sustainable Design Theory and Practice (3.0 cr)
• HSG 5463 - Housing Policy (3.0 cr)
• HSG 5467 - Housing and the Social Environment (4.0 cr)
• HSG 8463 - Housing: Race and Class (3.0 cr)
• LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
• LA 5405 - Interdisciplinary Studies in Landscape Architecture (1.0 - 6.0 cr)
• PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
• PA 5211 - Land Use Planning (3.0 cr)
• PA 5212 - Managing Urban Growth and Change (3.0 cr)
• PA 5231 - Transit Planning and Management (3.0 cr)
• PA 5261 - Housing Policy (3.0 cr)
• PA 5501 - Theories and Policies of Development (3.0 cr)
• PA 5511 - Community Economic Development (3.0 cr)
• PA 5721 - Energy Systems and Policy (3.0 cr)
• PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• PA 5723 - Water Policy (3.0 cr)
• PA 5802 - Global Economic Policy (3.0 cr)
• PA 8202 - Networks and Places: Transportation, Land Use, and Design (4.0 cr)
• PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
**Twin Cities Campus**

**Museum Studies Minor**

*Design, Housing & Apparel*

**College of Design**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Museum Studies Graduate Minor, College of Design, 240 McNeal Hall, 1985 Buford Avenue, 612-626-1219  
Email: [lnelsonm@umn.edu](mailto:lnelsonm@umn.edu)  
Website: [http://www.design.umn.edu/prospective_students/programs/museumstudies.html](http://www.design.umn.edu/prospective_students/programs/museumstudies.html)

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The museum studies minor offers a structured graduate curriculum for master’s and doctoral students interested in museums. It provides students from a variety of disciplines with an introduction to the issues involved in museum practices (e.g., educational, curatorial, administrative, and conservation). The curriculum includes seminars and internships.

**Program Delivery**

This program is available:
* via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**
As a minor-only program, all graduate students who have already been accepted into a University of Minnesota Graduate program are eligible for acceptance into the program.

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

**Core Course Requirements**

All students pursuing the museum studies minor must take the following core coursework, including 1 internship credit (MST 5020). Internships must be approved by the museum studies director of graduate studies.

- **MST 5011** - Museum History and Philosophy (3.0 cr)
- **MST 5012** - Museum Practices (3.0 cr)
- **MST 5020** - Internship (1.0 - 6.0 cr)

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

- **Master’s**
  Complete the 7-credit core curriculum described above.

**Doctoral**

**Doctoral Electives**
In addition to the core curriculum, take at least 5 credits from the following courses:

**Communication**
Take 0 or more credit(s) from the following:
* JOUR 5251 - Strategic Communication Theory (3.0 cr)

**Leadership**
Take 0 or more credit(s) from the following:
* ACL 5221 - Creative Entrepreneurship and Resource Development (3.0 cr)
* OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
* OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)
* PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
* PA 5104 - Strategic Human Resource Management (3.0 cr)
* PA 5123 - Philanthropy in America: History, Practice, and Trends (3.0 cr)
* PA 5253 - Designing Planning and Participation Processes (3.0 cr)
* PA 5251 - Strategic Planning and Management (3.0 cr)

**Education**
Take 0 or more credit(s) from the following:
* PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)

**Evaluation**
Take 0 or more credit(s) from the following:
* OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
* PA 5311 - Program Evaluation (3.0 cr)

**Exhibition Design**
Take 0 or more credit(s) from the following:
* DES 5185 - Human Factors in Design (3.0 cr)
* DES 8164 - Innovation Theory and Analysis (3.0 cr)
* GDES 8361 - Color, Design, and Human Perception (3.0 cr)
* KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)

**Other Museum Studies Electives**
Internships (MST 5020) must be approved by the museum studies director of graduate studies. Directed study (MST 8993) must be guided by a member of the museum studies graduate faculty.
Take 0 or more credit(s) from the following:
* MST 5020 - Internship (1.0 - 6.0 cr)
* MST 8993 - Directed Study in Museum Studies (1.0 - 4.0 cr)
Twin Cities Campus
Product Design Minor
Design, Housing & Apparel
College of Design

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Product Design Graduate Minor, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108
Email: dhagrad@umn.edu
Website: http://product.design.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 11
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Product design is the planning of an item intended to be manufactured and sold. These items exist both as discrete artifacts and as actors in larger social systems, such as branded environments, services, experiences, and social interactions. A graduate minor may be earned in product design when it logically relates to the graduate major field. The minor program is designed to suit the particular needs and interests of the student. The course of study is determined in consultation with the student's major advisor and the director of graduate studies for the minor.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A graduate minor may be earned in product design when it logically relates to the graduate major field.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum of two courses with the PDES designator must be taken to fulfill the minor requirements.

The course of study must be approved by the product design director of graduate studies.

Product Design Core Courses
Required Course (3 Credits)
PDES 5701 - Creativity, Idea Generation, and Innovation (3.0 cr)

Product Design Process (3 to 8 Credits)
Option 1
PDES 5711 - Toy Product Design (4.0 cr)

Option 2
DES 8151 - Product Development: Theory and Practice (3.0 cr)

Option 3
ME 8221 - New Product Design and Business Development I (4.0 cr)
ME 8222 - New Product Design and Business Development II (4.0 cr)

Option 4
BMEN 8401 - New Product Design and Business Development (4.0 cr)
BMEN 8402 - New Product Design and Business Development (4.0 cr)

Option 5
Take ENTR 6041 for 2 to 4 credits, in consultation with the Product Design director of graduate studies.

ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
ENTR 6042 - Implementing New Product Design and Business Development (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Electives (0 to 4 Credits)
Select remaining coursework, in consultation with the product design director of graduate studies, to meet the 11-credit minimum and the requirement for 2 PDES courses. Product design core courses not applied to the core requirement may be used as electives.

Design Process
- PDES 5711 - Toy Product Design (4.0 cr)
  or DES 8151 - Product Development: Theory and Practice (3.0 cr)
  or BMEN 8401 - New Product Design and Business Development (4.0 cr)
  BMEN 8402 - New Product Design and Business Development (4.0 cr)
  or ME 8221 - New Product Design and Business Development I (4.0 cr)
  ME 8222 - New Product Design and Business Development II (4.0 cr)
  or DES 8164 - Innovation Theory and Analysis (3.0 cr)

Drawing and Visualization
- PDES 5702 - Concept Sketching and Rendering (3.0 cr)
  or PDES 5704 - Computer-Aided Design Methods (3.0 cr)
  or GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

Prototyping, Manufacturing, and the Environment
- PDES 5703 - Product Form and Model Making (4.0 cr)
  or ME 5221 - Computer-Assisted Product Realization (4.0 cr)
  or ME 5223 - Materials in Design (4.0 cr)
  or ME 5241 - Computer-Aided Engineering (4.0 cr)
  or ME 8243 - Topics in Design (4.0 cr)
  or ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
  or ESPM 5605 - Recycling: Extending Raw Materials Supplies (3.0 cr)

Human Factors
- DES 5185 - Human Factors in Design (3.0 cr)
  or CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
  or GDES 5341 - Interactive Design (3.0 cr)
  or GDES 5386 - Fundamentals of Game Design (3.0 cr)
  or KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)
  or HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)

Understanding the Consumer and the Market
- PDES 5705 - History and Future of Product Design (3.0 cr)
  or ANTH 5121 - Business Anthropology (2.0 cr)
  or DES 8164 - Innovation Theory and Analysis (3.0 cr)
  or MKTG 6055 - Consumer Behavior (4.0 cr)
  or MKTG 6050 - Business Research Methods (2.0 cr)

Doctoral
Electives (1 to 4 Credits)
Select remaining coursework, in consultation with the product design director of graduate studies, to meet the 12-credit minimum and the requirement for 2 PDES courses. Product design core courses not applied to the core requirement may be used as electives.

Design Process
- PDES 5711 - Toy Product Design (4.0 cr)
  or DES 8151 - Product Development: Theory and Practice (3.0 cr)
  or BMEN 8401 - New Product Design and Business Development (4.0 cr)
  BMEN 8402 - New Product Design and Business Development (4.0 cr)
  or ME 8221 - New Product Design and Business Development I (4.0 cr)
  ME 8222 - New Product Design and Business Development II (4.0 cr)
  or DES 8164 - Innovation Theory and Analysis (3.0 cr)

Drawing and Visualization
- PDES 5702 - Concept Sketching and Rendering (3.0 cr)
  or PDES 5704 - Computer-Aided Design Methods (3.0 cr)
  or GDES 8362 - The Nature of Representation in Visual Communication (3.0 cr)

Prototyping, Manufacturing, and the Environment
PDES 5703 - Product Form and Model Making (4.0 cr)
or ME 5221 - Computer-Assisted Product Realization (4.0 cr)
or ME 5223 - Materials in Design (4.0 cr)
or ME 5241 - Computer-Aided Engineering (4.0 cr)
or ME 8243 - Topics in Design (4.0 cr)
or ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
or ESPM 5605 - Recycling: Extending Raw Materials Supplies (3.0 cr)
or Human Factors
DES 5185 - Human Factors in Design (3.0 cr)
or CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
or GDES 5341 - Interactive Design (3.0 cr)
or GDES 5386 - Fundamentals of Game Design (3.0 cr)
or KIN 5505 - Human-Centered Design - Principles and Applications (3.0 cr)
or HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
or Understanding the Consumer and the Market
PDES 5705 - History and Future of Product Design (3.0 cr)
or ANTH 5121 - Business Anthropology (2.0 cr)
or DES 8164 - Innovation Theory and Analysis (3.0 cr)
or MKTG 6055 - Buyer Behavior (4.0 cr)
or MKTG 6050 - Business Research Methods (2.0 cr)
**Twin Cities Campus**

**Additional Licensure Other**

*Curriculum & Instruction, Educational Psychology, Family Social Science, Kinesiology, School of, Organizational Leadership, Policy and Development*

**College of Education and Human Development**

Link to a list of faculty for this program.

**Contact Information:**
CEHD Office of Teacher Education
275 Peik Hall
159 Pillsbury Dr SE
Minneapolis, MN 55455
612-625-5060
Email: ote@umn.edu
Website: [http://www.cehd.umn.edu/future/graduate/teach/additional/default.html](http://www.cehd.umn.edu/future/graduate/teach/additional/default.html)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 19 to 24
- This program requires summer semesters for timely completion.
- Degree: College of Education Additional Licensure

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The additional licensure program offers a variety of courses specifically designed to address the competencies required by the state for various teaching and administrative licenses. Additional licenses are added to a current five-year, full-time professional Minnesota teaching license. Courses are offered throughout the year with evening courses offered during fall, spring, and summer semesters, and day courses offered during the summer semester. Students who enroll in the program are generally practicing teachers. They complete the program in an average of one to two years.

**Accreditation**
This program is accredited by NCATE/BOT, Council of Exceptional Children (CEC) and Council on Education of the Deaf (CED).

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
Other requirements to be completed before admission:
This program is not offered full-time and therefore is not intended for international students needing a visa to study in the United States.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

Students must complete all coursework with a grade of S or C or better.

**Required courses**
Required courses are specific to the individual Additional Licensure sub-plan programs listed.

**Program Sub-plans**
Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

Director of Community Education
Director of Special Education
Early Childhood Special Education
Parent and Family Education
Principal K-12
Superintendent K-12
Twin Cities Campus

Additional Licensure Teaching
Curriculum & Instruction, Educational Psychology, Family Social Science, Kinesiology, School of, Organizational Leadership, Policy and Development

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
CEHD Office of Teacher Education, 110 Wulling Hall, 86 Pillsbury Dr SE, Minneapolis, MN 55455 612-625-5060.
Email: ote@umn.edu
Website: http://www.cehd.umn.edu/graduate/additional-license.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 19 to 24
- This program requires summer semesters for timely completion.
- Degree: College of Education Additional Licensure

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The additional licensure program offers a variety of courses specifically designed to address the competencies required by the state for various teaching and administrative licenses. Additional licenses are added to a current five-year, full-time professional Minnesota teaching license. Courses are offered throughout the year with evening courses offered during fall, spring, and summer semesters, and day courses offered during summer semester. Students who enroll in the program are generally practicing teachers. They complete the program in an average of one to two years.

Accreditation
This program is accredited by NCATE/BOT, Council of Exceptional Children (CEC) and Council on Education of the Deaf (CED).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
This program is not offered full-time and therefore is not intended for international students needing a visa to study in the United States.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Students must complete all coursework with a grade of S or C or better.

Required courses
Required courses are specific to the individual Additional Licensure sub-plan programs listed.

Program Sub-plans

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Information current as of August 31, 2018
Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

**Academic and Behavioral Strategist**
The professional development program in special education offers a program of study that leads to K-12 licensure as an Academic Behavioral Strategist (ABS) and an MEd degree. This degree is designed to prepare teachers to work in a variety of educational settings with students who have mild to moderate disabilities. Graduates of the program are student-centered, collaborative professionals who implement evidence-based instructional interventions with fidelity to improve learner outcomes. The program incorporates maximizing learner expectations and learning opportunities including cultural and social diversity. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with developmental disabilities and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

**ABS Licensure Required Courses**
EPSY 4613, 5604, 5605, 5611, 5614, 5616, 5617, 5618, 5619, 5657, 5704, 5705 and 5741

**Agricultural Education 5-12**

**Autism Spectrum Disorders licensure**
The professional development program in special education offers a program in Autism Spectrum Disorders (ASD) that leads to Birth-12 licensure and an MEd degree. This degree is designed to prepare teachers to work in a variety of educational settings including home and school based programs with children who have been identified with ASD and their families. Graduates are prepared to assess, analyze, and provide intervention and remediation of academic, social and communicative challenges for students with ASD. This program focuses on the implementation of evidence-based practices, specialized educational services, and outcomes that add value to the learning and development of infants, children and adults with ASD from diverse cultural backgrounds.

**ASD Licensure Required Courses**
EPSY 4613, 5611, 5614, 5616, 5618, 5621, 5622, 5625, 5631, 5632, 5633, 5661, 5662, 5663, 5664, 5681, 5705, 5742

**Chemistry Education 9-12**

**Comm Arts/Lit Educ 5-8/9-12**

**Comm Arts/Lit Education 5-8**

**Deaf and Hard of Hearing**

**Developmental Disabilities**

**Early Childhood Educ Birth-Gr3**

**Earth & Space Science Ed 9-12**

**Emotional and Behavioral Disorders**
New student applications to Emotional and Behavioral Disorders are not being accepted.

**English as a Second Lang K-12**

**Learning Disabilities K-12**

**Life Science Education 9-12**

**Mathematics Education 5-8**

**Mathematics Education 5-8/9-12**

**Oral/Aural**

**Physics Education 9-12**

**Reading**

**Visual Arts Education K-12**

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Information current as of August 31, 2018
WorldLang/Cultures: Japanese K-12
WorldLang/Cultures: Arabic K-12
WorldLang/Cultures: Chinese K-12
WorldLang/Cultures: French K-12
WorldLang/Cultures: German K-12
WorldLang/Cultures: Hebrew K-12
WorldLang/Cultures: Italian K-12
WorldLang/Cultures: Latin K-12
WorldLang/Cultures: Norweg K-12
WorldLang/Cultures: Ojibwe K-12
WorldLang/Cultures: Polish K-12
WorldLang/Cultures: Russian K-12
WorldLang/Cultures: Spanish K-12
WorldLang/Cultures: Swedish K-12

Dance
Theatre
Twin Cities Campus
Adult Education M.Ed.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in adult education (AdEd), is a specialized academic area of the Human Resource Development program in the Department of Organizational Leadership, Policy, and Development. AdEd graduate programs prepare individuals to work with adults in a variety of roles, such as program developers, teachers, advisers, administrators, and managers in a variety of formal and informal settings, such as educational institutions, business and industry, community agencies, healthcare organizations, continuing and professional education, and adult basic education.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Special Application Requirements:
When applying online, applicants should complete Statements #1 & 2 (Statement #1 should indicate if student is in a special cohort). Filling out statement #3 optional. Applicants must also submit a résumé and personal statement (limit two pages) describing career goals and rationale for interest in the M.Ed. program. Two letters of recommendation from individuals who can attest to the applicant's potential are also required. Admissions are done on a rolling basis with the following deadlines: March 1 (Summer), July 1 (Fall), November 1 (Spring).

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan C: Plan C requires 24 major credits and 10 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Required Courses

Students must complete at least 34 credits, including the following courses:

- OLPD 5296: Field Experience in Adult Education (3 credits are required and no more than 6 credits may be applied toward the program)
- OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
- OLPD 5202 - Perspectives of Adult Learning and Development (3.0 cr)
- OLPD 5204 - Designing the Adult Education Program (3.0 cr)
- OLPD 5296 - Field Experience in Adult Education (1.0 - 6.0 cr)
- OLPD 5607 - Organization Development (3.0 cr)
- OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)
- OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)

One additional 3 credit Adult Education course with adviser approval

Up to 10 credits of electives courses with adviser approval to equal the 34 credits needed for this program. The appropriate elective courses may vary.

Note on OLPD 5296 Field Experience in Adult Education: 3 credits are required and no more than 6 credits may be applied toward the program.

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Rochester

All sub-plans have the same curriculum requirements. New students are not being admitted to this sub-plan. Courses may be taken on the Twin Cities campus.
Twin Cities Campus

Adult Education Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organization Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Adult Education PBacc Certificate Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in adult education (AdEd), is a specialized academic area of the Human Resource Development program track in the Department of Organizational Leadership, Policy, and Development. AdEd graduate programs prepare individuals to work with adults in a variety of roles, such as program developers, teachers, advisors, administrators, and managers in a variety of formal and informal settings, such as educational institutions, business and industry, community agencies, healthcare organizations, continuing and professional education, and adult basic education.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Admission is open to degree-seeking or non-degree seeking students who possess a U.S. bachelor's degree (or international equivalent). Applications are reviewed on an ongoing basis and may be submitted at any time.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.
Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

**Required Coursework**
- OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)
- OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
- OLPD 5202 - Perspectives of Adult Learning and Development (3.0 cr)

Students should enroll for a minimum of 4 credits of OLPD 5296 or OLPD 5696
- OLPD 5296 - Field Experience in Adult Education (1.0 - 6.0 cr)
- or OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)

**Electives**
- Only if needed to meet 14 credit minimum
- OLPD 5607 - Organization Development (3.0 cr)
- or Additional OLPD courses with adviser approval to make total credits earned equal at least 14 credits.
Twin Cities Campus

Adult Literacy Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
The Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Adult Literacy PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The adult literacy certificate is designed to prepare teachers, administrators, trainers, and counselors in the broad political, social, economic, and theoretical aspects of adult literacy in a global environment.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
Other requirements to be completed before admission:
US bachelor's degree or international equivalent.

Special Application Requirements:
Admission is open to degree-seeking or non-degree seeking students. Students may pursue the certificate alone or concurrently with a UM master's or doctoral degree program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

Adult Literacy
Select courses from the following three modules for a total of at least 6 credits.

Module 1
OLPD 5211 - Introduction to the Undereducated Adult (1.0 cr)
OLPD 5212 - Introduction to Adult Literacy in the Workplace (1.0 cr)
OLPD 5213 - Introduction to Adult Literacy in the Community (1.0 cr)

or Module 2
OLPD 5224 - Formal Assessment of Adult Literacy (1.0 cr)
OLPD 5225 - Informal Assessment of Adult Literacy (1.0 cr)
OLPD 5226 - Advanced Assessment of Adult Literacy (1.0 cr)

or Module 3
OLPD 5233 - Methods of Teaching Beginning Adult Literacy (1.0 cr)
OLPD 5234 - Methods of Teaching Intermediate Adult Literacy (1.0 cr)
OLPD 5235 - Methods of Teaching Advanced Adult Literacy (1.0 cr)

or Subgroup 3

**Adult Education**

Take one of the following courses for 3 credits.

OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

or OLPD 5202 - Perspectives of Adult Learning and Development (3.0 cr)

**Field Experience**

Take the following course for 3 credits.

OLPD 5296 - Field Experience in Adult Education (1.0 - 6.0 cr)

**Electives**

Take at least 2 credits of electives. Courses other than the following may be substituted with program advisor approval.

CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)

or CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)

or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)

or CI 5662 - Second Language Curriculum Design (3.0 cr)
Twin Cities Campus
Advanced Practices in Second Language Teaching Postbaccalaureate Certificate
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program requires summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota’s Advanced Practices in Second Language Teaching Certificate program is designed for teachers of foreign languages and English as a second/foreign language and is offered by the Department of Curriculum and Instruction in partnership with the Center for Advanced Research on Language Acquisition (CARLA) Summer Institute Program.

Courses are offered on the Twin Cities campus, typically during the last three weeks in July. The certificate may be completed independently or in conjunction with a master of education (M.Ed) degree in second languages and cultures education at the University of Minnesota.

Although the University certificate does not lead to teaching licensure or state certification, it adds value to a pre-service or in-service teacher’s academic program and professional life. Completion of the advanced practices in second language teaching certificate indicates successful participation in a set of internationally recognized, high-quality summer institutes for language teaching and provides a vehicle for teachers to receive tangible recognition of preparation in advanced language teaching practices and methodologies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A completed bachelor's degree is required for admission.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a one page personal statement discussing your experience teaching languages and the ways this certificate program will contribute to your professional development. Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Courses (6 credits)
- CI 5621 - Culture as the Core in the Second Language Classroom (2.0 cr)
- CI 5622 - Growing Learner Language: A Hands-On Approach to Developing the Language Learners Produce (2.0 cr)
If CI 5608: CARLA Summer Institute Seminar is selected, student must take "Teaching Language Online" topic section.
- LGTT 5110 - Technology in the Second Language Classroom (2.0 cr)
  or CI 5608 - CARLA Summer Institute Seminar (1.0 - 4.0 cr)

Elective Courses (6 credits)
Take 3 or more course(s) totaling 6 or more credit(s) from the following:
- CI 5608 - CARLA Summer Institute Seminar (1.0 - 4.0 cr)
- CI 5623 - Improving Language Learning: A Practical Course in Styles- and Strategies-based Instruction (2.0 cr)
- CI 5624 - Content-based Language Instruction and Curriculum Development (2.0 cr)
- CI 5625 - Developing Assessments for the Second Language Classroom (2.0 cr)
- CI 5626 - Developing Learners’ Sociocultural Competence (2.0 cr)
Twin Cities Campus

Applied Child and Adolescent Development M.A.

Institute of Child Development

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Institute of Child Development
51 East River Parkway
Minneapolis, MN 55455
612-625-9778
Email: icdapply@umn.edu
Website: http://icd.umn.edu/academics/applied-child-and-adolescent-development/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 32
- This program requires summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students will gain knowledge of developmental processes and competence in the application of theory and research to practice and policy/research. Specialization happens via formal tracks in infant and early childhood mental health, child life, or individualized studies.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have completed at least one general psychology, human development, or social science course with a grade of B or higher. Applicants must submit, via the online application system, a departmental application to a specific track, TOEFL scores if applicable, three letters of recommendation from persons familiar with their potential for graduate study, unofficial transcripts, a statement of career interests, goals, and objectives, and a statement of diversity.

Child life track applicants must also have completed or have in progress one child life course taught by a certified child life specialist (CCLS) and 100 hours of documented direct experience with children and families in a hospital/medical setting, preferably under the supervision of a CCLS. In addition, applicants must meet the minimum technical standards for internship in a clinical setting as outlined by the Child Life Council.

Please see our website for full details.

International applicants must submit score(s) from one of the following tests:
- TOEFL

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 32 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.
Capstone Project: Students will develop an individual capstone project in consultation with their advisor. Their capstone project should integrate the foundational knowledge gained via their coursework with the applied experience required as part of their Plan C Project.

Credits: CPSY 5996 Field Experience in Applied Child and Adolescent Development (3-6 credits).

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Students are admitted to a specific track (academic content sub-plan) and must complete the core courses, the required courses for their track as listed below, and the Plan C Project credits.

Core Courses
Take 14 or more credit(s) from the following:
- CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
- CPSY 5302 - Cognitive and Biological Development (3.0 cr)
- CPSY 5303 - Social and Emotional Development (3.0 cr)
- CPSY 5304 - Research Methods in Applied Child and Adolescent Development (3.0 cr)
- CPSY 5306 - Ethics and Professionalism in Applied Child and Adolescent Development (2.0 cr)

Plan C Project Credits
Take 3 - 6 credit(s) from the following:
- CPSY 5996 - Field Experience in Applied Child and Adolescent Development (1.0 - 12.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Infant and Early Childhood Mental Health
The infant and early childhood mental health track is committed to the development of culturally competent, trauma-informed practitioners and policy makers through inter-disciplinary studies and supervised professional practice. The program philosophy is shaped by an ecological, multi-generational, relational model of development and intervention, attending to the ways biology, environment (i.e., family, culture, socioeconomic context), and individual history transact to promote health and pathology. The track consists of coursework and training in the application of developmental science to early childhood evidence-based practice and policy development. The training prepares practitioners to conceptualize case work with young children (0-5) and their caregivers, and prepares individuals to formulate and advocate research-based policy and practice in the area of childrens mental health.

Infant and Early Childhood Mental Health Track Required Courses
Take 15 or more credit(s) from the following:
- CPSY 5503 - Development and Psychopathology in Early Childhood (3.0 cr)
- CPSY 5506 - Infant Observation Seminar I (1.0 cr)
- CPSY 5508 - Infant Observation Seminar II (1.0 cr)
- CPSY 5511 - Infant Observation Seminar III (1.0 cr)
- CPSY 5513 - Early Childhood Assessment (3.0 cr)
- CPSY 5518 - Prevention and Intervention in Early Childhood: Principles (3.0 cr)
- CPSY 5521 - Prevention and Intervention in Early Childhood: Practice (3.0 cr)

Child Life
The child life track is committed to preparing child life specialists with a strong educational foundation in developmental science coupled with a thorough theoretical education in topics central to the child life profession such as illness and injury, therapeutic play and relationships, and childhood death and bereavement. Students will develop the skills necessary to promote family-centered care and work with children and their families who are living with chronic and acute healthcare challenges.

Child Life Track Required Courses
Take 15 or more credit(s) from the following:
- CPSY 5601 - Child Life Theory, Practice and Program Development (3.0 cr)
- CPSY 5602 - Developmental Perspectives on Illness and Injury in Healthcare (3.0 cr)
- CPSY 5603 - Therapeutic Play for Child Life Practice (3.0 cr)
- CPSY 5604 - Therapeutic Relationships: Supporting Children in Healthcare (3.0 cr)
- CPSY 5605 - Childhood Death and Berevement (3.0 cr)

Individualized Studies
The individualized studies track prepares students whose work intersects with children and families with a strong academic foundation in developmental science, exposure to current issues and great challenges in developmental science, and the opportunity to craft a...
supporting program or add a graduate minor tailored to a student's individual career goals. This track recognizes the wide ranging professions that benefit from integration with developmental science, such as policy development, evaluation studies, prevention science, parent education, among many other domains currently addressed via existing coursework at the University.

**Individualized Studies Track Required Courses**
Take 9 or more credit(s) from the following:
- CPSY 5310 - Current Issues in Applied Child and Adolescent Development (3.0 cr)
- CPSY 5413 - Early Childhood and Public Policy (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)

**Individualized Studies Track Electives**
Take at least 6 credits, selected in consultation with an advisor.
Twin Cities Campus
Autism Spectrum Disorder Postbaccalaureate Certificate
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax: 612-624-8241).
Email: sped-adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych/Programs/SpecialEd/certificate/Autism.html

Program Type: Post-baccalaureate credit certificate/licensure/endorsement
Requirements for this program are current for Fall 2018
Length of program in credits: 12
This program does not require summer semesters for timely completion.
Degree: Autism Spectrum Disorder Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The certificate program in autism spectrum disorder (ASD) is designed to prepare teachers and related service personnel to design and deliver services to children and youth with ASD and their families. This 12-credit program provides a broad overview of major issues in ASD and specialized training in methods of assessment, intervention, and treatment evaluation. This program offers professional development opportunities for autism resource specialists, public and private social service agency staff, personnel at public and private schools, treatment facility personnel, and other human service professionals.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
International students wishing to complete the certificate must be admitted to a degree program at the University of Minnesota, Twin Cities. Graduate applicants must have a minimum 2.80 GPA in an undergraduate degree and 3.00 in graduate coursework from accredited institutions.

Special Application Requirements:
All applicants must submit the following materials: - Two letters of recommendation on letterhead stationery from individuals who can address the applicant's abilities to work in a professional context with this population - Typed goal statement - Completed online application - Transcripts from all postsecondary institutions attended or currently attending, except the University of Minnesota. For students not currently in a University of Minnesota program, transcripts must be received from the issuing school in a sealed and stamped envelope.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the...
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

All coursework must be completed for the certificate. Students will have a maximum of four years to do so from the time of admission. Students must maintain a minimum 3.00 GPA in certificate coursework to remain in the program.

Required Coursework
Students must complete the following coursework (12 credits).
EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
EPSY 5632 - Module 2: Evidence-based Methods for AAC Assessment and Intervention (2.0 cr)
EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
Twin Cities Campus
Child Psychology M.A.
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Institute of Child Development, 154 Child Development Building, 51 East River Parkway, Minneapolis, MN 55455 (612-624-0526; fax: 612-624-6373)
Email: ljendras@umn.edu
Website: http://www.cehd.umn.edu/icd/programs/graduate.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The Institute of Child Development does not offer admission for this master's degree. Current Child Psychology PhD students may choose to complete this master's degree (Plan B) during their progress toward the PhD. See the Child Psychology PhD for more information.

Students seeking an applied masters in Child Psychology should consider the Institute of Child Development's Applied MA in Child and Adolescent Development.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Note: The Institute of Child Development does not offer admission for this master's degree. Students may choose to complete this master's degree (Plan B) during their progress toward the Ph.D. See the Child Psychology Ph.D. for more information.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 22 major credits and up to null credits outside the major. The final exam is written. A capstone project is required.
Capstone Project: The Plan B project is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Major Courses
CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
CPSY 8304 - Developmental Research Methods (3.0 cr)
CPSY 8307 - Prelim Seminar (1.0 cr)
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Special Topics and Advanced Seminars (4 credits)
Take 4 or more credit(s) from the following:
- CPSY 8360 - Special Topics in Developmental Psychology (1.0 - 3.0 cr)
- CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
- CPSY 8660 - Advanced Developmental Psychology (1.0 - 4.0 cr)

Plan B Project Credits
Take 8 or more credit(s) from the following:
- CPSY 8994 - Research Problems in Child Psychology (1.0 - 6.0 cr)
Twin Cities Campus
Child Psychology Minor
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Email: ljendras@umn.edu
Website: http://www.cehd.umn.edu/icd/programs/CPSY/Graduate/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate students majoring in other fields may complete a doctoral minor in child psychology. Contact the Institute of Child Development for more information.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Please contact the Associate Director of Curriculum and Student Services at the Institute of Child Development before declaring the Child Psychology minor.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
Required Courses
CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
CPSY 8996 - Directed Field Experiences in Child Psychology (1.0 - 6.0 cr)
Remaining credits can be taken from CPSY 4xxx (subject to their major program's approval) or CPSY 8xxx courses.
Twin Cities Campus
Child Psychology Ph.D.
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Institute of Child Development, 154 Child Development Building, 51 East River Parkway, Minneapolis, MN 55455 (612-624-0526; fax: 612-624-6373).
Email: icdapply@umn.edu
Website: http://www.cehd.umn.edu/icd/programs/CPSY/Graduate/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 68 to 70
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD in child psychology focuses primarily on training for research in normal human development. The goal of the program is to train all students for careers in research and college teaching in child psychology, and to prepare students in the collaborative program options for careers in applied areas of child psychology, as well. Students are admitted to either the general track or the developmental psychopathology and clinical studies track.

General track students may choose to specialize in an area such as cognitive neuroscience, language, learning, personality, memory, perception, psychobiology, or social development.

Students interested in clinical research may specialize in developmental psychopathology and clinical science through participation in the developmental psychopathology and clinical science (DPCS) training program. DPCS training is a cooperative effort between the Institute of Child Development and the Department of Psychology to instruct leaders in research and teaching. DPCS training draws on the unique strengths of each program. Students in this track complete a required clinical internship, which adds an additional year to program completion.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Most students admitted have a substantial background in psychology, courses in mathematics and the natural sciences, and undergraduate research experience.

Special Application Requirements:
For full application instructions, please see: http://www.cehd.umn.edu/icd/programs/CPSY/Graduate/apply.html Applications are accepted for fall semester entry only and due by December 1 of the previous year. Late applications are not accepted.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 27
- IELTS
  - Total Score: 6.5
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
44 to 46 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

The PhD degree usually requires five years of graduate work. Major program components include coursework, research activities, and teaching experience. Coursework requirements are specialization specific, but all students are required to take 45 credits in the major and 24 thesis credits.

Each student specializes in an area such as social and personality development, learning, cognitive development, cognitive neuroscience, language development, psychobiology, or perceptual development.

Major Program Coursework
CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
CPSY 8304 - Developmental Research Methods (3.0 cr)
CPSY 8307 - Prelim Seminar (1.0 cr)
CPSY 8321 - Seminar in Teaching Developmental Psychology (1.0 cr)
CPSY 8322 - Apprenticeship in Teaching Developmental Psychology (1.0 - 3.0 cr)

Special Topics and Advanced Seminars (5 credits minimum)
5 credits of CPSY 8360/CPSY 86xx, of which one course must be at least 3 credits.
Take 2 or more course(s) totaling 5 or more credit(s) from the following:
• CPSY 8360 - Special Topics in Developmental Psychology (1.0 - 3.0 cr)
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• CPSY 8607 - Developmental Neurobiology of Stress and Emotion (3.0 cr)
• CPSY 8608 - Clinical Intervention with Children (3.0 cr)
• CPSY 8660 - Advanced Developmental Psychology (1.0 - 4.0 cr)

Statistical Analysis
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Research Credits (14 credits minimum)
Take 14 or more credit(s) from the following:
• CPSY 8994 - Research Problems in Child Psychology (1.0 - 6.0 cr)

5 elective credits of CPSY or outside coursework
5 credits of CPSY or outside elective coursework, planned in consultation with adviser.

Thesis Credits
Take exactly 24 credit(s) from the following:
• CPSY 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Clinical Physiology and Movement Science Minor
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
400 Cooke Hall, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-624-4370; fax: 612-624-1314)
Email: jkonczak@umn.edu
Website: http://ccms.umn.edu/Programs.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's or doctoral minor in clinical physiology and movement science is an innovative free-standing graduate minor that is available to University of Minnesota graduate students. Offering a uniquely interdisciplinary program in a new, emerging field of study, the minor is designed for graduate students in clinical, engineering, nursing, public health, and medical fields who are interested in the clinical aspects of physiology and movement science. The interdisciplinary coursework combines physiology and movement science with clinical skills for research and the diagnosis and assessment of disease conditions. Developed by faculty with rich collective expertise from across the University, the minor offers students a choice of two tracks: clinical physiology or clinical movement science.

The minor is attractive to graduate students seeking a PhD or master's degree in kinesiology, rehabilitation sciences, and the speech and hearing sciences; in biomedical or mechanical engineering; in the School of Nursing; in the School of Public Health; or seeking a combined MD/PhD who have an interest in a variety of medical fields such as neurology, neurosurgery, otolaryngology, orthopedics, and pediatrics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students wishing to pursue this graduate minor must be currently enrolled in a graduate degree program at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

CPMS 5101 Introduction to Clinical Physiology and Movement Science is a required core course for all students seeking the minor. KIN 5987 Professional Skills and Grant Writing for Health Sciences, 2 credits, is also required for a PhD minor, unless an equivalent course has been taken or the student can document previous grant writing experience.

Additional elective courses are selected in consultation with the faculty advisor and approved by the director of graduate studies (DGS), in order to satisfy the requirements for the minor. Courses chosen will depend on the background and goals of the student. Students can select one of two tracks: clinical physiology or clinical movement science.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Clinical Movement Science (Master's)

**Required Courses**
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)
- KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)

**Electives**
Electives are chosen in consultation with the advisor. NURS 8173 and SAPH 8173 are cross-listed. Take 4 or more credit(s) from the following:
- • BMEN 5201 - Advanced Biomechanics (3.0 cr)
- • CPMS 5201 - Colloquium in Clinical Physiology and Movement Science (1.0 cr)
- • CPMS 8201 - Seminar in Clinical Physiology and Movement Science (1.0 cr)
- • KIN 5122 - Applied Exercise Physiology (3.0 cr)
- • KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- • KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- • KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- • KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
- • KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
- • KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
- • KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
- • KIN 8132 - Seminar: Motor Development (3.0 cr)
- • KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
- • KIN 8211 - Seminar: Perception and Action (3.0 cr)
- • NURS 5222 - Advanced Human Physiology (2.0 cr)
- • NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)
- • NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
- • SAPH 8173 - Principles and Methods of Implementing Research (3.0 cr)
- • NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
- • OT 5393 - Functional Anatomy and Kinesiology (4.0 cr)
- • OTOL 5993 - Directed Studies (1.0 - 12.0 cr)
- • OTOL 8239 - Otoneurology (1.0 - 2.0 cr)
- • OTOL 8244 - Seminar: Current Literature (1.0 cr)
- • PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- • PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- • PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- • PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
- • PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- • RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- • RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- • RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
- • RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- • RSC 8135 - Human Kinematics (3.0 cr)
- • RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- • RSC 8282 - Problems in Human Movement (4.0 cr)

Clinical Movement Science (Doctoral)

**Required Courses**
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)
- KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)

**Electives**
Electives are chosen in consultation with the advisor. NURS 8173 and SAPH 8173 are cross-listed. Take 7 or more credit(s) from the following:
- • BMEN 5201 - Advanced Biomechanics (3.0 cr)
- • CPMS 5201 - Colloquium in Clinical Physiology and Movement Science (1.0 cr)
- • CPMS 8201 - Seminar in Clinical Physiology and Movement Science (1.0 cr)
- • KIN 5122 - Applied Exercise Physiology (3.0 cr)
- • KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- • KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- • KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- • KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
- • KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
- • KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
- • KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
- • KIN 8132 - Seminar: Motor Development (3.0 cr)
- • KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
Clinical Physiology (Master's)

**Required Courses**

- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

**Electives**

Electives are chosen in consultation with the advisor. NURS 8173 and SAPH 8173 are cross-listed.

Take 6 or more credit(s) from the following:

- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- CPMS 5201 - Colloquium in Clinical Physiology and Movement Science (1.0 cr)
- CPMS 8201 - Seminar in Clinical Physiology and Movement Science (1.0 cr)
- KIN 5122 - Applied Exercise Physiology (3.0 cr)
- KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
- KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
- KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
- KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
- KIN 8132 - Seminar: Motor Development (3.0 cr)
- KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)
- NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
- SAPH 8173 - Principles and Methods of Implementing Research (3.0 cr)
- NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
- OT 5393 - Functional Anatomy and Kinesiology (4.0 cr)
- OTOL 5993 - Directed Studies (1.0 - 12.0 cr)
- OTOL 8244 - Seminar: Current Literature (1.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- RSC 8135 - Human Kinematics (3.0 cr)
- RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8282 - Problems in Human Movement (4.0 cr)

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Information current as of August 31, 2018
Clinical Physiology (Doctoral)

Required Courses
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

Electives
Electives are chosen in consultation with the advisor. NURS 8173 and SAPH 8173 are cross-listed.
Take 9 or more credit(s) from the following:
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- CPMS 5201 - Colloquium in Clinical Physiology and Movement Science (1.0 cr)
- CPMS 8201 - Seminar in Clinical Physiology and Movement Science (1.0 cr)
- KIN 5122 - Applied Exercise Physiology (3.0 cr)
- KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
- KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
- KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
- KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
- KIN 8132 - Seminar: Motor Development (3.0 cr)
- KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)
- NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
- SAPH 8173 - Principles and Methods of Implementing Research (3.0 cr)
- NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
- OT 5393 - Functional Anatomy and Kinesiology (4.0 cr)
- OTOL 5993 - Directed Studies (1.0 - 12.0 cr)
- OTOL 8239 - Otoneurology (1.0 - 2.0 cr)
- OTOL 8244 - Seminar: Current Literature (1.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- RSC 8135 - Human Kinematics (3.0 cr)
- RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8282 - Problems in Human Movement (4.0 cr)
Clinical Physiology and Movement Science Postbaccalaureate Certificate
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
400 Cooke Hall, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-624-4370; fax: 612-624-1314).
Email: jkonczak@umn.edu
Website: http://ccms.umn.edu/Programs.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Clinical Physiology & Movement Science PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The clinical physiology and movement science postbaccalaureate certificate program is aimed at D.N.P. and M.D. fellows in nursing and medicine, as well as professionals in clinical fields, such as physical, occupational, and speech therapy. In addition, engineers working in the area of medical technology or medical device development are potential candidates. The interdisciplinary coursework combines physiology and movement science with clinical skills for research and the diagnosis and assessment of disease conditions. Students have the option to tailor the program to their individual needs and interest. They may select from a list of more than 30 courses. Developed by faculty with a rich collective expertise from across the University, the programs offer students a choice of two tracks: clinical physiology and clinical movement science.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Students wishing to pursue the certificate program must have completed a bachelor's degree, preferably in an allied health sciences or natural science field.

Special Application Requirements:
If the individual is applying for a certificate and is not currently enrolled in a graduate program at the University of Minnesota, two letters of support will be requested and a GPA of 3.0 or greater (or equivalent if there were a different student evaluation system) from a previous graduate program will be required. Submission package includes: clinical physiology and movement science application form, resume or curriculum vitae, transcripts, two letters of support, and documented language proficiency. Deadline for Fall semester admission is July 15; deadline for Spring semester admission is November 15.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

**Required Course**
This course is required for both the Clinical Movement Science track and the Clinical Physiology track:
CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

**Elective Courses**
The following courses are offered by a number of graduate programs and can be used as course electives for the certificate program in consultation with the adviser. NURS 8173 and SAPH 8173 are cross-listed.

BMEN 5201 - Advanced Biomechanics (3.0 cr)
or CPMS 5201 - Colloquium in Clinical Physiology and Movement Science (1.0 cr)
or CPMS 8201 - Seminar in Clinical Physiology and Movement Science (1.0 cr)
or KIN 5122 - Applied Exercise Physiology (3.0 cr)
or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
or KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
or KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
or KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
or KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
or KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
or KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
or KIN 8132 - Seminar: Motor Development (3.0 cr)
or KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
or NURS 5222 - Advanced Human Physiology (2.0 cr)
or NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)
or NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
or SAPH 8173 - Principles and Methods of Implementing Research (3.0 cr)
or NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
or OT 5393 - Functional Anatomy and Kinesiology (4.0 cr)
or OTOL 5993 - Directed Studies (1.0 - 12.0 cr)
or OTOL 8239 - Otoneurology (1.0 - 2.0 cr)
or OTOL 8244 - Seminar: Current Literature (1.0 cr)
or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
or PUBH 6342 - Epidemiologic Methods II (3.0 cr)
or PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
or PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
or RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
or RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
or RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
or RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
or RSC 8135 - Human Kinematics (3.0 cr)
or RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
or RSC 8282 - Problems in Human Movement (4.0 cr)

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Clinical Movement Science**
Clinical movement science is a new, interdisciplinary field of study focusing on human movement dysfunctions due to neurological or orthopedic diseases or diminished physical activity. This new field bridges the gap between basic and clinical sciences by crossing the boundaries of traditional disciplines of neurology, neurophysiology, kinesiology, and physical and occupational therapy. The curriculum includes a required core course that covers the theory and application of clinical physiology and movement science. Elective courses are chosen from a broad list of offerings in departments such as kinesiology, public health, rehabilitation science, and otolaryngology.

The postbaccalaureate certificate requires a minimum of 12 semester credits. CPMS 5101 serves as a required core course for all students seeking a certificate. Electives are selected in consultation with the faculty adviser and approved by the director of graduate studies (DGS), in order to satisfy the requirements for the certificate. The specific courses chosen will depend on the background and goals of the individual student.
Sample Program for Clinical Movement Science Track

**Required**
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

**Electives**
- Students should register for 2 credits of OTOL 8239.
- RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
- OTOL 8239 - Otoneurology (1.0 - 2.0 cr)
- KIN 5941 - Clinical Movement Neuroscience (3.0 cr)

Clinical Physiology

This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

Clinical physiology is a branch of physiology that bridges basic physiology and clinical medicine. It joins the gap between basic and clinical sciences by crossing the boundaries of traditional disciplines of neurology, neurophysiology, kinesiology, and physical and occupational therapy. The curriculum includes a required core course that covers the theory and application of clinical physiology and movement science. Elective courses are chosen from a broad list of offerings in departments such as kinesiology, public health, rehabilitation science, and otolaryngology.

The postbaccalaureate certificate requires a minimum of 12 semester credits. CPMS 5101 is required for all students seeking a certificate. Electives are selected in consultation with the faculty adviser and approved by the director of graduate studies (DGS) in order to satisfy the requirements for the certificate. The specific courses chosen will depend on the background and goals of the individual student.

Sample Program for Clinical Physiology Track

**Required**
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

**Electives**
- KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
Twin Cities Campus
Curriculum and Instruction M.Ed.
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of education (MEd)/professional studies degree programs are designed to meet the needs of practicing professionals in education and human development fields. Students admitted typically have interests in improving their current professional practice and applying their education to their present work responsibilities.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A bachelor's degree from an accredited college or university.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a clearly written statement of career interests, goals, and objectives. Master's applications are reviewed by department faculty three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

**Arts in Education**

This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in arts in education is designed for experienced art, theater, and dance teachers, and others who want to acquire advanced knowledge and leadership skills in the arts field. The program is flexible and can be tailored to accommodate individual needs. Final project requirements include a school-based project examining a problem, issue, or topic identified by the student.

The MEd/professional studies arts in education sub-plan requires a minimum of 10 credits of core coursework, 14 credits of arts in education coursework, and 6 credits of electives for a total of 30 credits.

**Core Coursework (10 credits)**

- CI 5177 should be taken for 3 credits. CI 5186 should be taken for 1 credit.
- CI 5049 - Digital Media & Technology Integration: Arts Education Theory & Practice (3.0 cr)
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
- CI 5177 - Practical Research (1.0 - 3.0 cr)
- CI 5186 - School-Related Projects (1.0 - 4.0 cr)

**Arts in Education Requirements (14 credits)**

- CI 5050 should be taken for 3 credits.
- CI 5050 - Issues in Art Education (1.0 - 4.0 cr)
- CI 5069 - Curriculum Innovations in Arts Education (3.0 cr)
- CI 5075 - The Social, Historical and Cultural Foundations of Arts Education (3.0 cr)
- CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)
- CI 8079 - Research in Art Education (3.0 cr)

**Electives (6 credits)**

Courses will be selected in consultation with faculty advisor.

**Elementary Education**

This sub-plan is limited to students completing the program under Plan C.

**Core Coursework (3 credits)**

- CI 5111 - Introduction to Elementary School Teaching (3.0 cr)

**Elementary Education Requirements (15 credits)**

Courses will be selected in consultation with faculty advisor.

**Electives (12 credits)**

Courses will be selected in consultation with faculty advisor.

**ALERT:** the MEd/professional studies degree program in elementary education is currently suspended. We are not accepting applications at this time.

The MEd/professional studies program in elementary education is designed for elementary teachers who want to improve their instructional, decision-making, evaluation, and leadership skills. The program is flexible and can be tailored to accommodate individual needs.

The MEd/professional studies elementary education sub-plan requires 3 credits of core coursework, 15 credits of elementary education coursework, and 12 credits of electives for a total of 30 credits.

**Core Coursework (3 credits)**

- CI 5111 - Introduction to Elementary School Teaching (3.0 cr)

**Elementary Education Requirements (15 credits)**

Courses will be selected in consultation with faculty advisor.

**Electives (12 credits)**

Courses will be selected in consultation with faculty advisor.
**English Education**
This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in English education addresses the needs and interests of middle school, high school, and community-college English teachers. The English education program provides instruction on current developments in English/language arts curriculum theory and research, as well as methods for teaching literature, reading, composition, media, drama, and journalism. The program is flexible and can be tailored to accommodate individual needs.

The MEd/professional studies English education sub-plan requires 6 credits of core coursework, 18 credits of English education coursework, and 6 credits of electives for a total of 30 credits.

**Core Coursework (6 credits)**
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)

**English Education Requirements (18 credits)**
Take 18 or more credit(s) from the following:
- CI 5404 - Multicultural Literature for Children and Adolescents (3.0 cr)
- CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
- CI 5417 - Elementary literacy Instruction for ESL Students (3.0 cr)
- CI 5422 - Teaching Writing in Schools (3.0 cr)
- CI 5442 - Literature for Adolescents (3.0 cr)
- CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
- CI 5462 - Evaluating and Assessing Writing (3.0 cr)
- CI 5472 - Teaching Critical Media Analysis in Schools (3.0 cr)
- CI 5475 - Teaching Digital Writing (3.0 cr)
- CI 5541 - Language, Culture, and Education (3.0 cr)

**Electives (6 credits)**
Courses will be selected in consultation with faculty advisor.

**Environmental Education**
This sub-plan is limited to students completing the program under Plan C.

ALERT: the MEd/professional studies degree program in environmental education is currently suspended. We are not accepting applications at this time.

The MEd/professional studies degree program in environmental education is designed to develop leaders in environmental education through integrated research, outreach, and teaching. This program of at least 30 semester credits offers an interdisciplinary, integrated approach to environmental learning and leadership for school teachers, extension service educators, and environmental educators in formal and informal settings. Learning experiences allow students to integrate their work experience and academic study. Field work, evaluation methods, internships, and other practical applications of theory and method are integral parts of the program.

The MEd/professional studies environmental education sub-plan requires 13 credits of core coursework, 3 credits of coursework related to research methods/evaluation/statistics, and 14 credits of electives for a total of 30 credits.

**Core Coursework (13 credits)**
- CI 5186 and CI 5190 must each be taken for a minimum of 2 credits.
- ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
- CI 5186 - School-Related Projects (1.0 - 4.0 cr)
- CI 5190 - Directed Individual Study in Curriculum and Instruction (1.0 - 6.0 cr)
- CI 5537 - Principles of Environmental Education (3.0 cr)
- CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)

**Research Methods, Evaluation, or Statistics (3 credits)**
A minimum of 3 credits, chosen in consultation with the faculty advisor, intended to provide skills or knowledge essential to the required research project.

**Electives (14 credits)**
A minimum of 14 credits of graduate-level coursework (5xxx and above) selected in consultation with faculty advisor from the following fields: natural sciences, social sciences, humanities, education, natural resources, or agriculture.

**Interdisciplinary Studies**
This sub-plan is limited to students completing the program under Plan C.
The MEd/professional studies program in interdisciplinary studies is a graduate-level, practitioner-based, coursework-only program designed for cohorts of experienced K-12 teachers of different subjects. This program is for cohorts of students and is not offered to individuals.

It integrates coursework representing a number of academic disciplines as defined in K-12 contexts with coursework emphasizing particular areas of interest. Practicing teachers complete 30 semester credits of work in two areas: a core academic program with courses representing a range of K-12 disciplines, and elective courses related to a specific focus area. The program may be combined with a certificate program offered in the Department of Curriculum and Instruction. Depending upon the cohort for which the program is designed, the program may be completed entirely online, entirely face-to-face (F2F), or as a hybrid, with a combination of F2F and online coursework.

The MEd/professional studies interdisciplinary studies sub-plan requires a minimum of 15 credits of interdisciplinary studies coursework, and 15 credits of electives for a total of 30 credits.

**MEd - Interdisciplinary Studies**

**Interdisciplinary Studies**

**Total: 30 credits**

**Interdisciplinary Requirements (15 credits)**

Students will take CI 5150 twice: once under the "Educational Inequities: Race, Class & Gender" topic, and the second under the "Teaching for Civic Engagement" topic. Each course should be taken for 3 credits.

Take 5 or more course(s) totaling 15 or more credit(s) from the following:

- CI 5361 - Teaching and Learning with the Internet (2.0 - 3.0 cr)
- CI 5540 - Special Topics: Science Education (1.0 - 4.0 cr)
- CI 5150 - Curriculum Topics (3.0 cr)
- CI 5474 - New Literacies Frameworks and Instruction: Digital Texts and Digital Reading (3.0 cr)

**Electives (15 credits)**

Elective credits around a specific focus area will be identified for specific cohorts based on their expressed interests. Elective credits may be comprised of courses leading to a particular certificate.

-OR-

**Interdisciplinary Studies - Dual Language & Immersion Education Cohort**

**Total: 30 credits**

**Interdisciplinary Requirements (15 credits)**

Students will take CI 5150 twice: once under the "Educational Inequities: Race, Class & Gender" topic, and the second under the "Teaching for Civic Engagement" topic.

Take 5 or more course(s) totaling 15 or more credit(s) from the following:

- CI 5361 - Teaching and Learning with the Internet (2.0 - 3.0 cr)
- CI 5540 - Special Topics: Science Education (1.0 - 4.0 cr)
- CI 5150 - Curriculum Topics (3.0 cr)
- CI 5474 - New Literacies Frameworks and Instruction: Digital Texts and Digital Reading (3.0 cr)

**Cohort Requirements (15 credits)**

Students will take the topic "Biliteracy Development in Dual Language and Immersion Classrooms" for the CI 5660 requirement. CI 5660 is taken for 3 credits.

- CI 5648 - Advanced Practices in Teaching Academic Language (3.0 cr)
- CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)
- CI 5670 - Foundations of Dual Language and Immersion Education (3.0 cr)
- CI 5671 - Curriculum Development and Assessment in Dual Language/Immersion Classrooms (3.0 cr)
- CI 5672 - Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms (3.0 cr)

**Language Immersion Education**

This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in language immersion education is designed for practicing dual language or language immersion educators, or individuals with an interest in language immersion education. Program participants have the option to add a 15 credit certificate in dual language and immersion education, which requires a separate application. Offered partially online, the program provides educators with the specific knowledge base and skill set needed for the dual language/immersion (DL/I) education setting and emphasizes practical application of concepts.

Key topics include: second language acquisition; research foundations of DL/I education; curriculum planning and assessment development that integrates subject matter content, language, literacy and culture; biliteracy development; language-focused instructional practices and strategies to bring a language focus to content-based instruction; academic language development; issues
related to language status; culturally relevant pedagogy; and tools for assessing language proficiency development. The program culminates with an independent capstone project that gives educators an opportunity to apply the knowledge and skills gained in coursework to their professional practice.

The MEd/professional studies language immersion education sub-plan requires 9 credits of core coursework, 15 credits of language immersion education coursework, and 6 credits of electives for a total of 30 credits.

**Core Coursework (9 credits)**
- CI 5186 should be taken for 3 credits.
- CI 5177 - Practical Research (1.0 - 3.0 cr)
- CI 5186 - School-Related Projects (1.0 - 4.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)

**Language Immersion Requirements (15 credits)**
- CI 5648 - Advanced Practices in Teaching Academic Language (3.0 cr)
- CI 5670 - Foundations of Dual Language and Immersion Education (3.0 cr)
- CI 5671 - Curriculum Development and Assessment in Dual Language/Immersion Classrooms (3.0 cr)
- CI 5672 - Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms (3.0 cr)
- CI 5676 - Biliteracy Development in Dual Language/Immersion Classrooms (3.0 cr)

**Electives (6 credits)**
- Recommended electives are included. Other elective options include University's Center for Advanced Research on Language Acquisition (CARLA) summer institutes on immersion education (options vary by year) or other courses selected in consultation with advisor.
- CI 5641 - Language, Culture, and Education (3.0 cr)
- or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)

**Learning Technologies**
This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in learning technologies is designed for professionals interested in using technology in their organizations (especially K-12 and college educators, new media designers, and corporate trainers). This program also serves students interested in using technology to develop instructional materials for a wide range of settings. Because TEL certificate requirements are incorporated into the MEd program, students may earn a certificate while earning the MEd degree.

The MEd/professional studies learning technologies sub-plan requires 9 credits of core coursework, 12 credits of learning technologies coursework, and 9 credits of electives for a total of 30 credits.

**Core Coursework (9 credits)**
- CI 5331 - Introduction to Learning Technologies (3.0 cr)
- CI 5177 - Practical Research (1.0 - 3.0 cr)
- CI 5190 - Directed Individual Study in Curriculum and Instruction (1.0 - 6.0 cr)

**Learning Technologies Requirements (12 credits)**
- Courses will be selected in consultation with faculty advisor.

**Electives (9 credits)**
- Courses will be selected in consultation with faculty advisor.

**Mathematics Education**
This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in mathematics education is designed for experienced mathematics teachers who want to acquire advanced knowledge and leadership skills in the field of mathematics education. The program is flexible and can be tailored to accommodate individual needs. Final project requirements include a school-based project examining a problem, issue, or topic identified by the student.

The MEd/professional studies mathematics education sub-plan requires 6 credits of core coursework, 14 credits of mathematics education coursework, and 10 credits of electives for a total of 30 credits.

**Core Coursework (6 credits)**
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
- CI 5177 - Practical Research (1.0 - 3.0 cr)

**Mathematics Education Requirements (14 credits)**
- MTHE 5314 - Teaching and Learning Mathematics (3.0 cr)
MTHE 5366 - Technology-Assisted Mathematics Instruction (3.0 cr)
MTHE 5993 - Directed Studies in Mathematics Education (2.0 cr)

Mathematics Education Electives
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
• MTHE 5155 - Rational Number Concepts and Proportionality (3.0 cr)
• MTHE 5171 - Teaching Problem Solving (3.0 cr)
• MTHE 5172 - Teaching Probability and Statistics (3.0 cr)

Electives (10 credits)
Courses will be selected in consultation with faculty advisor. Students choose electives from MATH-designated courses (minimum 7 credits); one MTHE-designated course may be included (maximum 3 credits).

Science Education
This sub-plan is limited to students completing the program under Plan C.

ALERT: the MEd/professional studies degree program in science education is currently suspended. We are not accepting applications at this time.

The MEd/professional studies program in science education is designed for experienced science teachers who want to acquire advanced knowledge and leadership skills in the field of science education. The program is flexible and can be tailored to accommodate individual needs. Final project requirements include a school-based project examining a problem, issue, or topic identified by the student.

The MEd/professional studies science education sub-plan requires 9 credits of core coursework, 12 credits of science education coursework, and 9 credits of electives for a total of 30 credits.

Core Coursework (9 credits)
CI 5186 should be taken for 3 credits.
CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)
CI 5186 - School-Related Projects (1.0 - 4.0 cr)

Science Education Requirements (12 credits)
CI 5533 - Current Developments in Science Teaching (3.0 cr)
CI 5534 - Studies in Science Education (3.0 cr)
CI 5535 - Foundations of Science Education (3.0 cr)
CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)

Electives (9 credits)
Courses will be selected in consultation with faculty advisor.

Social Studies
This sub-plan is limited to students completing the program under Plan C.

ALERT: the MEd/professional studies degree program in social studies education is currently suspended. We are not accepting applications at this time.

The MEd/professional studies program in social studies education is designed for experienced social studies teachers who want to acquire advanced knowledge and leadership skills in the field of social studies education. This program is flexible and can be tailored to accommodate individual needs.

The MEd/professional studies social studies education sub-plan requires 3 credits of core coursework, 15 credits of social studies education coursework, and 12 credits of electives for a total of 30 credits.

Core Coursework (3 credits)
CI 5741 - Introduction to Social Studies Education (3.0 cr)

Social Studies Requirements (15 credits)
Courses will be selected in consultation with faculty advisor.

Electives (12 credits)
Courses will be selected in consultation with faculty advisor.

Second Language Education
This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in second language education (SLE) is designed for experienced second language teachers.
who want to acquire advanced knowledge of research, best practices, and effective policies in the field of second language education. The program addresses the needs and interests of second language educators in a variety of teaching contexts, including world languages and English as a second/foreign language (ESL/EFL). While the program emphasizes instructional issues related to K-12 education, it is also relevant to teachers working with university-level or adult learners. The program is flexible and can be tailored to accommodate individual needs.

The MEd/professional studies second language education sub-plan requires 12 credits of core coursework, 12 credits of second language education coursework, and 6 credits of electives for a total of 30 credits.

**Core Coursework (12 credits)**
CI 5186 should be taken for 3 credits.
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
- CI 5177 - Practical Research (1.0 - 3.0 cr)
- CI 5186 - School-Related Projects (1.0 - 4.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)

**SLE Requirements (12 credits)**
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
- CI 5662 - Second Language Curriculum Design (3.0 cr)
- CI 5642 - Assessing English Learners (3.0 cr)
  - or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)

**Electives (6 credits)**
Courses will be selected in consultation with faculty advisor.

**Second Language Pedagogy**
This sub-plan is limited to students completing the program under Plan C.

The MEd/professional studies program in second language pedagogy is designed for practicing K-16 world language or English as a second language (ESL) teachers with an interest in enhancing their pedagogical knowledge and skills. Program participants have the option to add a 12 credit certificate in advanced practices in second language teaching, which requires a separate application. This coursework-only program is offered in conjunction with the summer institute program offered through the University’s Center for Advanced Research on Language Acquisition (CARLA).

Key topics include second language acquisition; the foundations of second language pedagogy and education; using technology to enhance language instruction; content-based curriculum development; performance assessment and issues in language testing; strategies to enhance second language literacy development and the teaching of speaking and listening skills; and integrating culture in language teaching.

The MEd/professional studies second language pedagogy sub-plan requires 21 credits of second language pedagogy coursework, and 9 credits of electives for a total of 30 credits.

**Second Language Pedagogy Requirements (21 credits)**
- LGTT 5110 - Technology in the Second Language Classroom (2.0 cr)
- CI 5621 - Culture as the Core in the Second Language Classroom (2.0 cr)
- CI 5622 - Growing Learner Language: A Hands-On Approach to Developing the Language Learners Produce (2.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
- CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
- CI 5662 - Second Language Curriculum Design (3.0 cr)
- CI 5642 - Assessing English Learners (3.0 cr)
  - or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)

**Electives (9 credits)**
Take 9 or more credit(s) from the following:
- CI 5608 - CARLA Summer Institute Seminar (1.0 - 4.0 cr)
- CI 5623 - Improving Language Learning: A Practical Course in Styles- and Strategies-based Instruction (2.0 cr)
- CI 5624 - Content-based Language Instruction and Curriculum Development (2.0 cr)
- CI 5626 - Developing Assessments for the Second Language Classroom (2.0 cr)
- CI 5641 - Language, Culture, and Education (3.0 cr)
Twin Cities Campus
Disability Policy and Services Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Disability Policy and Services PBacc Cert Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The certificate in disability policy and services is designed to allow graduate as well as community professionals, to study policies and services that affect the lives of children, youth, and adults with disabilities. The 12-credit program surveys the spectrum of education, health, and social services available to individuals with disabilities and their families, and examines the public and private networks of disability services from an interdisciplinary perspective. While the program addresses the needs of people with all types of disabilities, it emphasizes developmental disabilities across the lifespan. The program’s individualized learning experience (ILE) requires students to integrate theory with practice by completing a disability-related research project or working directly with people with disabilities in settings such as schools, recreation centers, or human-service agencies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.50.

Other requirements to be completed before admission:
Applicants must have completed an undergraduate degree by the time they start the program. Students must have completed a four-year college degree or equivalent coursework. Applications are reviewed on a rolling basis and may be submitted at any time.

Special Application Requirements:
Please address the following five questions below. Please answer each question listed and limit your response to 2 typed or word-processed pages, size-12 font. Upload your responses to the ApplyYourself online application in the “Program Specific Questions” upload area.

- What are your major areas of interest in the field of disability services or related to individuals with disabilities?
- What have been your past experiences in the area of disability services or related to individuals with disabilities?
- What is your current involvement in the field of disability services or related to individuals with disabilities?
- What is your anticipated or desired career interest?
- Why are you interested in the Disability Policy and Services Certificate Program?

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

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A minimum GPA of 2.80 is required for students to remain in good standing.

In addition to coursework, students must participate in at least six, one-hour interdisciplinary reflection groups to discuss relevant topics and ways to integrate field experiences with coursework. Reflection groups are offered throughout the year, including the summer session.

**Required Course**
OLPD 5356 - Disability Policy and Services (3.0 cr)

**Specialized Coursework**
This component broadens the student's level of knowledge in disability policies and services. Students must choose from courses offered across the University focusing on disability policy, disability services, and/or interdisciplinary teaming, such as communication disorders, family social science, kinesiology, nursing, public affairs, or social work. The ICI Certificate Coordinator can provide students with a list of acceptable courses meeting this requirement.
6 cr to be taken with approval from the ICI Certificate Coordinator

**Individualized learning experience & Interdisciplinary reflection groups**
This component allows students to integrate and apply the information they have learned in coursework. Students work with the ICI Certf Coord to design an individualized learning experience (ILE) in which they work with persons who have disabilities in settings like schools, recreation centers, health clinics, or human-service agencies. The ILE can be completed in one or two semesters, but must total at least 3 cr and at least 200 hours. The 3 cr to be taken with approval from the ICI Certf Coord
Twin Cities Campus
Dual Language and Immersion Education Postbaccalaureate Certificate

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Dual Language Immersion Education PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This graduate-level certificate program gives students an opportunity to complete a coordinated series of courses in the area of dual language and immersion education. The program does not lead to a state teaching certificate or licensure (note that a university certificate program or certificate is distinct from a state certificate or certification).

In Minnesota and other states in the U.S., dual language/immersion teachers at the elementary level are required to hold a teaching license in elementary education, and at the secondary level a license in the subject matter they teach (e.g., science, social studies, math). The University of Minnesota offers initial teacher licensure programs for individuals not yet licensed, and additional teacher licensure programs for those individuals who already hold a MN teaching license and wish to add another.

The dual language and immersion education certificate program is designed for preK-12 teachers and other professionals to be able to work effectively in the following school-based program models:
- "One-way" foreign language immersion programs designed for native English-speaking students
- "Two-way" bilingual immersion programs designed for native English-speaking students and native speakers of the program's partner language, such as Spanish
- Developmental bilingual programs designed for minority language learners, such as native Spanish speakers
- Indigenous language immersion programs designed for Native American children in indigenous communities with the goal of revitalizing an endangered language and culture

In dual language and immersion programs, the second/foreign/minority language that students are acquiring is a vehicle to teach school subjects. In order to be considered a dual language or immersion program, the immersion language must be used for at least 50 percent of subject-matter instruction during the elementary school years. In a middle/secondary continuation program, at least two, year-long content courses must be taught in the immersion language.

These programs aim for "additive bilingualism and biliteracy," or the acquisition of another language at no expense to the first, native language. Research shows that well-implemented programs allow students to develop higher levels of language proficiency in the immersion language than in any other type of language program model.

This unique University certificate program is the first in the U.S. to incorporate a coherent set of courses designed specifically for dual language and immersion teachers, and other professionals. Offered by the college's Department of Curriculum and Instruction (C&I), the program was designed jointly by the college's Second Languages and Cultures (SLC) education faculty, and representatives of dual language and immersion programs in the Twin Cities metropolitan area.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.
A completed bachelor’s degree is required for admission.

Students currently enrolled in a University of Minnesota graduate-level degree program may also apply.

Other requirements to be completed before admission:
Applications should either be currently practicing as dual language or immersion educators, or provide evidence of the necessary background and interest (based on a goal statement).

This certificate program is available to graduate-level students only. Coursework taken before completion of the bachelor's degree cannot be applied to the certificate program.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a goal statement (only if applicant is not a practicing dual language or immersion educator). Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Core Courses (9 credits)**
- CI 5670 - Foundations of Dual Language and Immersion Education (3.0 cr)
- CI 5671 - Curriculum Development and Assessment in Dual Language/Immersion Classrooms (3.0 cr)
- CI 5672 - Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms (3.0 cr)

**Elective Courses (6 credits)**
6 credits required with recommended courses listed. Other courses may be selected in consultation with the faculty advisor.
- CI 5648 - Advanced Practices in Teaching Academic Language (3.0 cr)
- CI 5676 - Biliteracy Development in Dual Language/Immersion Classrooms (3.0 cr)
Twin Cities Campus
Early Childhood Education M.Ed.
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Institute of Child Development, 51 East River Road, Minneapolis, MN 55455 (612-625-9778; fax: 612-624-6373)
Email: alle0335@umn.edu
Website: http://www.cehd.umn.edu/icd/programs/ECE/Graduate/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 57 to 61
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The early childhood education initial licensure/master's of education (MEd) program is offered through the Institute of Child Development in collaboration with the department of Curriculum and Instruction. The program is designed to prepare outstanding teachers of young children who will have a strong foundation in child development theory and research and developmentally appropriate methodology for educating the different ages within the early childhood years (birth to age 8). Clinical experiences in the Shirley G. Moore Laboratory School and in local urban/suburban public schools create a strong experiential base in which to apply the principles and methods learned in University courses. Emphasis is placed on understanding individual learners, working with diverse learners, using a variety of instructional strategies, providing inclusive programming for children with and without special needs, working closely with families, and creating positive classroom communities. The program includes preparation in developing and implementing professional writing and curriculum planning, authentic assessment, documentation of student learning, reflective practice, professional development, and ethics.

Master's of education/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with the Standards of Effective Practice for Teachers (SEPT) and the MN Early Childhood Indicators of Progress adopted by the Minnesota Board of Teaching.

The 52 to 56 credit program includes major coursework, early childhood and elementary methods courses, student teaching experiences in both early childhood and elementary education, and a masters capstone project. This program includes coursework to satisfy both initial licensure requirements and the MEd degree. Upon completion of all requirements, students are eligible for recommendation for teacher licensure in early childhood education (birth to third grade). Teacher licensure is awarded through the Minnesota Department of Education. Students have five years from initial enrollment in the program to complete their MEd degree and must maintain a 2.80 GPA to be eligible for the MEd.

A 30 to 32 credit advanced standing plan is available for students who completed the University of Minnesota-Twin cities BS in early childhood education: foundations degree. Students in the advanced standing plan complete the MEd in two semesters.

Accreditation
This program is accredited by Council for the Accreditation of Educator Preparation (CAEP)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A bachelor's degree must be completed at the time of matriculation.

Required prerequisites
Prerequisite Coursework
Prerequisite coursework is required to meet the Standards of Effective Practice for Teachers (SEPT) and the MN Early Childhood Indicators of Progress adopted by the Minnesota Board of Teaching. Prerequisites may be completed after admission to the program.

CPSY 2301 - Introduction to Child Psychology [SOCS] (4.0 cr)
CPSY 4331 - Social and Personality Development (3.0 cr)
CPSY 4343 - Cognitive Development (3.0 cr)
CPSY 5241 - Practicum in Early Childhood Education (3.0 cr)
CI 3401W - Diversity in Children's Literature [WI] (3.0 cr)
CI 5414 - Practicum: Working With Developing Readers (2.0 cr)
CI 5413 - Foundations of Reading (3.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
CI 3610 - Linguistics for Teachers [SOCS] (3.0 cr)
  or LING 3001 - Introduction to Linguistics [SOCS] (4.0 cr)
  or ENGL 3601 - Analysis of the English Language (4.0 cr)
PUBH 3005 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)
  or PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)

Other requirements to be completed before admission:
Applicants are strongly encouraged to obtain paid or unpaid classroom experience with young children, ages birth to third grade, with multicultural and diverse populations.

Students with an undergraduate degree other than the University of Minnesota-Twin Cities BS in early childhood education: foundations are eligible to apply with the understanding that they will take approximately 30 additional credits of prerequisite coursework to meet state licensure standards.

Special Application Requirements:
Applicants who have completed the Early Childhood: Foundations degree through the University of Minnesota apply for admission to fall terms.

Applicants who have not completed their bachelors degrees at the University of Minnesota are eligible to apply for a start term in the spring, summer, or fall.

All applicants must submit the following five required application materials through the online application system:

1. Transcripts - Unofficial transcripts or academic records should be uploaded directly to the online application. International students should also upload an English translation if the transcript is not in English. Please do not mail in paper copies of your transcripts. There is no need for official transcripts or academic records for initial review. If you are admitted, the University will then request official copies of this material.

2. Resume

3. Essay

4. Two Letters of Recommendation - These letters should be written by someone who is knowledgeable about your education-related experiences, work with young children, work style, and personal attributes.

5. Application fee - This fee is charged when you submit your application and is required for each application you submit. Fees must be paid online with a credit card.

Nonnative English speakers and/or international students should also submit an official score report from the Test of English as a Foreign Language (TOEFL).

All applicants must take the Minnesota Teacher Licensure Exam [Reading (test code 001), Writing (test code 002), and Mathematics (test code 003)] prior to beginning the program, or have qualifying ACT/SAT scores.

See full application instructions and deadlines at: http://www.cehd.umn.edu/icd/futurestudents/ece/graduate/

Applicants must submit their test score(s) from the following:
- Minnesota Teacher Licensure Exam
- MTLE Basic Skills Tests

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 21
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C**: Plan C requires 57 to 61 major credits and up to null credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Early Childhood Education**

MEd required coursework

**Major Courses**

- CPSY 5251W - Social and Philosophical Foundations of Early Childhood Education [WI] (3.0 cr)
- EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)
- EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
- EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)

**CPSY Methods Courses**

- CPSY 5252 - Facilitating Social and Emotional Learning in Early Childhood Education (3.0 cr)
- CPSY 5253 - Facilitating Cognitive and Language Learning in Early Childhood Education (3.0 cr)
- CPSY 5254 - Facilitating Creative and Motor Learning in Early Childhood Education (2.0 cr)

**CI Methods Courses**

- CI 5425 - Reading Instruction in the Elementary Grades (3.0 cr)
- CI 5426 - Language Arts Instruction in the Elementary Grades (3.0 cr)
- CI 5502 - Social Studies Instruction in the Elementary Grades (3.0 cr)
- CI 5645 - Teaching English Learners in the Elementary Classroom (3.0 cr)
- CI 5645 - Teaching English Learners in the Elementary Classroom (3.0 cr)
- CI 5646 - Teaching English Learners in the Elementary Classroom (3.0 cr)
- CI 5647 - Teaching English Learners in the Elementary Classroom (3.0 cr)
- CI 5822 - Mathematics Instruction in the Elementary Grades (3.0 cr)

Take exactly 2 credit(s) from the following:

- CPSY 5171 - Practicum: Applying Instructional Methods in the Elementary School (2.0 cr)

**Student Teaching**

Take exactly 10 credit(s) from the following:

- CPSY 5181 - Clinical Experience in Elementary School Teaching (10.0 cr)

Take 6 - 8 credit(s) from the following:

- CPSY 5281 - Student Teaching in Early Childhood Education (6.0 - 8.0 cr)

**MEd Completion**

- CPSY 5187 - Capstone Project: Improvement of Teaching in Early Childhood Education (2.0 - 4.0 cr)

**Early Childhood Education - U of MN BS in ECE:F Degree Transitioners**

MEd required coursework

**CI Methods Courses**

- CI 5425 - Reading Instruction in the Elementary Grades (3.0 cr)
- CI 5426 - Language Arts Instruction in the Elementary Grades (3.0 cr)
- CI 5502 - Science Instruction in the Elementary Grades (3.0 cr)
- CI 5645 - Teaching English Learners in the Elementary Classroom (3.0 cr)
- CI 5702 - Social Studies Instruction in the Elementary Grades (3.0 cr)
- CI 5822 - Mathematics Instruction in the Elementary Grades (3.0 cr)

**Student Teaching**

Take exactly 10 credit(s) from the following:

- CPSY 5181 - Clinical Experience in Elementary School Teaching (10.0 cr)

**MEd Completion**

- CPSY 5187 - Capstone Project: Improvement of Teaching in Early Childhood Education (2.0 - 4.0 cr)
Twin Cities Campus
Education, Curriculum, and Instruction M.A.
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-2545; fax: 612-624-8277).
Email: cigs@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 41
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

By focusing on the curricular and instructional processes central to all educational endeavors, graduate programs within the Department of Curriculum and Instruction prepare students for professional roles in K-12 education, postsecondary and research settings, educational service agencies, and business and industry.

The MA degree includes formal tracks in arts in education; elementary education; learning technologies; literacy education; mathematics education; science education; second language education; social studies education; and teaching English to speakers of other languages.

Students must have an interest in research in education or a related field; students plan a program of coursework that prepares them to conduct scholarly research in an area of expertise related to a track or tracks listed above.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Generally a bachelor's degree with licensure and/or teaching experience fulfills the requirement. For some areas, however, there is no equivalent undergraduate program. In that case, 15 to 20 credits of undergraduate coursework determined acceptable by advisors and the director of graduate studies is adequate.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the GRE, scores from the TOEFL/IELTS/MELAB (if applicable), three letters of recommendation from individuals familiar with their scholarship and research potential, a resume, a clearly written statement of career interests, goals, and objectives, and a diversity statement. Some program tracks require an example of academic writing. Master's applications are reviewed by department faculty once per academic year, with December 1 as the deadline.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 15 to 25 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 to 25 major credits and 6 to 9 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: All MA students must demonstrate familiarity with the tools of research or scholarship in their major track, the ability to work independently, and the ability to present their work effectively.

Plan B paper(s) are less formal than the Plan A thesis and may build more directly from coursework; papers should involve deep engagement of the research literature. A paper done for a course may serve as one of the Plan B papers, with the understanding that it would be extended and revised under the advisor's supervision.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: For TESOL track only

A minimum GPA of 3.00 is required for students to remain in good standing.

In education, curriculum & instruction, students may pursue Plan A (with thesis) or Plan B (with one or two papers). Core and research course requirements are specified for Plan A and Plan B in accord with each track and are chosen in consultation with the advisor.

Plan A requires 15-26 credits in the major, depending upon the formal track chosen, and a minimum of 6 credits in one or more related fields outside the major. Plan A also requires 10 thesis credits.

Plan B requires 24-26 credits in the major and 6-9 credits in one or more related fields outside the major, depending upon formal track chosen.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

Arts in Education

The MA program's arts in education track presents opportunities for students with experience in schools or other educational settings to develop their ability to work at the intersection of theory and practice. Gaining the knowledge and skills necessary to be reflective and well-informed art educators, graduates become educational leaders in many contexts—school districts, museums, community arts organizations, government agencies—or often pursue further graduate study. Students are encouraged to take courses both across the College of Education and Human Development and the University at large and typically fulfill program requirements by exploring issues of teaching, learning, curriculum, teacher education, and school reform in urban and suburban schools, several renowned art museums in the greater Minneapolis area, and within the initial teacher licensure program at the University. The course of study is planned in consultation with the adviser to meet the academic interests and background of the students; those needs are balanced with the expected foundations in research and scholarship. Independent scholarship is encouraged and typically comes in the form of a final project (Plan B) or a more formal thesis (Plan A).

Program faculty exhibit a strong commitment to curriculum innovation, issues of social justice and diversity, and life-long aesthetic and
The arts in education track (Plan A) requires 13 credits of required major coursework plus an additional 2 credits of coursework to be selected in consultation with faculty advisor, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The arts in education track (Plan B) requires 7 credits of required major coursework plus an additional 11 credits of coursework selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

**Plan A or Plan B**

**Arts in Ed - Plan A**

Total: 31 credits

**Major Coursework**

- Required courses are listed; others selected in consultation with faculty advisor for a total of 15 credits
  - CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)
  - CI 8075 - Seminar: Art Education (2.0 cr)
  - CI 8079 - Research in Art Education (3.0 cr)
  - CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
  - CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

**Minor or Related Field**

Selected in consultation with faculty advisor for a total of 6 credits

**Thesis Credits**

A minimum of 10 credits are required
  - CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Arts in Ed - Plan B**

Total: 30 credits

**Major Coursework**

- Required courses are listed; others selected in consultation with faculty advisor for a total of 18 credits
  - CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)
  - CI 8075 - Seminar: Art Education (2.0 cr)
  - CI 8079 - Research in Art Education (3.0 cr)

**Research Coursework**

- CI 8095 is required and should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
  - CI 8095 - Problems: Art Education (1.0 - 12.0 cr)

**Minor or Related Field**

Selected in consultation with faculty advisor for a total of 6 credits

**Elementary Education**

The MA program's elementary education track is designed to help professionals acquire and contribute to the advancement of knowledge and leadership so necessary to address the dynamic challenges of contemporary education at the elementary level. Emphasized within the track are, for example, the following: a focus on interdisciplinary approaches to curriculum development, the use of inquiry as a key pedagogical approach, the importance of a strong understanding of diversity and its social and educational implications, and child development and learning theories as the foundation for research and teaching elementary settings.

The elementary education track (Plan A) requires 6 credits of required major coursework plus an additional 9 credits of coursework to be selected in consultation with faculty advisor, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The elementary education track (Plan B) requires 18 credits of coursework selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

**Plan A or Plan B**

**Elem Ed - Plan A**

Total: 31 credits

**Major Coursework**

- Required courses are listed; others selected in consultation with faculty advisor for a total of 15 credits
  - CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
  - CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

**Minor or Related Field**

Selected in consultation with faculty advisor for a total of 6 credits

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Information current as of August 31, 2018
Thesis Credits
A minimum of 10 credits are required
CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Elem Ed - Plan B
Total: 36 credits
Major Coursework
Courses will be selected in consultation with faculty advisor for a total of 18 credits
Research Coursework
CI 8195 (Plan B paper) should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
CI 8195 - Problems: Improvement of Instruction (1.0 - 6.0 cr)
Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Learning Technologies
The learning technologies (LT) MA track prepares people for research and practice related to multimedia, design, K-12 technology integration, and online distance learning. MA graduates often conduct research and engage in LT-related practice in K-12, higher education, or business or industry, such as software companies. LT coursework includes hands-on learning and use of current technologies, development of technological solutions, consideration of theory and research, and conducting educational research.

The MA's LT track is targeted at students interested in a stronger research orientation than those who pursue the master of education degree. MA students, who often continue to a PhD program, are required to take courses in research methodology and to write a Plan A thesis or Plan B paper to complete their degree. Master's degrees extend the content in the certificate programs and include various courses taken from inside and outside the program. Students may engage in advanced media and software design and development or develop plans for technology integration for diverse educational settings.

The learning technologies track (Plan A) requires 9 credits of required major coursework plus an additional 9 credits of coursework to be selected in consultation with faculty advisor, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 34 credits.

The learning technologies track (Plan B) requires 6 credits of required major coursework plus an additional 12 credits of coursework to be selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

LT - Plan A
Total: 34 credits
Major Coursework
Required courses are listed; others selected in consultation with faculty advisor for a total of 18 credits
CI 5331 - Introduction to Learning Technologies (3.0 cr)
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)
Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits
Thesis Credits
A minimum of 10 credits are required
CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

LT - Plan B
Total: 30 credits
Major Coursework
18 credits are required; 6 credits of required courses are listed. Recommend 12 remaining credits be taken in a technology certificate area.
CI 5331 - Introduction to Learning Technologies (3.0 cr)
CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
Research Coursework
CI 8395 is required and should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
CI 8395 - Directed Study: Learning Technologies (1.0 - 6.0 cr)
Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits
Literacy Education
The MA program's literacy track is thoughtfully designed to balance theory with practical application in a variety of educational settings. There is a deep foundation in evaluating current research and students are encouraged to contribute meaningfully to research in the field of literacy. Faculty members and students work together to study at the intersection of the strands of literacy: children's and adolescent literature, critical literacies, English education, language arts, and reading. Literacy research related to diverse learners in urban, multilingual settings is a central focus of the program. The course of study is planned in consultation with the adviser to meet the academic interests and background of the students; those needs are balanced with the expected foundations in research and scholarship. Independent scholarship is encouraged and typically comes in the form of a final project (Plan B) or a more formal thesis (Plan A).

The literacy education track (Plan A) requires 6 credits of required major coursework plus an additional 9 credits of coursework to be selected in consultation with faculty advisor, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The literacy education track (Plan B) requires 18 credits of coursework selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

Lit Ed - Plan A
Total: 31 credits

Major Coursework
- Required courses are listed; others selected in consultation with faculty advisor for a total of 15 credits. At least one course must be a Literacy Education seminar.
  - CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
  - CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Minor or Related Field
- Selected in consultation with faculty advisor for a total of 6 credits

Thesis Credits
- A minimum of 10 credits are required
  - CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Lit Ed - Plan B
Total: 30 credits

Major Coursework
- Courses will be selected in consultation with faculty advisor for a total of 18 credits. At least one course must be a Literacy Education seminar.

Research Coursework
- CI 8495 is required and should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
  - CI 8495 - Problems: Teaching English and Reading (1.0 - 6.0 cr)

Minor or Related Field
- Selected in consultation with faculty advisor for a total of 6 credits

Mathematics Education
The MA program's mathematics education track prepares students for research and practice related to K-12 mathematics and engineering education. The MA is targeted at students interested in a stronger research orientation than those who pursue the master of education (MEd) degree. MA students, who often continue on to a PhD program, are required to take courses in research methodology and to write a Plan A or Plan B paper to complete their degree. Graduate students participate in this work as teaching assistants, research assistants in externally funded projects, and as instructors.

The mathematics education track (Plan A) requires 15 credits of required major coursework, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The mathematics education track (Plan B) requires 15 credits of coursework selected in consultation with faculty advisor, 6 credits of required research coursework plus an additional 3 credits of research coursework selected in consultation with faculty advisor, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

Math Ed - Plan A
Total: 31 credits
Major Coursework

Required courses are listed:

- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)
- CI 8572 - Learning Theory and Classical Research in STEM Education (3.0 cr)
- MTHE 8571 - Research in Mathematics Education (3.0 cr)

Major Coursework - Additional Choice

Choose any one of the following for a total of 3 credits. Any variable credit course should be taken for 3 credits.

- MTHE 5155 - Rational Number Concepts and Proportionality (3.0 cr)
- or MTHE 5171 - Teaching Problem Solving (3.0 cr)
- or MTHE 5172 - Teaching Probability and Statistics (3.0 cr)
- or MTHE 5366 - Technology-Assisted Mathematics Instruction (3.0 cr)
- or MTHE 8591 - Seminar: Mathematics Education (1.0 - 3.0 cr)

Minor or Related Field

Selected in consultation with faculty advisor for a total of 6 credits.

Thesis Credits

A minimum of 10 credits are required

- CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Math Ed - Plan B

Total: 30 credits

Major Coursework

Selected in consultation with faculty advisor for a total of 15 credits.

Research Coursework

Required courses are listed and MTHE 8995 should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 9 credits.

- MTHE 8571 - Research in Mathematics Education (3.0 cr)
- MTHE 8995 - Problems: Mathematics Education (1.0 - 6.0 cr)

Minor or Related Field

Selected in consultation with faculty advisor for a total of 6 credits.

Science Education

The MA program's science education track is designed to prepare scholars to conduct thoughtful research in order to assume roles as university faculty members, educational leaders, policy makers, and researchers and to contribute meaningfully to the field. The field of science education is a broad one and includes science and environmental education at the K-12 levels, the college level, in informal and adult settings, and in early childhood. Focus areas of research within the science education area are the preparation of pre-service science teachers (K-12), induction and mentoring of beginning science teachers, design and implementation of curricula across the K-college spectrum, environmental education, cooperative learning, and social justice.

The science education track (Plan A) requires 15 credits of required major coursework, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The science education track (Plan B) requires 15 credits of required major coursework plus an additional 3 credits of coursework to be selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

Sci Ed - Plan A

Total: 31 credits

Major Coursework

Required courses are listed; CI 8570 should be taken for 3 credits.

- CI 5535 - Foundations of Science Education (3.0 cr)
- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)
- CI 8570 - Advanced Topics in Science Education (1.0 - 4.0 cr)
- CI 8571 - Equity, Policy, and Social Justice in Science Education (3.0 cr)

Minor or Related Field

Selected in consultation with faculty advisor for a total of 6 credits.

Thesis Credits

A minimum of 10 credits are required

- CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Sci Ed - Plan B
Total: 30 credits

Major Coursework
Required courses are listed; others selected in consultation with faculty advisor for a total of 18 credits. CI 8570 should be taken twice for a total of 6 credits.
- CI 5534 - Studies in Science Education (3.0 cr)
- CI 5535 - Foundations of Science Education (3.0 cr)
- CI 8570 - Advanced Topics in Science Education (1.0 - 4.0 cr)
- CI 8571 - Equity, Policy, and Social Justice in Science Education (3.0 cr)

Research Coursework
CI 8595 is required and should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
- CI 8595 - Problems: Science Education (1.0 - 6.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Second Language Education
The second language education (SLE) track is nationally and internationally known for its programs, which focus on English as a second language (ESL) for K-12, postsecondary, and adult classrooms; bilingual and immersion education; and traditional foreign language education in both K-12 and postsecondary settings. The program’s perspective on language learning and teaching is markedly pedagogical and informed by an awareness of the role social context plays in the process of language learning and teaching. Master's students in the SLE track engage in coursework and projects that balance theory and research with practical application. Students pursue a course of study that is designed in collaboration with the faculty adviser to correspond to the interests and background of each student and to provide a solid understanding of research and best practice in the field. Independent scholarship is encouraged and typically comes in the form of a final project (Plan B) or a more formal thesis (Plan A).

The second language education track (Plan A) requires 18 credits of required major coursework, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 34 credits.

The second language education track (Plan B) requires 15 credits of major coursework, 9 credits of foundational and research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

SLE - Plan A
Total: 34 credits

Major Coursework
- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
  or CI 5670 - Foundations of Dual Language and Immersion Education (3.0 cr)
If taking CI 8650, student should register for 3 credits
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
  or CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
  or CI 8689 - Language and Education Policy (3.0 cr)
  or CI 8650 - Seminar: Special Topics in Second Languages and Cultures Research (1.0 - 3.0 cr)
Take exactly 2 course(s) totaling exactly 6 credit(s) from the following:
  - CI 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
  - CI 5662 - Second Language Curriculum Design (3.0 cr)
    or CI 5671 - Curriculum Development and Assessment in Dual Language/Immersion Classrooms (3.0 cr)
  - CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
    or CI 5542 - Assessing English Learners (3.0 cr)
  - CI 5565 - Teaching Literacy in Second Language Classrooms (3.0 cr)
    or CI 5676 - Biliteracy Development in Dual Language/Immersion Classrooms (3.0 cr)
  - CI 5567 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
    or CI 5672 - Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms (3.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Thesis Credits
A minimum of 10 credits are required
- CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
SLE - Plan B
Total: 30 credits

Major Coursework
Take exactly 15 credit(s) from the following:
• CI 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
• CI 5648 - Advanced Practices in Teaching Academic Language (3.0 cr)
• CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
• CI 5641 - Language, Culture, and Education (3.0 cr)
• CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
  *or CI 5676 - Biliteracy Development in Dual Language/Immersion Classrooms (3.0 cr)
• CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
  *or CI 5641 - Language, Culture, and Education (3.0 cr)
• CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
  *or CI 5672 - Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms (3.0 cr)
• CI 5662 - Second Language Curriculum Design (3.0 cr)
  *or CI 5671 - Curriculum Development and Assessment in Dual Language/Immersion Classrooms (3.0 cr)
• CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
  *or CI 5642 - Assessing English Learners (3.0 cr)

Foundational & Research Coursework
Student should take the Plan B paper course - CI 8695 - for 3 credits
CI 8695 - Problems: Second Languages and Cultures Education (1.0 - 6.0 cr)
CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
  *or CI 5670 - Foundations of Dual Language and Immersion Education (3.0 cr)
If student takes CI 5177, it should be taken for 3 credits
CI 5177 - Practical Research (1.0 - 3.0 cr)
  *or CI 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
  *or EPSY 5261 - Introductory Statistical Methods (3.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Social Studies Education
The MA's social studies education track focuses on issues related to curriculum, instruction and assessment in K-12 social studies. Graduate students are strongly encouraged to present research papers at professional conferences, specifically the National Council for the Social Studies and the American Educational Research Association.

Faculty maintain active research agendas with several research centers at the University including the Center for Applied Research and Educational Improvement, housed within the College of Education and Human Development, and two research centers housed outside the College: the Center for Environmental Learning and Leadership and the Center for the Study of Political Psychology. Social studies faculty research interests include the areas of political socialization, political tolerance, authentic assessment, citizenship and civics education, and democratic thought. In addition, faculty members engage in research centered on the history of curricula, multicultural and gender studies, and social justice.

The social studies education track (Plan A) requires 10 credits of required major coursework plus an additional 6 credits of coursework to be selected in consultation with faculty advisor, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 32 credits.

The social studies education track (Plan B) requires 18 credits of coursework to be selected in consultation with faculty advisor, 6 credits of research coursework which includes 3 credits for the Plan B paper, and 6 credits in a minor/related field for a total of 30 credits.

Plan A or Plan B

Soc Stud Ed - Plan A
Total: 32 credits

Major Coursework
Required courses are listed; others selected in consultation with faculty advisor for a total of 16 credits. CI 8796 has to be taken for a minimum of 1 credit.
CI 5762 - Developing Civic Discourse in the Social Studies (3.0 cr)
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)
CI 8796 - Research Internship in Social Studies Education (1.0 - 6.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Thesis Credits
A minimum of 10 credits are required
CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Soc Stud Ed - Plan B
Total: 30 credits
Major Coursework
Courses are selected in consultation with faculty advisor for a total of 18 credits
Research Coursework
CI 8795 is required and should be taken for 3 credits; other courses selected in consultation with faculty advisor for a total of 6 credits
CI 8795 - Problems: Social Studies Education (1.0 - 6.0 cr)
Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits

Teaching English to Speakers of Other Languages
The teaching English to speakers of other languages (TESOL) track focuses on the broad field of applied linguistics uniting research, teaching and service in addressing the second language learning needs of adult learners in the university and the wider community, both in the US and abroad. Independent scholarship is encouraged and typically comes in the form of a final project (Plan B) or a more formal thesis (Plan A).

The teaching English to speakers of other languages (TESOL) track (Plan A) requires 25 credits of required major coursework, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 41 credits.

The teaching English to speakers of other languages (TESOL) track (Plan B) requires 25 credits of required major coursework, and 9 credits in a minor/related field for a total of 34 credits.

Plan A or Plan B

TESOL - Plan A
Total: 41 credits
Major Coursework
CI 5654 must be taken for 6 credits.
CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
CI 5653 - Methods in Teaching English as a Second Language (ESL) in Higher Education (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5649 - Language Analysis for ESL Teaching in Higher Ed (4.0 cr)
CI 5654 - Practicum in Language Teaching: ESL and World Languages (1.0 - 6.0 cr)
CI 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5654 - Practicum in Language Teaching: ESL and World Languages (1.0 - 6.0 cr)

or
CI 5642 - Assessing English Learners (3.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 6 credits
Thesis
A minimum of 10 credits are required
CI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

TESOL - Plan B
Total: 34 credits
Major Coursework
CI 5654 must be taken for 6 credits.
CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
CI 5653 - Methods in Teaching English as a Second Language (ESL) in Higher Education (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5649 - Language Analysis for ESL Teaching in Higher Ed (4.0 cr)
CI 5654 - Practicum in Language Teaching: ESL and World Languages (1.0 - 6.0 cr)
CI 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5654 - Practicum in Language Teaching: ESL and World Languages (1.0 - 6.0 cr)

or
CI 5642 - Assessing English Learners (3.0 cr)

Minor or Related Field
Selected in consultation with faculty advisor for a total of 9 credits
Twin Cities Campus
Education, Curriculum, and Instruction Minor
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-2545; fax: 612-624-8277)
Email: cigs@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

By focusing on the curricular and instructional processes central to all educational endeavors, graduate programs within the Department of Curriculum and Instruction prepare students for professional roles in preK-12 education, postsecondary and research settings, educational service agencies, and business and industry.

The minor in education, curriculum and instruction may include a focus in any one of the available tracks: art education; culture and teaching (at the doctoral level); elementary education; learning technologies; literacy education; mathematics education; science education; second language education; and social studies education.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students must consult with the Director of Graduate Studies in the Department of Curriculum & Instruction regarding specific coursework and committee involvement for the minor. The Director of Graduate Studies gives final approval for the minor coursework submitted on the Graduate Degree Plan or Graduate Planning & Audit System (GPAS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
A minor at the master's level requires a minimum of 6 credits of CI-designated coursework selected in consultation with the director of graduate studies.

Doctoral
Doctoral (12 Credits)
CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Electives (6 Credits)
Courses will be selected in consultation with the director of graduate studies.
Twin Cities Campus

Education, Curriculum, and Instruction Ph.D.
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-2545; fax: 612-624-8277).
Email: cigs@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 75
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

By focusing on the curricular and instructional processes central to all educational endeavors, graduate programs within the Department of Curriculum and Instruction prepare students for academic and professional roles in K-12 education, post-secondary education, research settings, educational service agencies, and business and industry.

The PhD degree includes formal tracks in the following: arts in education; culture and teaching; elementary education; learning technologies; literacy education; science, technology, engineering and mathematics (stem) education; second language education; and social studies education.

Students must have an interest in research in education or a related field; students plan a program of coursework that prepares them to conduct scholarly research in an area of expertise related to a track listed above.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A master's degree is preferred for admission to some of the tracks within the PhD program, but it is not always required.

Other requirements to be completed before admission:
Generally a bachelor's degree with licensure and/or teaching experience fulfills the requirement. For some areas, however, there is no equivalent undergraduate program. In that case, 15 to 20 credits of undergraduate coursework determined acceptable by faculty is adequate.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the GRE, scores from the TOEFL/IELTS/MELAB (if applicable), three letters of recommendation from individuals familiar with their scholarship and research potential, a clearly written statement of career interests, goals, and objectives, a diversity statement, and a resume. Some program tracks require an example of academic writing. Doctoral applications are reviewed by department faculty once per academic year.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21

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Information current as of August 31, 2018
Program Requirements

39 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

A total of 75 credits is required for the education, curriculum and instruction PhD program. Requirements include core coursework required by all students, major coursework in the student's selected track, research methodology coursework, and a minimum of 12 credits in a minor or supporting program. All PhD students must also complete 24 doctoral thesis credits. Specific courses and additional work vary depending upon the track and are planned in consultation with the faculty advisor.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

Arts in Education

The PhD program's arts in education track presents opportunities for students with experience in schools or other informal educational settings to develop necessary philosophical, theoretical, and methodological competence to make scholarly contributions to the field. Working as researchers, scholars, policy makers, and practitioners, graduates become educational leaders in universities, colleges, K-12 school districts, museums, community arts organizations, and government agencies.

Students typically carry out dissertation inquiry in local urban and suburban schools, several renowned art museums in the Minneapolis-St. Paul area, and within the initial teacher licensure program at the University. Both qualitative and quantitative research methods have guided PhD candidates’ inquiry on the following: rightness of aesthetic-based problem solving, design thinking, and media arts theory and practice in arts classrooms; teaching critical literacy in and through the arts; innovation in culture-based arts education; and other knowledge building questions specific to art teacher development and retention.

Faculty and students are committed to understanding equity and social justice in both research and teaching. Graduate students often work closely with faculty in the development, implementation, and evaluation of national, state, and local arts education initiatives.

Arts in education students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework

- CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Major Coursework

Required courses are listed; others selected in consultation with faculty advisor for a total of 15 credits. CI 8085 is a required course as well, though it may be taken as either a major requirement course or as a research elective course.

- CI 5075 - The Social, Historical and Cultural Foundations of Arts Education (3.0 cr)
- CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)
- CI 8075 - Seminar: Art Education (2.0 cr)
CI 8079 - Research in Art Education (3.0 cr)

**Research Coursework**
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

**Research Electives**
9 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.

Take 9 or more credit(s) from the following:
- CI 8085 - Narrative Inquiry in Education (3.0 cr)
- CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
- CI 8146 - Critical Ethnography in Education (3.0 cr)
- CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
- CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
- CI 8157 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
- CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
- CI 8699 - Language and Education Policy (3.0 cr)
- CI 8913 - Interpretive Research (3.0 cr)
- OLPD 5056 - Case Studies for Policy Research (3.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
- EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- AMST 8289 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
- LING 5462 - Field Research in Spoken Language (3.0 cr)

**Minor or Supporting Program**
12 credits outside the track, selected in consultation with faculty advisor

**Elective**
3 credits selected in consultation with faculty advisor

**Culture and Teaching**
The culture and teaching (CaT) track engages the study of education as a cultural phenomenon. Students in CaT study a range of educational processes that take place both in and beyond the borders of schools, and explore alternative epistemologies and pedagogies. Faculty and students are dedicated to seeking better understandings of issues pertaining to equity and social justice in both research and teaching. The track is interdisciplinary and collaborative, so students' work will encompass many different approaches, methods, and perspectives.

Some of CaT's courses focus on the ways in which teachers are prepared to teach; engage in ongoing professional development; and develop their own personal and professional identities within collegial communities. Other courses examine the salience of understanding white racial identity for pedagogy and social change; as well as the implications of globalization and immigration for teaching, learning, and curriculum. Still other courses explore popular culture and media in relation to contemporary critical theory and teaching practices. "Culture" in CaT includes thinking about "high" and "popular" cultures, the cultures of teaching and the cultures of learning, and how our responses to all influence and are influenced by everyday meanings and practices.

CaT students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor.
advisor. 24 doctoral thesis credits are also required.

**Core Coursework**
- CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

**Major Coursework**
15 credits total, with 9 credits selected in consultation with faculty advisor. CI 8159 will be taken twice for a total of 6 credits.
- CI 8159 - Culture and Teaching Colloquium (3.0 cr)

**Research Coursework**
- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

**Research Electives**
9 additional credits to be selected based upon student’s research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.
- Take 9 or more credits from the following:
  - CI 8003 - Narrative Inquiry in Education (3.0 cr)
  - CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
  - CI 8146 - Critical Ethnography in Education (3.0 cr)
  - CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
  - CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
  - CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
  - CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
  - CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
  - CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
  - CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
  - CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
  - CI 8689 - Language and Education Policy (3.0 cr)
  - CI 8913 - Interpretive Research (3.0 cr)
- OLPD 5056 - Case Studies for Policy Research (3.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- EPSY 8222 - Performance Assessment Design and Analysis (3.0 cr)
- EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- AMST 8289 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
- LING 5462 - Field Research in Spoken Language (3.0 cr)

**Minor or Supporting Program**
12 credits outside the track, selected in consultation with faculty advisor

**Elective**
3 credits selected in consultation with faculty advisor

**Elementary Education**
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

The PhD program's elementary education track is designed to help professionals acquire and contribute to the advancement of knowledge and leadership necessary to address the dynamic challenges of contemporary education at the elementary level. Emphasized within the track are, for example, the following: a focus on interdisciplinary approaches to curriculum development, the use of inquiry as a key pedagogical approach, the importance of a strong understanding of diversity and its social and educational implications, and child development and learning theories as the foundation for research and teaching in elementary settings.
Elementary students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework
- CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Major Coursework
15 credits selected in consultation with faculty advisor

Research Coursework
- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Research Electives
9 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.
Take 9 or more credit(s) from the following:
- CI 8085 - Narrative Inquiry in Education (3.0 cr)
- CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
- CI 8146 - Critical Ethnography in Education (3.0 cr)
- CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
- CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
- CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
- CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
- CI 8689 - Language and Education Policy (3.0 cr)
- CI 8913 - Interpretive Research (3.0 cr)
- OLPD 5056 - Case Studies for Policy Research (3.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
- EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- AMST 8289 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
- LING 5462 - Field Research in Spoken Language (3.0 cr)

Minor or Supporting Program
12 credits outside the track, selected in consultation with faculty advisor

Elective
3 credits selected in consultation with faculty advisor

Learning Technologies
The PhD's learning technologies (LT) track prepares students for research and practice related to multimedia, design, K-12 technology integration, and online distance learning. PhD graduates often earn academic positions in higher education or become directors and leaders of development or research within business and industry. Coursework in LT includes hands-on learning and use of current technologies, development of technological solutions, research methods, and theory of curriculum, instruction, and learning.

The PhD degree is targeted primarily at students interested in pursuing research careers. Student research, culminating in a dissertation, typically evaluates various learning technologies issues and interventions. Common areas of study include conditions
affecting educational technology use in schools, higher education, and business settings, and tend to focus on psychological, sociological, and philosophical factors. For example, recent graduates have studied the impact of technology on learning and cognition, variables that mediate effective technology use in education, and issues related to ethical technology use.

LT students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student’s faculty advisor. 24 doctoral thesis credits are also required.

### Core Coursework
- **CI 8131** - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- **CI 8132** - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

### Major Coursework
15 credits selected in consultation with faculty advisor

### Research Coursework
- **CI 8134** - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- **CI 8135** - Foundations of Research in Curriculum and Instruction II (3.0 cr)

### Research Electives
9 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.

Take 9 or more credit(s) from the following:
- **CI 8085** - Narrative Inquiry in Education (3.0 cr)
- **CI 8145** - Using Mixed Methods in Educational Research (3.0 cr)
- **CI 8146** - Critical Ethnography in Education (3.0 cr)
- **CI 8147** - Critical Discourse Analysis in Educational Research (3.0 cr)
- **CI 8149** - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- **CI 8153** - Research Approaches to Classroom Discourse (3.0 cr)
- **CI 8155** - Immigrant Families and U.S. Schools (3.0 cr)
- **CI 8165** - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
- **CI 8371** - Applied Social Network Analysis in Education (3.0 cr)
- **CI 8645** - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- **CI 8671** - Sociolinguistic Research Approaches to Education (3.0 cr)
- **CI 8689** - Language and Education Policy (3.0 cr)
- **CI 8913** - Interpretive Research (3.0 cr)
- **OLPD 5056** - Case Studies for Policy Research (3.0 cr)
- **OLPD 5061** - Ethnographic Research Methods (3.0 cr)
- **OLPD 5528** - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- **EPSY 5221** - Principles of Educational and Psychological Measurement (3.0 cr)
- **EPSY 5243** - Principles and Methods of Evaluation (3.0 cr)
- **EPSY 5244** - Survey Design, Sampling, and Implementation (3.0 cr)
- **EPSY 8215** - Advanced Research Methodologies in Education (3.0 cr)
- **EPSY 8222** - Advanced Measurement: Theory and Application (4.0 cr)
- **EPSY 8224** - Performance Assessment Design and Analysis (3.0 cr)
- **EPSY 8225** - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- **EPSY 8226** - Item Response Models: Theory and Applications (3.0 cr)
- **EPSY 8251** - Statistical Methods in Education I (3.0 cr)
- **EPSY 8252** - Statistical Methods in Education II (3.0 cr)
- **EPSY 8264** - Advanced Multiple Regression Analysis (3.0 cr)
- **EPSY 8265** - Factor Analysis (3.0 cr)
- **EPSY 8266** - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- **EPSY 8267** - Applied Multivariate Analysis (3.0 cr)
- **EPSY 8268** - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- **EPSY 8282** - Statistical Analysis of Longitudinal Data (3.0 cr)
- **AMST 8289** - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
- **ANTH 8203** - Research Methods in Social and Cultural Anthropology (3.0 cr)
- **LING 5462** - Field Research in Spoken Language (3.0 cr)

### Minor or Supporting Program
12 credits outside the track, selected in consultation with faculty advisor

### Elective
3 credits selected in consultation with faculty advisor

### Literacy Education
Within the literacy education track there are three specializations: (1) children's and adolescent literature, (2) critical literacy and English education, and (3) reading education. Students who have an interest in literacy outside of these specialization areas are able to work with faculty and advisors to develop a program that builds on their interests. Although faculty members work within these distinct
specializations, they also enjoy collaborating on teaching, research, and writing projects across the areas embedded within literacy education. Together, faculty and graduate students in the program investigate a host of issues in the field of literacy.

The literacy education track has four overarching goals. They are:
To apply multiple theoretical and research perspectives to problems and questions central to the field;
To engage in research, teaching, and outreach that supports culturally and linguistically diverse literacy learners;
To develop literacy teachers and leaders for diverse schools; and
To influence literacy policies that address inequities and benefit all learners.

Literacy students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework
CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Major Coursework
15 credits selected in consultation with faculty advisor

Research Coursework
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Research Electives
9 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.
Take 9 or more credit(s) from the following:
• CI 8085 - Narrative Inquiry in Education (3.0 cr)
• CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
• CI 8146 - Critical Ethnography in Education (3.0 cr)
• CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
• CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
• CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
• CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
• CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
• CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
• CI 8689 - Language and Education Policy (3.0 cr)
• CI 8913 - Interpretive Research (3.0 cr)
• OLPD 5056 - Case Studies for Policy Research (3.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
• AMST 8289 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
• ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
• LING 5462 - Field Research in Spoken Language (3.0 cr)

Minor or Supporting Program
Minor or Supporting Program

Elective
3 credits selected in consultation with faculty advisor

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Information current as of August 31, 2018
Science, Technology, Engineering, and Mathematics Education

The doctoral program's STEM education track at the University of Minnesota is interdisciplinary, focusing on science education, mathematics education, engineering education or agricultural education. Students pursuing this track will choose an area of emphasis in one of the four specializations, while simultaneously participating in scholarly work that spans all areas of STEM education. This integrated-style is one of the first in the nation, and is designed to prepare scholars to conduct thoughtful disciplinary and interdisciplinary research in STEM education in order to assume roles as university faculty members, educational leaders, policy makers, and researchers.

STEM students must take 6 credits of core coursework, 9 credits of STEM core coursework, 9 credits of focus area specific (science or mathematics or engineering or agriculture) coursework, 15 credits of research coursework, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework
CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

STEM Core Coursework
CI 8571 - Equity, Policy, and Social Justice in Science Education (3.0 cr)
CI 8572 - Learning Theory and Classical Research in STEM Education (3.0 cr)
CI 8573 - Nature of Inquiry in STEM Education (3.0 cr)

STEM Focus Area Coursework
Students take 9 credits, with faculty advisor approval, in their focus area: science education or mathematics education or engineering education or agricultural education.

Science Education
3 required credits are listed; 6 additional credits must be taken in consultation with faculty advisor.
CI 8574 - History and Philosophy of Science in Education (3.0 cr)

or
Mathematics Education
9 credits required in consultation with faculty advisor

or
Engineering Education
9 credits required in consultation with faculty advisor

or
Agricultural Education
6 required credits are listed; one additional "AFEE" 3 credit course must be taken in consultation with faculty advisor.
AFEE 8090 - Seminar: Agricultural Education and Extension (1.0 - 3.0 cr)
AFEE 8094 - Research in Agricultural Education and Extension (1.0 - 6.0 cr)

Research Coursework
Students must take CI 8134 and CI 8135, as well as a minimum of 6 credits of statistics and one research elective course, for a total of 15 credits.
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Statistics Requirement
Students must take a minimum of 6 credits of graduate-level Statistics in consultation with their advisor

Research Electives
3 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.
Take 3 or more credit(s) from the following:
• CI 8085 - Narrative Inquiry in Education (3.0 cr)
• CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
• CI 8146 - Critical Ethnography in Education (3.0 cr)
• CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
• CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
• CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
• CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
• CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
• CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
• CI 8689 - Language and Education Policy (3.0 cr)
• CI 8913 - Interpretive Research (3.0 cr)
• OLPD 5056 - Case Studies for Policy Research (3.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
• AMST 8299 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
• ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
• LING 5462 - Field Research in Spoken Language (3.0 cr)

Minor or Supporting Program
12 credits outside the track, selected in consultation with faculty advisor.

Second Language Education
The PhD track in second language education (SLE) focuses on the study of language use, teaching, learning, and policy across a range of educational and community settings, including programs that serve language minority and language majority learners: ESL/EFL, foreign language education, and bilingual and immersion education. The PhD track is designed to assume roles as university faculty members, researchers, policy makers, and educational leaders. Independent scholarship is the cornerstone of the PhD.

The SLE PhD track has four specializations that correspond to the program's primary focus areas and faculty expertise:
1) Second language acquisition and classroom discourse research examines language learning processes and the way language is used by learners and their interlocutors in or out of school.
2) Second language pedagogy and teacher development research examines teachers' classroom practices and strategies as well as professional identities, experiences and attitudes.
3) Language policy research involves analysis of the formation, implementation, and negotiation of language policy in national, school, community, and private spheres.
4) Languages and cultures across schools and communities research examines connections across homes, schools, and communities with an emphasis on the experience.

SLE students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student's faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework
CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Major Coursework
Required courses are listed; others selected in consultation with faculty advisor for a total of 15 credits.
CI 8161 - Research Experience I: Study Design and Planning (3.0 cr)
CI 8162 - Research Experience II: Data Analysis and Manuscript Preparation (3.0 cr)

Research Coursework
CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Research Electives
9 additional credits to be selected based upon student's research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.

Take 9 or more credit(s) from the following:
• CI 8085 - Narrative Inquiry in Education (3.0 cr)
• CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
• CI 8146 - Critical Ethnography in Education (3.0 cr)
• CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
• CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
• CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
• CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
• CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
• CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)

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Information current as of August 31, 2018
Social Studies Education

The PhD program’s social studies education track focuses on issues related to curriculum, instruction, and assessment in K-12 social studies. Full-time graduate students generally have opportunities to supervise student teachers, teach introductory social studies classes, and conduct and publish research with one or more faculty members. Doctoral students are required to complete a research internship with one or more of the faculty as part of their study for the degree. Graduate students are strongly encouraged to present research papers at professional conferences, specifically the National Council for the Social Studies and the American Educational Research Association. Recent PhD graduates have conducted research in the areas of intercultural relations, moral development, multicultural gender-fair curriculum, social studies instructional issues, and the standards movement as it relates to social studies education. Graduates have assumed positions as instructional leaders in the public schools, curriculum development specialists, social studies assessment specialists, and college/university faculty.

Social Studies students must take 6 credits of core coursework, 15 credits of major coursework, 15 credits of research coursework, 3 credits of electives, and 12 credits outside the track. Unless otherwise noted, credits need to be selected in consultation with the student’s faculty advisor. 24 doctoral thesis credits are also required.

Core Coursework
- CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- CI 8132 - Curriculum and Instruction Core: Teaching Theory and Research (3.0 cr)

Major Coursework
- 15 credits selected in consultation with faculty advisor.

Research Coursework
- CI 8134 - Foundations of Research in Curriculum and Instruction I (3.0 cr)
- CI 8135 - Foundations of Research in Curriculum and Instruction II (3.0 cr)

Research Electives
- 9 additional credits to be selected based upon student’s research methodology. If student wishes to take a course not selected below, they should first consult with their faculty advisor to make sure it will count as a research elective.

Take 9 or more credits from the following:
- CI 8085 - Narrative Inquiry in Education (3.0 cr)
- CI 8145 - Using Mixed Methods in Educational Research (3.0 cr)
- CI 8146 - Critical Ethnography in Education (3.0 cr)
- CI 8147 - Critical Discourse Analysis in Educational Research (3.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- CI 8153 - Research Approaches to Classroom Discourse (3.0 cr)
- CI 8155 - Immigrant Families and U.S. Schools (3.0 cr)
- CI 8165 - Queer and Feminist Theories: Collective Memory Research Methods (3.0 cr)
• CI 8371 - Applied Social Network Analysis in Education (3.0 cr)
• CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
• CI 8671 - Sociolinguistic Research Approaches to Education (3.0 cr)
• CI 8889 - Language and Education Policy (3.0 cr)
• CI 8913 - Interpretive Research (3.0 cr)
• OLPD 5056 - Case Studies for Policy Research (3.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
• AMST 8299 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
• ANTH 5056 - Research Methods in Social and Cultural Anthropology (3.0 cr)
• LING 5462 - Field Research in Spoken Language (3.0 cr)

Minor or Supporting Program
12 credits outside the track, selected in consultation with faculty advisor.

Elective
3 credits selected in consultation with faculty advisor.
Twin Cities Campus
Educational Psychology M.A.
Educational Psychology
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax: 612-624-8241).
Email: epsy.adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 51
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The educational psychology program has five tracks: counseling and student personnel psychology (CSPP); school psychology; special education (including applied behavior analysis); psychological foundations of education (learning and cognition/educational technology, social psychological and social developmental processes in educational psychology including human relations); and quantitative methods in education (including measurement, evaluation, statistics, and statistics education).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applications are accepted for fall admission only. Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. Applications should be accompanied by official transcripts from all colleges and universities attended. In addition, school psychology applicants must also submit a one page critical issue essay, answering the following questions: What is the role of a school psychologist? What are the most critical educational issues school psychologists can help address? How would you like to contribute to addressing these issues in your future career? An interview is required for those who make the initial cut in school psychology.

Application deadlines are November 15 for the school psychology track; December 1 for the quantitative methods and special education tracks; March 1 for the psychological foundations track, and as a second deadline for the quantitative methods track. To be considered for fellowship nominations, applications must be submitted by the November 15 (school psychology) or December 1 deadlines.

Applicants must submit the following test score(s):
GRE General Test (no subject tests are required)

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

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Information current as of August 31, 2018
Program Requirements

**Plan A:** Plan A requires 20 to 24 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 to 51 major credits and 0 credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

The CSPP subplan requires a minimum GPA of 3.0 for students to remain in good standing.

Students must complete credits in EPSY core courses (3 credits in statistics, 3 credits in measurement/evaluation, 3 credits in learning/cognition and 3 credits social/personality). EPSY core courses must be taken on an A-F grade basis. Plan A students must take 10 thesis credits; Plan B registration varies by track. Students must have a minimum of 14 credits in EPSY. Further required credits are detailed within subplan requirements.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Counseling and Student Personnel Psychology**

This sub-plan is limited to students completing the program under Plan B.

The counseling and student personnel psychology (CSPP) track subscribes to the scientist/practitioner model, which assumes that scholarly inquiry and counseling practice are interdependent and complementary. The track's primary mission is to prepare counseling psychologists to bring a well-trained professional's attitude and interest to bear on the application of psychological and educational knowledge. In addition to becoming skilled clinicians, students learn to be critical consumers and producers of both quantitative and qualitative research. Emphasis areas: community counseling, school counseling, and student personnel psychology/higher education.

Students take 47-51 credits distributed as follows: 12 credits EPSY core courses, 23 credits in counseling theory and practice and 12-16 credits in the area of emphasis. All courses must be taken on an A-F grade basis.

The CSPP subplan requires a minimum GPA of 3.0, no more than two grades below B-, and no more than six credits of incomplete grades for students to remain in good standing.

The final exam is written; students must also submit a portfolio.

**Ed Psych Core Course Requirements**

Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits in social/personality, and 3 credits in learning/cognition.

- **EPSY 5261** - Introductory Statistical Methods (3.0 cr)
- **EPSY 5221** - Principles of Educational and Psychological Measurement (3.0 cr)
- **EPSY 8132** - Personality Development and Socialization (3.0 cr)

**Learning/Cognition**

Take 3 or more credit(s) from the following:

- **EPSY 5101** - Intelligence and Creativity (3.0 cr)
- **EPSY 5113** - Psychology of Instruction and Technology (3.0 cr)
- **EPSY 5114** - Psychology of Student Learning (3.0 cr)
- **EPSY 5119** - Mind, Brain, and Education (3.0 cr)
- **EPSY 5191** - Education of the Gifted and Talented (3.0 cr)
- **EPSY 8112** - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

Counseling Theory & Practice Requirements
EPSY 8402 - Individual Counseling: Theories, Applications & Counseling Skills (4.0 cr)
EPSY 8403 - Social/Cultural Contexts: Counseling and Skills (3.0 cr)
EPSY 8404 - Group Counseling: Theory, Applications, and Skills (3.0 cr)
EPSY 8405 - Career Development: Theory, Skills, and Counseling Applications (3.0 cr)
EPSY 8406 - Professional Ethics for Counselors and Psychologists (3.0 cr)
EPSY 8407 - Assessing and Counseling Clients With Psychological Disorders (4.0 cr)
EPSY 8431 - Master's Research Seminar: CSPP (3.0 cr)

Courses in Area of Emphasis
Students must take additional courses (12-16 credits) in their area of emphasis.

Community Emphasis
Students must take 4 credits of EPSY 8503, 4 credits of EPSY 8504 and the special topic course listed below for 4 credits.
EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
EPSY 8503 - Counseling Practicum I (1.0 - 4.0 cr)
EPSY 8504 - Counseling Practicum II (1.0 - 4.0 cr)
EPSY 5400 Wkshp:CounselPsy - Clients in Crises: Intervention and Diagnosis (4 cr)

-OR-

Student Personnel/Higher Ed Emphasis
Students must take 4 credits of EPSY 8503 and 4 credits of EPSY 8504. EPSY5421/OLPD5724 and EPSY 5451/OLPD5704 are recommended, but not required.
EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
EPSY 8503 - Counseling Practicum I (1.0 - 4.0 cr)
EPSY 8504 - Counseling Practicum II (1.0 - 4.0 cr)

-OR-

School Counseling Emphasis
Students must take 3 credits of EPSY 5435, 3 credits of EPSY 8503, and 3 credits of EPSY 8504.
EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
EPSY 5435 - Introduction to School Counseling (3.0 - 6.0 cr)
EPSY 5436 - Crisis Management and Consulting in Schools (3.0 cr)
EPSY 8503 - Counseling Practicum I (1.0 - 4.0 cr)
EPSY 8504 - Counseling Practicum II (1.0 - 4.0 cr)

Psychological Foundations of Education
Graduate study in psychological foundations of education prepares students for research and teaching positions in colleges and universities. Students have also gone on to positions in professional settings such as schools, private industry, human service organizations, health science units, and government agencies. The goal of the track is to apply and generate knowledge of psychological processes and methodological procedures involved in learning and teaching.

The psychological foundations track offers emphases in learning and cognition/educational technology or social psychological and social developmental (including human relations) processes in educational psychology. Students typically choose one of these areas in addition to achieving broad competence in all aspects of the curriculum.

Students take 33-34 credits distributed as follows: 12 credits EPSY core requirements, 3 credits research methodology, and 12 credits in an area of emphasis (PsyF Foundations requirements in the area of emphasis will satisfy EPSY core requirement for learning/cognition or social/personality). Plan A students take 10 thesis credits; Plan B students take 6 research credits and 3 additional credits.

Ed Psych Core Course Requirements
Students must take 3 credits in learning/cognition, 3 credits in social/personality, 3 credits in statistics and 3 credits in measurement/evaluation. 3 credits from the area of emphasis will satisfy learning/cognition or social/personality core requirement. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

Learning/Cognition
Students in the learning area of PsyF can satisfy this requirement with required learning emphasis courses from the list below.
Students in the social area must take one of the following courses: EPSY 5101, 5112, 5113, 5114, 5115, 5119, 5191.

Take 3 or more credit(s) from the following:

• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)

Social/Personality

Students in the social area of PsyF can satisfy this requirement with required social emphasis courses from the list below. Students in the learning area must take one of the following courses: EPSY 5151, 5157 or 8157.

Take 3 or more credit(s) from the following:

• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8206 - Social Psychology: The Self (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)

Statistics

Take 3 or more credit(s) from the following:

• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Measurement/Evaluation

Take 3 or more credit(s) from the following:

• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)

Research Methodology

EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)

Plan B Paper

For students completing the MA under Plan B.

Take 6 or more credit(s) from the following:

• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
• EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

Additional 3 credits

3 additional credits are required for Plan B, preferably in either learning/cognition or social psychology/social development, but may also include other areas of educational psychology. Consult with advisor.

Psychological Foundations Emphases

Learning/Cognition Emphasis

Required Learning and Cognition Courses

Take 6 or more credit(s) from the following:

• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)

Specialization Courses in Learning and Cognition

Take 6 or more credit(s) from the following:

• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8113 - The Psychology of Scientific Reasoning (3.0 cr)
• EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)

Social Emphasis
Required social psychology course
EPSY 5157 - Social Psychology of Education (3.0 cr)

Additional social psychology or social developmental courses
Take 6 or more credit(s) from the following:
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8208 - Social Psychology: The Self (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)

Additional 3 credits
3 additional credits are required, preferably in either social psychology/social development or learning/cognition, but may also include other areas of educational psychology.

Quantitative Methods in Education
This sub-plan is limited to students completing the program under Plan B.

In Quantitative Methods in Education (QME) students explore methodologies of measurement, evaluation, and statistics to improve our understanding and use of these methods as well as explore new approaches to address educational phenomena. Students specializing in measurement study psychometric theories and methods of developing, selecting, and using measures of knowledge, skills, abilities, and non-cognitive variables. This includes item writing, test design, equating, scaling, and standard setting, techniques supporting decision making and accountability. Students specializing in evaluation study theories and models of evaluation that include quantitative and qualitative techniques for evaluating the effectiveness of educational and human services programs. Students specializing in statistics study a wide range of statistical methods, as well as their underlying statistical theories, and develop an understanding of the relationship between research design and statistical analysis, acquiring skills in using a variety of statistical techniques appropriate for specific problems in education. Students specializing in statistics education investigate issues related to teaching and learning statistics and gain experience in statistics instruction. QME students develop knowledge and skills that prepare them for a variety of positions, including test companies, colleges and universities, research and evaluation centers, public school systems, government agencies, and industry.

Students take 33 credits distributed as follows: 12 credits EPSY core requirements, 18 credits QME core requirements (6 credits may be used to satisfy EPSY core requirements, and 3 research credits (EPSY 5991) for the Plan B paper. 2 additional courses (minimum 6 credits) in the area of emphasis are determined in consultation with advisor.

Ed Psych Core Course Requirements
Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits in learning/cognition, and 3 credits in social/personality. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

Statistics
QME core courses EPSY 8251 or 8252 will satisfy this requirement.

Measurement/Evaluation
QME core courses EPSY 5221, 5243, 5244 or 5247 will satisfy this requirement.

Learning/Cognition
Take 3 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• EPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

Social/Personality
Take 3 or more credit(s) from the following:
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5135 - Human Relations Workshop (4.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• EPSY 8132 - Personality Development and Socialization (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
• PSY 5101 - Personality: Current Theory and Research (3.0 cr)
• PSY 5157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

QME Core Course Requirements
Courses taken to satisfy QME core requirements must be taken on an A-F grade basis.

- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Courses in area of emphasis
Students must take two additional courses (minimum 6 credits) in their area of emphasis.

Evaluation Emphasis
  OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
QME course in consultation with adviser (3 credits)

  - OR -

Measurement Emphasis
Students must take one 8xxx level measurement course (3 credits)
QME course in consultation with adviser (3 credits)

  - OR -

Statistics Emphasis
  EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
QME course in consultation with adviser (3 credits)

  - OR -

Statistics Education Emphasis
Students must take EPSY 5272 for 3 credits.
  EPSY 5271 - Becoming a Teacher of Statistics (3.0 cr)
  EPSY 5272 - Statistics Teaching Internship (1.0 - 3.0 cr)

School Psychology
This sub-plan is limited to students completing the program under Plan B.

School psychology does not offer the MA as a terminal degree; rather, the MA is required to obtain the specialist certificate or PhD in educational psychology.

Students take 30 credits distributed as follows: 12 credits EPSY core requirements, 15 credits School Psychology course requirements, and 3 research credits (EPSY 8822).

EPSY Core Course Requirements
Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits in learning/cognition, and 3 credits in
social/personality. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

**Statistics**
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8251 - Statistical Methods in Education I (3.0 cr)

**Measurement/Evaluation**
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)

**Learning/Cognition**
Take 3 or more credit(s) from the following:
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
- EPSY 8112 - Mathematical Cognition (3.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
- EPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- PSY 5054 - Psychology of Language (3.0 cr)
- PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

**Social/Personality**
- EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)

**Plan B Paper**
Take 3 or more credit(s) from the following:
- EPSY 8822 - Research in School Psychology (3.0 cr)

**School Psychology Course Requirements**
Take 15 or more credit(s) from the following:
- EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)
- EPSY 5802 - History & Scientific Bases of Psychology (3.0 cr)
- EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
- EPSY 8811 - Assessment in School Psychology I: Foundations of Academic Assessment (3.0 cr)
- EPSY 8812 - Assessment in School Psychology II: Intellectual and Social-Emotional Domains (3.0 cr)
- EPSY 8813 - Introductory Practicum in School Psychology (2.0 cr)
- EPSY 8815 - Behavioral and Social Emotional Prevention and Intervention (3.0 cr)
- EPSY 8816 - Academic Preventive and Intervention (3.0 cr)
- EPSY 8817 - Problem Analysis and Consultation in School Psychology (3.0 cr)
- EPSY 8818 - Intermediate Practicum in School Psychology (2.0 cr)
- EPSY 8821 - Issues in School Psychology (3.0 cr)
- EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)
- EPSY 8849 - Assessment in Early Childhood (3.0 cr)

**Special Education**
The special education track offers opportunities for research and specializations in autism spectrum disorder, deaf/hard-of-hearing, emotional behavior disorders, early childhood special education, specific learning disabilities, developmental disabilities, and self-injurious behaviors and applied behavior analysis. Early involvement in research projects and the development of original research programs in areas such as academic instructional strategies, social and cognitive development, behavioral/psychological management, child development, and technology are encouraged.

The special education track focuses on the attainment of core competencies required for special education professionals as well as interdisciplinary skills and goals. A complementary emphasis is placed on problem solving that is influential in the social and cultural perceptions, care, education, intervention, and support of persons with disabilities.

Students may emphasize consulting, college teaching, or research in one or more of the specializations.

Students take 30-36 credits distributed as follows: 12 credits EPSY core courses. Plan A students take 9 special ed coursework electives and 10 thesis credits; Plan B students take 12 special ed coursework electives and 6 credits in Research Problems (EPSY 8994); students with an area of emphasis in Applied Behavior Analysis (Plan B) take 15 credits required courses and 9 credits Research Problems (EPSY 8994).

**EPSY Core Course Requirements**
Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits in learning/cognition, and 3 credits in social/personality. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

**Statistics**
Take 3 or more credit(s) from the following:

• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8254 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)

Measurement/Evaluation
3 credits required in measurement or evaluation

Take 3 or more credit(s) from the following:

• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
• PSY 5865 - Advanced Psychological and Educational Measurement (4.0 cr)

or

Take 3 or more credit(s) from the following:

• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

Learning/Cognition
Students in the ABA area of emphasis should submit a petition for EPSY 5659.

Take 3 or more credit(s) from the following:

• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

Social/Personality
Take 3 or more credit(s) from the following:

• EPSY 5135 - Human Relations Workshop (4.0 cr)
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• EPSY 8132 - Personality Development and Socialization (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
• PSY 5101 - Personality: Current Theory and Research (3.0 cr)
• PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8208 - Social Psychology: The Self (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)

Special Ed Course Requirements - Plan A
For students completing the MA under Plan A.

Electives
Special Ed coursework selected in consultation with advisor (9 credits).

Thesis Credits
Take 10 or more credit(s) from the following:
• EPSY 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Special Ed Course Requirements - Plan B
For students completing the MA under Plan B.

Electives
Special Ed coursework selected in consultation with advisor (12 credits)

Research Problems
Take 6 or more credit(s) from the following:
• EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

Applied Behavior Analysis Emphasis Requirements
ABA students must complete the MA under Plan B.

Required Courses
EPSY 5623 - Ethics in Applied Behavior Analysis (3.0 cr)
EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
EPSY 8706 - Single Case Designs in Intervention Research (3.0 cr)
EPSY 8708 - Functional Behavior Assessment (3.0 cr)
  or EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)

Research Problems
9 credits required.
EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)
**Twin Cities Campus**

**Educational Psychology Minor**

**Educational Psychology**

**College of Education and Human Development**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455; (612-624-6083; fax: 612-624-8241)
Email: epsy-adm@umn.edu
Website: [http://www.cehd.umn.edu/edpsych](http://www.cehd.umn.edu/edpsych)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The educational psychology program has five tracks: 1) counseling and student personnel psychology (CSPP); 2) school psychology; 3) special education; 4) psychological foundations of education (learning and cognition/educational technology, social psychological and social developmental processes in educational psychology including human relations); and 5) quantitative methods in education (including measurement, evaluation, statistics, and statistics education).

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A master's minor requires at least 6 credits of graduate-level EPSY courses. A doctoral minor requires at least 12 credits of graduate-level EPSY courses, of which at least 9 credits must be in 8xxx courses. Course selection is determined in consultation with the educational psychology committee member. Courses must be taken on an A-F grade basis.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Master's**

A master's minor requires at least 6 credits of graduate-level EPSY courses. Course selection is determined in consultation with the educational psychology committee member. Courses must be taken on an A-F grade basis.

**Doctoral**

A doctoral minor requires at least 12 credits of graduate-level EPSY courses, of which at least 9 credits must be in 8xxx courses. Course selection is determined in consultation with the educational psychology committee member. Courses must be taken on an A-F grade basis.
Twin Cities Campus
Educational Psychology Ph.D.
Educational Psychology
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax: 612-624-8241).
Email: epsy-adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 66 to 97
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The educational psychology program has four tracks: school psychology; special education; psychological foundations of education (learning and cognition/educational technology, social psychological and social developmental processes in educational psychology including human relations); and quantitative methods in education (including measurement, evaluation, statistics, and statistics education).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applications are accepted for fall admission only. Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. Applications should be accompanied by official transcripts from all colleges and universities attended. In addition, school psychology applicants must also submit a one page critical issue essay, answering the following questions: What is the role of a school psychologist? What are the most critical educational issues school psychologists can help address? How would you like to contribute to addressing these issues in your future career? An interview is required for those who make the initial cut in school psychology.

Application deadlines are November 15 for the school psychology track; December 1 for the psychological foundations, quantitative methods and special education tracks; March 1 as a second deadline for quantitative methods. To be considered for fellowship nominations, applications must be submitted by the November 15 (school psychology) or December 1 deadlines.

Applicants must submit the following test score(s):
GRE General Test (no subject tests are required)

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
42 to 73 credits are required in the major.
0 to 9 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students must complete credits in EPSY core courses (6 credits in statistics, 3 credits in measurement/evaluation, 6 credits in research methods, 9 credits from at least two areas: learning/cognition, social/personality, history/systems), 9 credits EPSY electives and 24 thesis credits. Further required credits are detailed within subplan requirements.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Psychological Foundations of Education
Graduate study in psychological foundations of education prepares students for research and teaching positions in colleges and universities. Students have also gone on to positions in professional settings such as schools, private industry, human service organizations, health science units, and government agencies. The goal of the track is to apply and generate knowledge of psychological processes and methodological procedures involved in learning and teaching.

The psychological foundations track offers emphases in learning and cognition/educational technology or social psychological and social developmental (including human relations) processes in educational psychology. Students typically choose one of these areas in addition to achieving broad competence in all aspects of the curriculum.

Students take 72 credits distributed as follows: 24 credits EPSY core requirements, 9 credits EPSY electives, 18 credits in the area of emphasis in PsyF (12 PSYF credits can be used to satisfy EPSY core and elective requirements), 9 credits of coursework outside of ed psych, and 24 thesis credits.

Ed Psych Core Course Requirements
Psychological foundations students must take 3 credits in history/systems, 3 credits in learning/cognition, 3 credits in social/personality, 6 credits in research methods, 6 credits in statistics and 3 credits in measurement/evaluation. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

History/Systems
PsyF students must take EPSY 8905.
EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

Learning/Cognition
Students in the learning area of PsyF can satisfy this requirement with required learning emphasis courses from the list below. Students in the social area of PsyF must take one of the following courses: EPSY 5101, 5112, 5113, 5114, 5115, 5119 or 5191.
Take 3 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)

Social/Personality
Students in the social area of PsyF can satisfy this requirement with required social emphasis courses from the list below. Students in the learning area of PsyF must take one of the following courses: EPSY 5151, 5157 or 8157.
Take 3 or more credit(s) from the following:
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8208 - Social Psychology: The Self (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)

Research Methods
EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)
EPSY 8216 - Seminar: Research Processes in Psychological Foundations of Education (3.0 cr)

Statistics
6 credits required
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Measurement/Evaluation
Take 3 or more credit(s) from the following:
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)

EPSY Electives
9 credits of EPSY electives can be satisfied by additional courses in the area of emphasis.

External Courses
Psych foundations students must take a minimum of 9 credits of coursework outside of educational psychology in consultation with advisor.

Courses in Area of Emphasis
Students must take additional courses in their area of emphasis in consultation with advisor. EPSY courses will satisfy 3 credits ed psych learning or social core requirement and 9 credits EPSY electives.

Learning/Cognition Emphasis

Required Learning and Cognition Courses
Take 6 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)

Specialization Courses in Learning and Cognition
Take 12 or more credit(s) from the following:
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8113 - The Psychology of Scientific Reasoning (3.0 cr)
• EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8290 - Special Topics: Seminar in Psychological Foundations (1.0 - 6.0 cr)

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Social Emphasis

Required Social Psychology or Social Development Courses
Take 6 or more credit(s) from the following:
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)

Specialization Courses in Social Psychology or Social Development
Take 12 or more credit(s) from the following:
Quantitative Methods in Education

In Quantitative Methods in Education (QME) students explore methodologies of measurement, evaluation, and statistics to improve our understanding and use of these methods as well as explore new approaches to address educational phenomena. Students specializing in measurement study psychometric theories and methods of developing, selecting, and using measures of knowledge, skills, abilities, and non-cognitive variables. This includes item writing, test design, equating, scaling, and standard setting, techniques supporting decision making and accountability. Students specializing in evaluation study theories and models of evaluation that include quantitative and qualitative techniques for evaluating the effectiveness of educational and human services programs. Students specializing in statistics study a wide range of statistical methods, as well as their underlying statistical theories, and develop an understanding of the relationship between research design and statistical analysis, acquiring skills in using a variety of statistical techniques appropriate for specific problems in education. Students specializing in statistics education investigate issues related to teaching and learning statistics and gain experience in statistics instruction. QME students develop knowledge and skills that prepare them for a variety of positions, including test companies, colleges and universities, research and evaluation centers, public school systems, government agencies, and industry.

Students take 72 credits distributed as follows: 27 credits EPSY core requirements, 9 credits EPSY electives, 18 credits QME core requirements, 12 additional credits in the area of emphasis in QME (18 QME credits can be used to satisfy EPSY core and elective requirements), and 24 thesis credits.

Ed Psych Core Course Requirements

Students must take 9 credits in at least two of these areas: learning/cognition, social/personality or history/systems; and 9 credits in research methods. (QME core courses will satisfy EPSY core requirements for 6 credits in statistics and 3 credits in measurement/evaluation; 9 credits in EPSY electives can be satisfied by additional courses in the area of emphasis.) Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

Learning/Cognition, Social/Personality, History/Systems
Take 9 or more credit(s) including 2 or more sub-requirements(s) from the following:

learning/cognition
Take 0 or more course(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

social/personality
Take 0 or more course(s) from the following:
• EPSY 5135 - Human Relations Workshop (4.0 cr)
• EPSY 5151 - Cooperative Learning (3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• EPSY 8132 - Personality Development and Socialization (3.0 cr)
• EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
• EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• PSY 5101 - Personality: Current Theory and Research (3.0 cr)
• PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8206 - Social Psychology: The Self (3.0 cr)
• SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)

• history/systems
Take 0 or more course(s) from the following:
• EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

Research Methods
QME students must take these 3 research methods courses.
EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)

Statistics
6 credits of statistics will be satisfied by QME core course requirements.
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Measurement/Evaluation
3 credits of measurement or evaluation will be satisfied by QME core course requirements.
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
or EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)

EPSY Electives
9 credits of EPSY electives can be satisfied by additional QME core courses and courses in the area of emphasis.

QME Core Course Requirements
Students must take these courses, including an 8xxx level measurement course selected in consultation with advisor (minimum 18 credits total). Courses taken to satisfy QME core requirements must be taken on an A-F grade basis.
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8xxx measurement course (minimum 3 credits)

Courses in Area of Emphasis
Students must take minimum 12 credits in their area of emphasis (in consultation with advisor). EPSY courses will satisfy 9 credits ed psych elective core requirement.

Evaluation Emphasis
For other possible courses, check with your advisor.
Take 12 or more credit(s) from the following:
• EPSY 5246 - Evaluation Colloquium: Psychological Foundations (1.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
• OLPD 5056 - Case Studies for Policy Research (3.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

-OR-

Measurement Emphasis
For other possible courses, check with your advisor.
Take 12 or more credit(s) from the following:
• EPSY 5246 - Evaluation Colloquium: Psychological Foundations (1.0 cr)
• EPSY 5271 - Becoming a Teacher of Statistics (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)

- OR -

Statistics Emphasis
For other possible courses, check with your advisor.
Take 12 or more credit(s) from the following:
• EPSY 5246 - Evaluation Colloquium: Psychological Foundations (1.0 cr)
• EPSY 5271 - Becoming a Teacher of Statistics (3.0 cr)
• EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
• EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
• EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
• EPSY 8265 - Factor Analysis (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• EPSY 8271 - Statistics Education Research Seminar: Studies on Teaching and Learning Statistics (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)

- OR -

Statistics Education Emphasis
EPSY 5271 - Becoming a Teacher of Statistics (3.0 cr)
EPSY 8271 - Statistics Education Research Seminar: Studies on Teaching and Learning Statistics (3.0 cr)
MathEd (MTHE) course (minimum 3 credits)-consult with adviser
Additional course (minimum 3 credits)-consult with adviser

School Psychology
The school psychology PhD program is fully accredited by the American Psychological Association, and the Minnesota Board of Teaching, and approved by the National Association of School Psychologists. Through coursework and practica/internships, students develop competencies in research, assessment, consultation, prevention and intervention, supervision, and higher education instruction. Graduates are employed as faculty and researchers in universities, and as psychologists in K12 schools, clinics, hospitals, community mental health centers. Graduates are eligible for the state school psychologist credential, national certification in school psychology, and most states license to practice professional psychology. Students graduate preparation focuses on the knowledge and skills necessary to develop, implement, and disseminate high quality research and to engage in provision of research-based school psychological practices within multi-tier systems of support to improve academic, social, behavioral, and emotional competence of children and youth. Students develop specific competencies through a broad range of didactic courses, research activities, teaching and supervisory experience, and field placements, including practica and a full-year internship.

Students take 97 credits distributed as follows: 24 credits EPSY core requirements, 9 credits EPSY electives, 49 credits School Psychology required courses (9 credits can be used to satisfy EPSY elective requirement), and 24 thesis credits.

Ed Psych Core Course Requirements
Students must take 9 credits in at least two of these areas: learning/cognition, social/personality or history/systems; 6 credits in research methods; 6 credits in statistics; 3 credits in measurement/evaluation and 9 credits EPSY electives. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

Learning/Cognition, Social/Personality, History/Systems
Take 9 or more credit(s) including 2 or more sub-requirements(s) from the following:
learning/cognition
  Take 0 or more course(s) from the following:
  • EPSY 5101 - Intelligence and Creativity (3.0 cr)
  • EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
  • EPSY 5114 - Psychology of Student Learning (3.0 cr)
  • EPSY 5119 - Mind, Brain, and Education (3.0 cr)
  • EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
  • EPSY 8112 - Mathematical Cognition (3.0 cr)
  • EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
  • EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
  • EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
  • CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
  • PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
  • PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
  • PSY 5054 - Psychology of Language (3.0 cr)
  • PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)
• **social/personality**
  School Psychology students must take EPSY 8819
  Take 1 or more course(s) from the following:
  • EPSY 5135 - Human Relations Workshop (4.0 cr)
  • EPSY 5151 - Cooperative Learning (3.0 cr)
  • EPSY 5157 - Social Psychology of Education (3.0 cr)
  • EPSY 8132 - Personality Development and Socialization (3.0 cr)
  • EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
  • EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
  • CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
  • CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
  • PSY 5101 - Personality: Current Theory and Research (3.0 cr)
  • PSY 5135 - Psychology of Individual Differences (3.0 cr)
  • PSY 5202 - Attitudes and Social Behavior (3.0 cr)
  • PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
  • PSY 5205 - Applied Social Psychology (3.0 cr)
  • PSY 5207 - Personality and Social Behavior (3.0 cr)
  • PSY 8201 - Social Cognition (3.0 cr)
  • PSY 8202 - Close Relationships (3.0 cr)
  • PSY 8208 - Social Psychology: The Self (3.0 cr)
  • SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)

• **history/systems**
  Take 0 or more course(s) from the following:
  • EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

• **Statistics**
  EPSY 8251 - Statistical Methods in Education I (3.0 cr)
  EPSY 8252 - Statistical Methods in Education II (3.0 cr)

• **Measurement/Evaluation**
  EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)

• **Research Methods**
  6 credits required
  EPSY 8822 - Research in School Psychology (3.0 cr)
  Take 3 or more credit(s) from the following:
  • EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)
  • EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)

• **EPSY Electives**
  9 credits of EPSY electives can be satisfied by school psychology course requirements.

• **School Psychology Course Requirements**
  EPSY courses will satisfy 9 credits ed psych elective core requirement.
  EPSY 5802 - History & Scientific Bases of Psychology (3.0 cr)
  EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
  EPSY 8811 - Assessment in School Psychology I: Foundations of Academic Assessment (3.0 cr)
  EPSY 8812 - Assessment in School Psychology II: Intellectual and Social-Emotional Domains (3.0 cr)
  EPSY 8815 - Behavioral and Social Emotional Prevention and Intervention (3.0 cr)
  EPSY 8816 - Academic Prevention and Intervention (3.0 cr)
  EPSY 8817 - Problem Analysis and Consultation in School Psychology (3.0 cr)
  EPSY 8821 - Issues in School Psychology (3.0 cr)
  EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)
  EPSY 8831 - Comprehensive School Practicum in School Psychology (3.0 cr)
  EPSY 8832 - Advanced Practicum in School Psychology (3.0 cr)

• **Introductory Practicum (4 credits)**
  Students must take EPSY 8813 twice.
  EPSY 8813 - Introductory Practicum in School Psychology (2.0 cr)

• **Intermediate Practicum (4 credits)**
  Students must take EPSY 8818 twice.
  EPSY 8818 - Intermediate Practicum in School Psychology (2.0 cr)

• **Practicum: Instruction and Supervision in School Psychology (6 credits)**
  Students must take EPSY 8841 twice.
  EPSY 8841 - Practicum: Instruction and Supervision in School Psychology (3.0 cr)

• **Internship**
  There are two options for internship registration:
  * Students completing an internship after defending their dissertation must register for EPSY 8843 both fall & spring semesters of the internship year (2 credits total).
  * Students completing an internship before dissertation defense must register for EPSY 8842 both fall & spring semesters of the internship year (1 credit each term).
EPSY 8843 - Internship - School Psychology (1.0 cr)
or EPSY 8842 - Internship: School Psychological Services (1.0 - 10.0 cr)

**Special Education**

The special education track offers specializations in deaf/hard-of-hearing, emotional behavior disorders, early childhood special education, learning disabilities, autism spectrum disorder, and developmental disabilities. Early involvement in research projects and the development of original research programs in such areas as instructional strategies, social and cognitive development, behavioral and psychological management, child development, and technology are encouraged. Special projects and training programs supplement academic studies.

The special education track focuses on the attainment of core competencies and related skills, since special education professionals share many common concerns and goals. A complementary emphasis is placed on problems unique to or extremely influential in the field, including social and cultural perceptions about disabilities; and federal, state, and local legislation regarding prevention and the care, treatment, education, training, and support of persons with disabilities.

Students take 66 credits distributed as follows: 24 credits EPSY core requirements, 9 credits EPSY electives, 18 credits special ed course requirements (9 credits can be used to satisfy EPSY elective requirement), and 24 thesis credits.

**Ed Psych Core Course Requirements**

Students must take 9 credits in at least two of these areas: learning/cognition, social/personality or history/systems; 6 credits in research methods; 6 credits in statistics; 3 credits in measurement/evaluation and 9 credits EPSY electives. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

**Learning/Cognition, Social/Personality, History/Systems**

Take 9 or more credit(s) including 2 or more sub-requirements(s) from the following:

**learning/cognition**

- Take 0 or more course(s) from the following:
  - EPSY 5101 - Intelligence and Creativity (3.0 cr)
  - EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
  - EPSY 5114 - Psychology of Student Learning (3.0 cr)
  - EPSY 5119 - Mind, Brain, and Education (3.0 cr)
  - EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
  - EPSY 8112 - Mathematical Cognition (3.0 cr)
  - EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
  - EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
  - EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
  - CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
  - PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
  - PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
  - PSY 5054 - Psychology of Language (3.0 cr)
  - PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

**social/personality**

- Take 0 or more course(s) from the following:
  - EPSY 5135 - Human Relations Workshop (4.0 cr)
  - EPSY 5151 - Cooperative Learning (3.0 cr)
  - EPSY 5157 - Social Psychology of Education (3.0 cr)
  - EPSY 8132 - Personality Development and Socialization (3.0 cr)
  - EPSY 8157 - Key Topics and Issues in Applying Social Psychology to Education (3.0 cr)
  - EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
  - CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
  - CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
  - PSY 5101 - Personality: Current Theory and Research (3.0 cr)
  - PSY 5135 - Psychology of Individual Differences (3.0 cr)
  - PSY 5202 - Attitudes and Social Behavior (3.0 cr)
  - PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
  - PSY 5205 - Applied Social Psychology (3.0 cr)
  - PSY 5207 - Personality and Social Behavior (3.0 cr)
  - PSY 8201 - Social Cognition (3.0 cr)
  - PSY 8202 - Close Relationships (3.0 cr)
  - PSY 8208 - Social Psychology: The Self (3.0 cr)
  - SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)

**history/systems**

- Take 0 or more course(s) from the following:
  - EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

**Research Methods**

EPSY 8694 - Research in Special Education (3.0 cr)
EPSY 8706 - Single Case Designs in Intervention Research (3.0 cr)

Statistics
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Measurement/Evaluation
Take 3 or more credit(s) from the following:
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
- EPSY 5865 - Advanced Psychological and Educational Measurement (4.0 cr)

EPSY Electives
9 credits of EPSY electives can be satisfied by special ed course requirements.

Special Ed Course Requirements
Students take 18 special ed credits in consultation with advisor. EPSY courses will satisfy 9 credits ed psych elective core requirement.

EPSY 8600 Special Topics: Special Education Issues - Grant Writing Seminar (3 credits)
EPSY 8701 - Doctoral Core Seminar: Special Education I (3.0 cr)
EPSY 8702 - Doctoral Core Seminar: Special Education II (3.0 cr)
EPSY 8xxx - Special Ed elective in consultation with adviser, 3 cr. (EPSY 8707 recommended, but not required)
EPSY 8xxx - Special Ed elective in consultation with adviser, 3 cr. (EPSY 8706 recommended, but not required)
EPSY 8xxx - Special Ed elective in consultation with adviser, 3 cr.
Twin Cities Campus
Educational Psychology Specialist Certificate in Education and School Psychological Services
Educational Psychology
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, University of Minnesota, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-4156; fax 612-624-8241).
Email: spsy-adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych/Programs/SchoolPsych/default.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Certificate of Specialist in Educ/Sch Psych Svc

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students graduate preparation focuses on the knowledge and skills necessary to engage in provision of research-based school psychological practices within multi-tier systems of support to improve academic, social, behavioral, and emotional competence of children and youth, as well as to develop, implement, and use applied research in school settings. Students develop specific competencies through a broad range of didactic courses, research activities, and field placements, including practica and a full-year internship. The specialist certificate is designed for students who want to become practitioners. The school psychology specialist certificate is approved by the Minnesota Board of Teaching and the National Association of School Psychologists. Graduates are eligible for the Minnesota school psychologist credential, and the national certification in school psychology, as well as the school psychology credential in most states.

Accreditation
This program is accredited by National Association of School Psychologists (NASP).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. Applicants must also submit a one page critical issue essay, answering the following questions: What is the role of a school psychologist? What are the most critical educational issues school psychologists can help address? How would you like to contribute to addressing these issues in your future career?

Applications should be accompanied by official transcripts from all colleges and universities attended. The GRE General Test is required (no subject tests are required); an interview is also required for those who make the initial cut.

Applications are accepted for fall admission only (deadline November 15).

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Students take 60 credits distributed as follows: 15 credits EPSY core courses, 6 credits EPSY electives, and 45 credits school psychology course requirements (6 credits can satisfy EPSY elective requirement). There is a written final exam.

Ed Psych Core Course Requirements
Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits learning/cognition, 3 credits social/personality, 3 credits in research methods and 6 credits EPSY electives. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

Statistics
Take 3 or more credit(s) from the following:
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)

Measurement/Evaluation
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)

Learning/Cognition
School Psychology students in the Specialist Certificate program may submit a petition for EPSY 5659. Take 3 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

Social/Personality
EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)

Research Methods
Take 3 or more credit(s) from the following:
• EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)
• EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)

EPSY Electives
6 credits of EPSY electives can be satisfied by school psychology course requirements.

School Psychology Course Requirements
Students must take 36 credits required courses, 3 credits research problems and 6 credits electives.

Introductory Practicum (4 credits)
Students must take EPSY 8813 twice.

Intermediate Practicum (4 credits)
Students must take EPSY 8818 twice.

**EPSY 8818 - Intermediate Practicum in School Psychology (2.0 cr)**

**Internship (4 credits)**

Students must take EPSY 8842 twice for 4 credits total. Note: if additional electives are taken, students may enroll in one credit per semester of internship, as long as the total number of credits accrued while in the program is at least 60.

**EPSY 8842 - Internship: School Psychological Services (1.0 - 10.0 cr)**

**Additional Required Courses**

EPSY courses will satisfy 6 credits educational psychology elective core requirement.

**EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)**

**EPSY 8811 - Assessment in School Psychology I: Foundations of Academic Assessment (3.0 cr)**

**EPSY 8812 - Assessment in School Psychology II: Intellectual and Social-Emotional Domains (3.0 cr)**

**EPSY 8815 - Behavioral and Social Emotional Prevention and Intervention (3.0 cr)**

**EPSY 8816 - Academic Prevention and Intervention (3.0 cr)**

**EPSY 8817 - Problem Analysis and Consultation in School Psychology (3.0 cr)**

**EPSY 8821 - Issues in School Psychology (3.0 cr)**

**EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)**

**Research Problems**

**EPSY 8822 - Research in School Psychology (3.0 cr)**

**Electives (6 credits)**

Students must take at least 6 credits electives selected in consultation with advisor.
Twin Cities Campus

Educational Psychology Specialist Certificate in Education and Special Education

Educational Psychology

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, University of Minnesota, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax 612-624-8241).
Email: epsy.adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Certificate of Specialist in Educ/Spec Educ

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Special education offers specializations in deaf/hard-of-hearing, emotional behavior disorders, early childhood special education, learning disabilities, autism, and developmental disabilities. Early involvement in research projects and the development of original research programs in such areas as instructional strategies, social and cognitive development, behavioral and psychological management, child development, and technology are encouraged. Special projects and training programs supplement academic studies.

The program focuses on the attainment of core competencies and related skills, since special education professionals share many common concerns and goals. A complementary emphasis is placed on problems unique to or extremely influential in the field, including social and cultural perceptions about disabilities, and federal, state, and local legislation regarding prevention and the care, treatment, education, training, and support of persons with disabilities.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. Applications are accepted for fall admission only (deadline December 1).

Applications should be accompanied by official transcripts from all colleges and universities attended. The GRE General Test is required (no subject tests are required).

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

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Information current as of August 31, 2018
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Students take 60 credits distributed as follows: 15 credits EPSY core courses, 6 credits EPSY electives and 45 credits of coursework in special education (6 credits can satisfy EPSY elective requirement).

**Ed Psych Core Course Requirements**

Students must take 3 credits in statistics, 3 credits in measurement/evaluation, 3 credits learning/cognition, 3 credits social/personality, 3 credits in research methods and 6 credits EPSY electives. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

**Statistics**

Take 3 or more credit(s) from the following:

- EPSY 8251 - Statistical Methods in Education I (3.0 cr)

**Measurement/Evaluation**

3 credits required from measurement or evaluation

**measurement**

Take 3 or more credit(s) from the following:

- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8226 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)

**or evaluation**

Take 3 or more credit(s) from the following:

- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

**Learning/Cognition**

Take 3 or more credit(s) from the following:

- EPSY 5101 - Intelligence and Creativity (3.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
- EPSY 8112 - Mathematical Cognition (3.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- EPSY 8118 - Advanced Cognitive Psychology (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- PSY 5054 - Psychology of Language (3.0 cr)
- PSY 8042 - Proseminar in Cognition, Brain, and Behavior (3.0 cr)

**Social/Personality**

Take 3 or more credit(s) from the following:

- EPSY 5135 - Human Relations Workshop (4.0 cr)
- EPSY 5151 - Cooperative Learning (3.0 cr)
- EPSY 5157 - Social Psychology of Education (3.0 cr)
- EPSY 8132 - Personality Development and Socialization (3.0 cr)
- EPSY 8819 - Emotion & Childhood Psychopathology (3.0 cr)
- PSY 5101 - Personality: Current Theory and Research (3.0 cr)
- PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5207 - Personality and Social Behavior (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8202 - Close Relationships (3.0 cr)
• PSY 8208 - Social Psychology: The Self (3.0 cr)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)

Research Methods
EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)

EPSY Electives
6 credits of EPSY electives can be satisfied by special education course requirements.

Special Education Course Requirements
EPSY courses will satisfy 6 credits Ed Psych elective core requirement.
EPSY 8694 - Research in Special Education (3.0 cr)
EPSY 8701 - Doctoral Core Seminar: Special Education I (3.0 cr)
EPSY 8702 - Doctoral Core Seminar: Special Education II (3.0 cr)
EPSY 8706 - Single Case Designs in Intervention Research (3.0 cr)
EPSY 8600 Special Topics: Grant Writing (3 cr.)
EPSY 8600 Special Topics: Math Res: Sts with Math Diff (3 cr.)
EPSY 8600 Special Topics: Reading Disabilities Research (3 cr.)

Electives
Students must take 15 credits electives from the following list. Other courses may be taken with permission of advisor.
Take 15 or more credit(s) from the following:
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
• EPSY 8600 - Special Topics: Special Education Issues (1.0 - 3.0 cr)
• OLPD 5344 - School Law (3.0 cr)

Specialist Project
Take 9 or more credit(s) from the following:
• EPSY 8993 - Directed Study: Educational Psychology (1.0 - 10.0 cr)
• EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)
**Twin Cities Campus**  
**Family Education M.Ed.**  
**Family Social Science**  
**College of Education and Human Development**  

Link to a list of faculty for this program.

**Contact Information:**  
Department of Family Social Science, 290 McNeal Hall, 1985 Buford Ave, St. Paul, MN 55108 (612-625-2705; fax: 612-625-4227)  
Email: famed@umn.edu  
Website: http://cehd.umn.edu/FSoS/  

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30 to 31  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's of education (MEd) Plan C in family education develops and strengthens professionals' competencies to work with individuals and families to enhance family life. This graduate-level, practitioner-based program is offered by the Department of Family Social Science (FSoS). The program prepares licensed teachers to further develop their knowledge and skills in the family education field, or non-licensed professionals to work with adults, youth, or children in a variety of settings. This program prepares parent educators for positions in an early childhood family education (ECFE) program in Minnesota, as well as for positions in health care, social service agencies, and religious settings in Minnesota and in other states and countries. Diversity and cultural responsiveness are integrated throughout coursework, student teaching, and observation experiences. Students may fulfill requirements for a parent educator license, parent education certificate, or community and learning certificate as part of this degree. With guidance from faculty advisors, students choose at least 30 semester credits of work that may include courses and independent study.

**Program Delivery**  
This program is available:  
- completely online (all program coursework can be completed online)  
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

**Prerequisites for Admission**  
A bachelor's degree from an accredited institution in family studies, child psychology, early childhood education, nutrition, or related fields. A 2.80 overall GPA in undergraduate work.

**Special Application Requirements:**  
Application deadline is March 1. Apply Online at  
https://app.applyyourself.com/AYApplicantLogin/fi_ApplicantConnectLogin.asp?id=UMN-GRAD

For program specific application details see http://www.cehd.umn.edu/FSoS/programs/medapply.asp

International Students: Please note, this program is not offered full-time and therefore is not intended for international students needing a visa to study in the US.

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Total Score: 79  
  - Internet Based - Writing Score: 21  
  - Internet Based - Reading Score: 19  
  - Paper Based - Total Score: 550  
- IELTS  
  - Total Score: 6.5  
- MELAB  
  - Final score: 80

The preferred English language test is Test of English as Foreign Language
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 30 to 31 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Family education MEd requires 30 credits in consultation with the adviser.

Students complete: 15 credits in family education, including FSoS 5902 Family Education Perspectives (3 cr); 5-6 credits in coursework with a focus on educational processes that are not limited to a specific subject matter (family ed courses do not count for this (e.g., FSoS 5949)); 9-10 credits in coursework with a supporting focus on family, children, and/or youth issues; a degree completion interview/examination.

Required Coursework

FSoS 5902 - Family Education Perspectives (3.0 cr)

Recommended Coursework

Recommended courses that fulfill the major area of family education are within the department and include:

FSoS 5932 - Introduction to Parent Education (1.0 cr)

or FSoS 5937 - Parent-Child Interaction (3.0 cr)

or FSoS 5942 - Everyday Experiences of Families (2.0 cr)

or FSoS 5943 - Parent Learning and Development: Implications for Parent Education (2.0 cr)

or FSoS 5944 - Parent Education Curriculum (2.0 cr)

or FSoS 5945 - Teaching and Learning in Parent Education (2.0 cr)

or FSoS 5946 - Assessment and Evaluation in Parent Education (2.0 cr)

or FSoS 5949 - Student Teaching in Parent Education (2.0 cr)

or OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

or CI 5351 - Technology Tools for Educators (3.0 cr)

or CPSY 4302 - Infant Development (3.0 cr)

or CPSY 4331 - Social and Personality Development (3.0 cr)

Educational Processes

Supporting Focus: Family/Children/Youth

FSoS 5946 - Assessment and Evaluation in Parent Education (2.0 cr)

or FSoS 5949 - Student Teaching in Parent Education (2.0 cr)

or CPSY 4302 - Infant Development (3.0 cr)

or CPSY 4331 - Social and Personality Development (3.0 cr)

Program Sub-plans

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Parent Education Teaching License

A teacher of parent and family education is authorized to instruct parents in an early childhood family education (ECFE) program. A parent educator plans, coordinates, and teaches in an instructional program that addresses the intellectual, emotional, cultural, social, and physical needs of both parents and children. Parent education seeks to support respectful, reciprocal interactions between parents and their children.

In Minnesota, a parent educator license is required for employment in an ECFE program. The purpose of the license is to ensure, through scholarly preparation, that parent educators are well-prepared professionals who are qualified to deliver educational programs for parents.
Coursework for the sub plan MEd is organized by teaching license requirements.

Application deadlines are sub plan MEd are March 1 and October 1.

**MEd Required Course**
- FSOS 5902 - Family Education Perspectives (3.0 cr)

**Parenting Ed Courses**
- FSOS 5932 - Introduction to Parent Education (1.0 cr)
- FSOS 5937 - Parent-Child Interaction (3.0 cr)
- FSOS 5942 - Everyday Experiences of Families (2.0 cr)
- FSOS 5943 - Parent Learning and Development: Implications for Parent Education (2.0 cr)
- FSOS 5944 - Parent Education Curriculum (2.0 cr)
- FSOS 5945 - Teaching and Learning in Parent Education (2.0 cr)
- FSOS 5946 - Assessment and Evaluation in Parent Education (2.0 cr)
- FSOS 5949 - Student Teaching in Parent Education (2.0 cr)

**Child Development, Human Relations, & Fundamentals of Drug & Alcohol Abuse**
- CPSY 4302 - Infant Development (3.0 cr)
- CPSY 4331 - Social and Personality Development (3.0 cr)
- EPSY 5135 - Human Relations Workshop (4.0 cr)
- PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)

**M.Ed. Elective Education Processes**
- OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
  or CI 5351 - Technology Tools for Educators (3.0 cr)
Twin Cities Campus

Family Social Science M.A.

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Family Social Science, 290 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-625-3116; fax: 612-625-4227)
Email: fsosgrad@umn.edu
Website: http://www.cehd.umn.edu/fsos/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 32
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Family Social Science offers a unique program of study using the insights and methods of the social sciences to examine how families work within various contexts and cultures.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Three overall criteria guide admissions decisions: 1) evidence of strong academic preparation and the ability and desire to perform graduate level scholarship, including research; 2) fit of the applicant's professional goals with family social science (FSoS) faculty scholarship and with the overall FSoS mission, that is, enhancing the well-being of diverse families in a changing world; and 3) unique contributions applicant would make to FSoS values, including social relevance, collaboration, inclusiveness, excellence, innovation, and diversity.

Special Application Requirements:
For more information about application requirements and procedures, consult the Family Social Science web page at http://www.cehd.umn.edu/fsos/.

Applicants for the master's program are reviewed only once per year. The application deadline is March 1 for admission for the following fall semester.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Plan A: Plan A requires 14 to 19 major credits, 3 to 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 19 to 23 major credits and 3 to 7 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Students must demonstrate familiarity with the tools of research or scholarship in the field of family social science or prevention science, the ability to work independently, and the ability to present the results of their investigation effectively, by completing at least one Plan B project.

The project should involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The graduate faculty specifies both the nature and extent of the options available to satisfy this requirement, and whether the requirement is to be satisfied in conjunction with, or independent of, the courses in the student's program.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.50 is required for students to remain in good standing.

The MA program is offered under Plan A and Plan B. The Plan A master's is recommended for students who intend to pursue a PhD degree. The Plan B master's is for students who wish to further their education so that they may hold positions of responsibility serving families. Although the instruction is based on research, the Plan B degree is not intended to provide intensive research training. The Plan B program is understood to be a terminal degree and is not recommended for students who intend to pursue the PhD degree. Consult the department for the most current information.

Plan A
Plan A requires at least 30 credits, including at least 20 course credits, of which 6 credits are outside the department in a related field, and 10 thesis credits.

FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
FSOS 5015 - Family Research Laboratory (1.0 cr)
FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
FSOS 8200 - Orientation for Family Social Science (1.0 cr)
FSOS Elective
One FSOS course (3.0 cr)
or One PREV course (3.0 cr)

Statistical Methods
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Thesis Credits
Take 10 or more credit(s) from the following:
• FSOS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Plan B requires at least 30 credits, including at least 26 course credits, of which 3 credits are outside the department in a related field, and at least 4 credits for a Plan B project.

FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
FSOS 8200 - Orientation for Family Social Science (1.0 cr)
One of the following research methods course(s).
FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
FSOS 5015 - Family Research Laboratory (1.0 cr)
or FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
or Evaluation research methods course (3.0 cr)

Electives
FSOS/PREV courses (12-13 cr)
FSOS Elective
or PREV Elective

Statistical Methods
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)
or EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
or One course outside FSOS (3.0 cr)

**Family Science Plan B Project**
Take exactly 1 course(s) totaling exactly 4 credit(s) from the following:

### Program Sub-plans
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

#### Prevention Science
This sub-plan is limited to students completing the program under Plan A or Plan B.

Understanding & Using What Works:

How can communities support families that have experienced trauma? What are the root causes of addictive behavior? And what strategies work best to promote the wellbeing of children and families?

Prevention Science equips students, scholars, and professionals across a range of fields to answer these questions and confront many of the daunting challenges facing today’s families and communities. The Master's in Prevention Science is grounded in the belief that our greatest hope for improving the lives of children and families is comprehensive, multi-disciplinary training and education that bridges research and practice.

The Prevention Science Plan A requires at least 32 credits, including at least 22 course credits of which 3 credits are outside the department in a related field, and 10 thesis credits.

**Plan A**
- FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
- FSOS 5015 - Family Research Laboratory (1.0 cr)
- FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- FSOS 5701 - Prevention Science: Principles and Practices (3.0 cr)
  - or PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)
- FSOS 5702 - Prevention Science Research Methodology (3.0 cr)
  - or PREV 8002 - Prevention Science Research Methodology (3.0 cr)
- FSOS 5703 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)
  - or PREV 8003 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)

Take 1 or more course(s) totaling exactly 3 credit(s) from the following:
- FSOS 8193 - Directed Study in Family Social Science (1.0 - 6.0 cr)

**Thesis Credits**
Take 1 or more course(s) totaling exactly 10 credit(s) from the following:
- FSOS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B**
- FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
- FSOS 5015 - Family Research Laboratory (1.0 cr)
- FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- FSOS 5701 - Prevention Science: Principles and Practices (3.0 cr)
  - or PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)
- FSOS 5702 - Prevention Science Research Methodology (3.0 cr)
  - or PREV 8002 - Prevention Science Research Methodology (3.0 cr)
- FSOS 5703 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)
  - or PREV 8003 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)

**Independent Study in Prevention Science**
Take 1 or more course(s) totaling exactly 3 credit(s) from the following:
- FSOS 8193 - Directed Study in Family Social Science (1.0 - 6.0 cr)

**Electives**
Four additional credits of elective courses from student's area of concentration.

**Plan B Project**
Take 1 or more course(s) totaling exactly 4 credit(s) from the following:
- FSOS 8755 - Master's Paper: Plan B Project (1.0 - 6.0 cr)
Twin Cities Campus
Family Social Science Minor
Family Social Science
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Family Social Science, 290 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-625-3116; fax: 612-625-4227).
Email: fsosgrad@umn.edu
Website: http://www.cehd.umn.edu/fsos/default.asp

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program of study for the family social science graduate minor uses methods of social science to examine family systems and their interactions with various environments. The curriculum supports study in core family social science coursework including family theories, family research methods, and core family content.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Master’s students must complete at least 6 credits of 5xxx or 8xxx coursework in family social science.

Doctoral students must complete at least 12 credits of 5xxx or 8xxx coursework in family social science.

All courses for the minor must be taken A-F and completed with a GPA of at least 3.00.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
Required
Take 12 or more credit(s) from the following:

Required
• FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
• FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
• FSOS 8xxx
• FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
• FSOS 5015 - Family Research Laboratory (1.0 cr)
• or FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
or FSOS 8014 - Quantitative Family Research Methods II (3.0 cr)

Masters

Required
Take 6 or more credit(s) from the following:
• FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)

FSOS Electives
• FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
• FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
• FSOS 5015 - Family Research Laboratory (1.0 cr)
• FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
• FSOS 8014 - Quantitative Family Research Methods II (3.0 cr)
Family Social Science Ph.D.
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Family Social Science, 290 McNeal Hall, 1985 Buford Avenue, Saint Paul, MN 55108 (612-625-3116; fax: 612-625-4227)
Email: fsosgrad@umn.edu
Website: http://www.cehd.umn.edu/fsos/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 72 to 75
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Family social science (FSoS) offers a unique program of study using insights and methods of the social sciences to examine how families work within various contexts and cultures. A doctoral degree in family social science provides a broad foundation of expertise in theory, research, and practice.

Your program of study will include research and coursework across the breadth of family social science, including child adjustment in family context; families and culture; families and financial decisions; family formation and intergenerational studies; families, loss, and trauma; and intimate family relationships. Coursework and research engagement, along with intensive mentoring from faculty, prepares students to contribute to the broader field of family science.

Accreditation
This program is accredited by Commission on Accreditation for Marriage and Family Therapy Education.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Three overall criteria guide admissions decisions: 1) evidence of strong academic preparation and the ability and desire to perform graduate level scholarship, including research; 2) fit of the applicant's professional goals with family social science (FSoS) faculty scholarship and with the overall FSoS mission, that is, enhancing the well-being of diverse families in a changing world; and 3) unique contributions the applicant would make to FSoS values, including social relevance, collaboration, inclusiveness, excellence, innovation, and diversity.

Special Application Requirements:
Family Science Specialization:
Students may apply for admission to the Family Science Ph.D. specialization after completing either a Bachelor's degree or a Master's degree. If you do not already hold a Master's degree, you may apply for the combined Master's/Ph.D. Program.

Couple & Family Therapy Specialization:
The Couple & Family Therapy Ph.D. specialization features rigorous training in couple and family therapy research informed by diverse disciplines and perspectives.

This specialization is accredited by the Commission on Accreditation for Marriage and Family Therapy Education. Admission to the Couple & Family Therapy specialization is available to applicants who have already obtained a clinical Master's degree, or have achieved equivalent clinical experience as determined by the CFT Faculty.
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

48 to 51 credits are required in the major.

0 credits are required outside the major.

24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.5 is required for students to remain in good standing.

Courses in the PhD degree program must contribute to an organized program of study and research. The program requires at least 72 credits, including a minimum of 48 course credits and 24 dissertation credits. Coursework includes at least 23 credits in core family theory and research methods, 9 credits in statistics, and 7 directed research credits. In addition, students complete one of two designated specializations: family science (9 additional credits) or couple and family therapy (12 additional credits). An optional teaching internship program is recommended for students who are planning for careers in higher education.

Major field credits: Depending on previous preparation and the nature of the research undertaken, the number of credits required for individual students, even within the same major field, may vary considerably.

Core Requirements

Take the following courses for a total of 23 credits:

- FSOS 8200 - Orientation for Family Social Science (1.0 cr)
- FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
- FSOS 8002 - Advanced Family Conceptual Frameworks (3.0 cr)
- FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
- FSOS 8015 - Advanced Qualitative Family Research Methods (3.0 cr)
- FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
- FSOS 5015 - Family Research Laboratory (1.0 cr)
- FSOS 8014 - Quantitative Family Research Methods II (3.0 cr)
- FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)

Directed Research

Take FSOS 8794 during the first three years of the program, for a total of 7 credits.

Take 7 or more credit(s) from the following:

- FSOS 8794 - Directed Research in Family Social Science (1.0 - 6.0 cr)

Statistics or Methods

Take one of the following statistics/methods sequences for a total of 9 credits:

**Family Science**

- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- Advanced Statistics or Methods (3.0 cr)
  - or EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
  - or EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
or EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
or NURS 8185 - Qualitative Data Analysis for Health Care Research (3.0 - 4.0 cr)
or NURS 8195 - Mixed Methods in the Social, Behavioral, and Applied Health Sciences (3.0 cr)
or Couple & Family Therapy
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)
FSOS 8036 - Couple/Marriage and Family Therapy Research (3.0 cr)

Specialization Requirements

Family Science Specialization

Family Science Electives
Take at least 6 credits in consultation with advisor.
FSOS Elective
or PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)

Community/Engagement/Internship Experience
Take 3 credits of coursework to fulfill the specialization's community, engagement, or internship experience requirement, chosen in consultation with advisor.
FSOS 8193 - Directed Study in Family Social Science (1.0 - 6.0 cr)
or Elective (3.0 cr)

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Couple & Family Therapy Specialization Requirements

Family Therapy Supervision
Take 3 or more credit(s) from the following:
• FSOS 8034 - Marriage and Family Therapy Supervision (3.0 cr)

Family Therapy Practicum
Take FSOS 8295 twice for a total of 6 credits.
Take 6 or more credit(s) from the following:
• FSOS 8295 - Couple/Marriage Family Therapy Practicum (1.0 - 6.0 cr)

Family Therapy Internship
Take 3 or more credit(s) from the following:
• FSOS 8296 - Couple/Marriage Family Therapy Internship (1.0 - 12.0 cr)
Twin Cities Campus
Human Resource Development M.Ed.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of education (MEd)/professional studies program in human resource development (HRD) focuses on training of human resources and organizational change issues. This graduate-level, practitioner-based program can be tailored to meet the needs of individual students. The HRD program is offered by the Department of Organizational Leadership, Policy, and Development (OLPD) in the College of Education and Human Development (CEHD). Courses at the University of Minnesota campus are offered at a variety of times, including late afternoons and evenings. Students may also enroll in courses offered during the summer and at off-campus sites.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Special Application Requirements:
In addition to Statements #1 & 2, applicants must upload or submit a résumé and personal statement describing their career goals and rationale for interest in the M.Ed. program (limit two pages) along with the application. Two letters of recommendation must also be submitted. Applications are accepted on a rolling basis with semester deadlines of March 1 (Summer), July 1 (Fall) and November 1 (Spring).

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 22 major credits and 12 credits outside the major. The is no final exam.
This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Course Requirements
Students not holding an undergraduate degree in HRD must complete at least 34 credits, including the following courses listed below.

Note: For OLPD 5696 at least 4 credits are required and no more than 6 credits will count toward the program.

OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
OLPD 5605 - Strategic Planning through Human Resources (3.0 cr)
OLPD 5607 - Organization Development (3.0 cr)
OLPD 5615 - Training and Development of Human Resources (3.0 cr)
OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)

Twelve (12) elective credits approved by a faculty adviser.

U of M HRD UG Degree Continuing Students
Students holding an undergraduate HRD degree from the University of Minnesota will not be required to retake courses completed during the undergraduate program. Students must still take a total of 34 credits of graduate coursework in the program. Of this, students must complete at least 16 credits in HRD-designated courses as described below. Note: For OLPD 5696 at least 4 credits are required and no more than 6 credits will count toward the program.

Required Courses (16 cr)
OLPD 5605 - Strategic Planning through Human Resources (3.0 cr)
OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)

Option 1 (6 cr)
Organization Development Specialization
OLPD 5607 - Organization Development (3.0 cr)
OLPD 8602 - Advanced Organization Development (3.0 cr)

Option 2 (6 cr)
Training and Development Specialization
OLPD 5615 - Training and Development of Human Resources (3.0 cr)
OLPD 8601 - Advanced Training and Development of Human Resources (3.0 cr)

Additional HRD Courses (6 cr)
6 additional HRD credits approved by faculty adviser

Electives (12 cr)
12 elective credits approved by faculty adviser

Program Sub-plans
A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Rochester
Requirements for the Rochester sub-plan are the same as those listed in general description. Students may take courses on Twin Cities or Rochester campuses.
**Twin Cities Campus**

**Human Resource Development Postbaccalaureate Certificate**

Organizational Leadership, Policy and Development

**College of Education and Human Development**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455  
(612-624-1006, fax: 612-624-3377)  
Email: olpd@umn.edu  
Website: [http://www.cehd.umn.edu/olpd](http://www.cehd.umn.edu/olpd)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Human Resource Development PBacc Cert Grad

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The certificate program in human resource development (HRD) focuses on training of human resources and organizational change issues. The HRD program is offered by the Organizational Leadership, Policy, and Development (OLPD) in the College of Education and Human Development (CEHD). Courses at the University of Minnesota campus are offered at a variety of times, including late afternoons and evenings.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**
Admission is open to degree-seeking or non-degree seeking students who possess a U.S. bachelor’s degree (or international equivalent). Applications are reviewed on an ongoing basis and may be submitted at any time.

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

**Required Courses**

- OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)
- OLPD 5615 - Training and Development of Human Resources (3.0 cr)
- OLPD 5607 - Organization Development (3.0 cr)

**Internship or Field Experience**

4 credits is recommended for either option below

Take exactly 1 course(s) totaling 3 - 6 credit(s) from the following:

- OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
- OLPD 5296 - Field Experience in Adult Education (1.0 - 6.0 cr)

**Electives**
The remaining credits can be selected from the following:

- OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
or Additional OLPD courses with adviser approval to make total credits earned equal at least 14 credits.
Twin Cities Campus
Infant and Early Childhood Mental Health Graduate Minor
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Email: icdapply@umn.edu
Website: http://www.cehd.umn.edu/icd/programs/graduate.html

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 9 to 12
• Length of program in credits (Doctorate): 12 to 15
• This program does not require summer semesters for timely completion.
• Students will have the option to complete a field study at a location of their choosing. This will not be a requirement of the minor, however.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program will provide students across diverse disciplines and training programs with access to foundational learning from the field of Infant and Early Childhood Mental Health (IECMH). Students will gain knowledge of developmental processes related to competence, psychopathology, and resilience in the application of theory and research to early childhood and multi-generational practice and policy.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
Students must be actively pursuing a masters or doctoral degree at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Courses
Three foundational courses, for a total of 9 credits, are required for both the masters and doctoral minor.
CPSY 5518 - Prevention and Intervention in Early Childhood: Principles (3.0 cr)
CPSY 5503 - Development and Psychopathology in Early Childhood (3.0 cr)
CPSY 5513 - Early Childhood Assessment (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Optional Field Experience
Students pursuing the IECMH masters-level minor may take up to 3 credits of CPSY 5996 in addition to the 9 required course credits.
CPSY 5996 is an optional opportunity that not required for the minor.
CPSY 5996 - Field Experience in Applied Child and Adolescent Development (1.0 - 12.0 cr)
Doctoral

**Required Observation Courses**
Take exactly 3 course(s) totaling exactly 3 credit(s) from the following:
- CPSY 5506 - Infant Observation Seminar I (1.0 cr)
- CPSY 5508 - Infant Observation Seminar II (1.0 cr)
- CPSY 5511 - Infant Observation Seminar III (1.0 cr)

**Optional Field Experience**
Students pursuing the IECMH doctoral-level minor may take 3 credits of CPSY 5996 in addition to the 12 required course credits. CPSY 5996 is an optional opportunity that not required for the minor.
Take exactly 3 credit(s) from the following:
- CPSY 5996 - Field Experience in Applied Child and Adolescent Development (1.0 - 12.0 cr)
Twin Cities Campus
Infant and Early Childhood Mental Health Postbaccalaureate Certificate
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Institute of Child Development, 51 East River Road, Minneapolis, MN 55455 (612-625-2252; fax: 612-624-6373).
Email: icdapply@umn.edu
Website: http://www.cehd.umn.edu/ICD/Programs/IECMH/default.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 20
- This program requires summer semesters for timely completion.
- Online.
- Degree: Infant & Early Childhood Mental Health PBac Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota online Infant and Early Childhood Mental Health (IECMH) Certificate Program is an intensive, interdisciplinary postbaccalaureate training program for students and professionals in domains of mental health, health and early care and education.

The program serves to deepen the knowledge and skills of individuals working in birth-to-five prevention, intervention, program administration, and policy development, and to prepare individuals to provide leadership in expanding the breadth and depth of relationship-based services and policies.

The IECMH certificate program is founded on a core set of principles of infant and early childhood mental health practice, asserting that services to families should be relationship-based, culturally sensitive, grounded in an understanding of developmental theory and research with special attention to the effects of trauma, and supported by reflective practice.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
Other requirements to be completed before admission:
Applicants must hold at least a baccalaureate degree from an accredited college or university in a related area (e.g., child development, social work, child psychology) or document at least two years of work experience in a related field.

The admissions model is cohort-based, with new cohorts usually admitted every other year. Admission to this program is currently suspended, but may be opened for fall 2015 at a future time. Please see our website for more details: http://www.cehd.umn.edu/CEED/certificateprograms/iecmh/admissionprocess.html

Special Application Requirements:
Applicants must have at least two years of documented experience in early childhood research or practice.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

Key to test abbreviations (TOEFL, IELTS).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Course requirements
CPSY 5996 must be taken for 2 credits
- CPSY 5501 - Foundations in Infant and Early Childhood Mental Health I (3.0 cr)
- CPSY 5503 - Development and Psychopathology in Early Childhood (3.0 cr)
- CPSY 5506 - Infant Observation Seminar I (1.0 cr)
- CPSY 5508 - Infant Observation Seminar II (1.0 cr)
- CPSY 5511 - Infant Observation Seminar III (1.0 cr)
- CPSY 5513 - Early Childhood Assessment (3.0 cr)
- CPSY 5518 - Prevention and Intervention in Early Childhood: Principles (3.0 cr)
- CPSY 5521 - Prevention and Intervention in Early Childhood: Practice (3.0 cr)
- CPSY 5996 - Field Experience in Applied Child and Adolescent Development (1.0 - 12.0 cr)
Twin Cities Campus
Integrative Leadership Minor
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. S.E., Minneapolis, MN 55455 (612-624-1006)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/grad-programs/ILM/default.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate-level academic minor in integrative leadership (ILM) will enhance the preparation of graduate students to lead and foster collective actions across boundaries of individuals, groups, organizations, sectors, and nations to solve some of the world's most pressing and complex problems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Prior admission into an established master's, doctoral, or graduate professional degree program is required. Students interested in admission to the minor should contact the ILM director of graduate studies. Admission requires the addition of the required minor coursework to the student's graduate degree program form and the ILM director of graduate studies's signature on the form. Students must demonstrate relevant academic background and experience.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Any student in any University of Minnesota graduate or professional program, regardless of college or enrollment, is encouraged to apply for this minor. Students must already be admitted to a master's, doctoral, or professional degree program at the University of Minnesota.

Doctoral students will need to take an additional course from either the Overview of Leadership Theory or Leading Engagement Processes subgroups to total the 12 credits required of the doctoral minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
Overview of Leadership Theory
Take 3 - 6 credit(s) from the following:
- OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
• OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)
• PA 5011 - Management of Organizations (3.0 cr)
• PUBH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)
• Courses on overview of leadership theory and development from other colleges may be substituted for this core course subject to approval by the Director of Graduate Studies for the Integrative Leadership Minor.

Leading Engagement Processes
If student is taking PA 5990 to fulfill this requirement it should be for section called "Neighborhood Collaborative Engagement (CHANCE)."

MGMT 6035 is cross listed with LAW 6626.
Take 3 - 6 credit(s) from the following:
• MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
• MGMT 6410 - Corporate Responsibility (2.0 cr)
• OLPD 5736 - Public Engagement and Higher Education (3.0 cr)
• OLPD 6490 - Managing Civic Engagement (3.0 cr)
• PA 5145 - Civic Participation in Public Affairs (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 5990 - Topics: Public Affairs - General Topics (0.0 - 3.0 cr)
• PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
• Courses on overview of leadership theory and development from other colleges may be substituted for this core course subject to approval by the Director of Graduate Studies for the Integrative Leadership Minor.

Required Final Course
All students must take one of the following:
GCC 5023 - Grand Challenge: Leading Across Sectors to Address Grand Challenges [CIV] (3.0 cr)
or LAW 6623 - Integrative Leadership: From Theory to Practice (3.0 cr)
or MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
or OLPD 6402 - Integrative Leadership Seminar (3.0 cr)
or PA 5105 - Integrative Leadership Seminar (3.0 cr)
or PUBH 6702 - Integrative Leadership Seminar (3.0 cr)

Additional Coursework
A minimum of 3 additional credits must be selected from the list of electives below. With permission from the ILM director of graduate studies, students with sufficient background and previous course experience equivalent to one or more courses within the curriculum may apply for waiver of appropriate requirements and replace waived courses with additional electives. PA 5190 is a topics course and topic must be approved by ILM director of graduate studies prior to registering for course.
IBUS 6316 - Sustainability & Cooperative Advantage in Scandinavia (4.0 cr)
or MGMT 6004 - Negotiation Strategies (2.0 cr)
or MGMT 6032 - Strategic Alliances (2.0 cr)
or MGMT 6034 - Strategic Leadership (2.0 cr)
or MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
or MGMT 6040 - International Strategy and Organization (2.0 cr)
or NURS 7610 - System Leadership and Innovation (3.0 cr)
or OLPD 5323 - Women in Leadership (3.0 cr)
or OLPD 5332 - Personal Leadership and the Private College (3.0 cr)
or OLPD 8702 - Administration and Leadership in Higher Education (3.0 cr)
or PA 5103 - Leadership and Change (3.0 cr)
or PA 5190 - Topics in Public and Nonprofit Leadership and Management (1.0 - 3.0 cr)
or PA 5251 - Strategic Planning and Management (3.0 cr)
or PA 5405 - Public Policy Implementation (3.0 cr)
or PA 5920 - Skills Workshop (0.5 - 4.0 cr)
or PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)

Masters
Overview of Leadership Theory
Take 3 or more credit(s) from the following:
• OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
• OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)
• PA 5011 - Management of Organizations (3.0 cr)
• PUBH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)
• Other Courses on overview of leadership theory and development from other colleges may be substituted for this core course subject to approval by the director of graduate studies for the integrative leadership minor.

Leading Engagement Processes
If student is taking PA 5990 to fulfill this requirement it should be for section called "Neighborhood Collaborative Engagement (CHANCE)."
MGMT 6035 is cross listed with LAW 6626.
Take 3 or more credit(s) from the following:
- MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
- MGMT 6410 - Corporate Responsibility (2.0 cr)
- OLPD 5736 - Public Engagement and Higher Education (3.0 cr)
- OLPD 6490 - Managing Civic Engagement (3.0 cr)
- PA 5145 - Civic Participation in Public Affairs (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5990 - Topics: Public Affairs - General Topics (0.0 - 3.0 cr)
- PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
- Other
  Courses on overview of leadership theory and development from other colleges may be substituted for this core course subject to approval by the director of graduate studies for the integrative leadership minor.

**Required Final Course**
All students must take one course from the following:
- GCC 5023 - Grand Challenge: Leading Across Sectors to Address Grand Challenges [CIV] (3.0 cr)
- LAW 6623 - Integrative Leadership: From Theory to Practice (3.0 cr)
- MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
- OLPD 6402 - Integrative Leadership Seminar (3.0 cr)
- PA 5105 - Integrative Leadership Seminar (3.0 cr)
- PUBH 6702 - Integrative Leadership Seminar (3.0 cr)
Twin Cities Campus
International Education Minor
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 178 Pillsbury Dr S E Minneapolis, MN 5545-0226 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 9
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The interdisciplinary minor in international education is for students enrolled in any masters or doctoral program who wish to enter careers in research, consulting, administration, and teaching in an international context. The minor offers a coordinated set of courses from the Departments of Curriculum and Instruction; Educational Psychology; Organizational Leadership, Policy, and Development; the School of Kinesiology; and the Institute of Child Development.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Admission is contingent upon being admitted to a master's or a doctoral degree-granting program at the University of Minnesota. For an application form visit the international education minor website (http://www.cehd.umn.edu/olpd/grad-programs/CIDE/gradminor.html) or consult with the director of graduate studies for more information.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Each program is developed in consultation with the student, the student's advisor, major director of graduate studies, and director of graduate studies for international education. Requirements include courses listed below. Electives from the University may be added with the advisor's consent and director of graduate studies approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Core Courses
Take 1 or more course(s) from the following:
• OLPD 5103 - Comparative Education (3.0 cr)
• OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
• OLPD 5121 - Educational Reform in International Context (3.0 cr)
• OLPD 5124 - Critical Issues in International Education and Educational Exchange (3.0 cr)
• OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
• OLPD 8101 - International Education and Development (3.0 cr)
• OLPD 8103 - Comparative Education (3.0 cr)

**Area Specific Coursework**

Students interested in OLPD 5080 or OLPD 8087 should consult minor advisor prior to registration, as these courses can vary and may or may not be appropriate for this minor.

Take 6 or more credit(s) from the following:

- CI 5145 - Critical Pedagogy (3.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 8150 - Research Topics in Curriculum & Instruction (3.0 cr)
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- CI 8650 - Seminar: Special Topics in Second Languages and Cultures Research (1.0 - 3.0 cr)
- EPSY 8403 - Social/Cultural Contexts: Counseling and Skills (3.0 cr)
- OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
- OLPD 5121 - Educational Reform in International Context (3.0 cr)
- OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
- OLPD 5612 - International Human Resource Development (3.0 cr)
- OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
- OLPD 8101 - International Education and Development (3.0 cr)
- OLPD 8842 - Comparative Systems in Organizational Leadership, Policy, and Development (3.0 cr)
- PA 5414 - Child Human Rights: Work and Education (3.0 cr)

**Doctoral Core Courses**

Students interested in OLPD 8087 should consult minor advisor prior to registration, as this course can vary and may or may not be appropriate for this minor.

Take 2 or more course(s) from the following:

- OLPD 5103 - Comparative Education (3.0 cr)
- OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
- OLPD 5121 - Educational Reform in International Context (3.0 cr)
- OLPD 5124 - Critical Issues in International Education and Educational Exchange (3.0 cr)
- OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
- OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
- OLPD 8101 - International Education and Development (3.0 cr)
- OLPD 8103 - Comparative Education (3.0 cr)

**Area specific coursework**

Students interested in OLPD 5080 should consult minor advisor prior to registration, as this course can vary and may or may not be appropriate for this minor.

Take 6 or more credit(s) from the following:

- CI 5145 - Critical Pedagogy (3.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 8150 - Research Topics in Curriculum & Instruction (3.0 cr)
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- CI 8650 - Seminar: Special Topics in Second Languages and Cultures Research (1.0 - 3.0 cr)
- EPSY 8403 - Social/Cultural Contexts: Counseling and Skills (3.0 cr)
- OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
- OLPD 5121 - Educational Reform in International Context (3.0 cr)
- OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
- OLPD 5612 - International Human Resource Development (3.0 cr)
- OLPD 8101 - International Education and Development (3.0 cr)
- OLPD 8842 - Comparative Systems in Organizational Leadership, Policy, and Development (3.0 cr)
- PA 5414 - Child Human Rights: Work and Education (3.0 cr)
Twin Cities Campus
Interpersonal Relationships Research Minor
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Psychology, University of Minnesota, S354 Elliott Hall, 75 East River Parkway, Minneapolis, MN 55455 (612-626-0025)
Email: simps108@umn.edu
Website: http://www.cehd.umn.edu/icd/Programs/IrelMinor/

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 14
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in interpersonal relationships research provides doctoral students with a broad theoretical and methodological foundation for research on behavioral interaction patterns between two persons and the impact of these interactions.

A recently recognized and rapidly advancing interdisciplinary field of scientific inquiry, interpersonal relationships research has its roots in psychology, sociology, family studies, communication, and nursing. The program brings together faculty and students from eight University departments and schools.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to the interpersonal relationships research graduate minor is contingent upon prior admission to a doctoral program in a degree-granting department. Admission to the minor program is limited and only by permission of the director of graduate studies in interpersonal relationships research.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctrinal
Required Coursework
IREL 8001 - Proseminar in Interpersonal Relationships Research (2.0 cr)
IREL 8021 - Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships (3.0 cr)
PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
or PSY 8202 - Close Relationships (3.0 cr)
6 additional credits selected in consultation with minor adviser.
Twin Cities Campus
K-12 Technology Integration Postbaccalaureate Certificate
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://www.cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: T E L: K-12 Technology Integration PBacc Cert Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The K-12 Technology Integration certificate program prepares students to use technology (computers and the web) to develop instructional materials for use in a wide range of educational contexts (note that a university certificate program or certificate is distinct from a state certificate or certification).

The program is designed for K-12 teachers or administrators interested in using technology in the classroom.

Program Delivery
This program is available:
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A completed bachelor’s degree is required for admission.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn’t earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a one page goal statement. Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Courses (12 credits)
Required courses are listed; students will also take one additional CI 5xxx course for 3 credits that complements content area, elementary/secondary focus, and individual interests.
CI 5330 - Special Topics in Learning Technologies (3.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)
CI 5361 - Teaching and Learning with the Internet (2.0 - 3.0 cr)
Twin Cities Campus  
Kinesiology M.S.  
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 1900 University Avenue SE, Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700).
Email: kin@umn.edu
Website: http://cehd.umn.edu/kin

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Kinesiology spans a wide range of inquiry connected by the common thread of the study of human movement. Graduate programs reflect a broad study of physical activity ranging from exercise science, movement science, and human performance, to physical activity and sport science and sport management. Much of the research conducted in the school is interdisciplinary in nature and involves collaborative partnerships with life science disciplines such as medicine, neuroscience, and epidemiology and fosters links with business, education, and social sciences. MS students pursue an individualized program with an emphasis in one of the following areas: behavioral aspects of physical activity; biomechanics and neuromotor control; exercise physiology; perceptual-motor control and learning; physical activity and health; sport and exercise psychology; sport sociology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Although prospective masters students generally have an undergraduate degree in kinesiology or the health sciences, others with a baccalaureate degree who have related preparation and a significant background and interest in the scientific study of physical activity may be admitted.

Special Application Requirements:
Applicants must submit a University of Minnesota Graduate Admissions application which includes a written statement of academic interests, goals, and objectives; scores from the General Test of the GRE (verbal, quantitative, and analytical writing) that are less than five years old; three letters of recommendation from persons familiar with their scholarship and research potential; a scholarly writing sample; and transcripts.
Priority deadline for submission of all application materials is December 1 for the following fall admission. Students generally are admitted for the fall semester only.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4.5

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 18 major credits and 12 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is an independent research project with the advisor that meets the following guidelines: Involves a total of approximately 120 hours of work; demonstrates familiarity with the tools of research and scholarship in the field of kinesiology; demonstrates the ability to work independently; and demonstrates the ability to effectively present the results of the investigation.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MS is offered under Plan A and Plan B. Plan A requires 30 credits, including at least 14 course credits in kinesiology, 6 course credits in a minor or related field (either of which must include a minimum of 3 credits in statistics as determined by faculty advisor) and 10 thesis credits (8777). Plan B also requires 30 credits, including at least 14 major course credits in kinesiology, a capstone project of 4 credits in KIN 8995, at least 6 course credits in a minor or related field (either of which must include a minimum of 3 credits in statistics as determined by faculty advisor), and 6 additional credits in any of these areas.

For both Plan A and Plan B, students must take KIN 5981 (3 cr), KIN 8980 (1 cr), and in the related field or minor, at least 3 credits of statistics or equivalent as defined by the faculty advisor. A GPA of at least 3.00 is required to maintain good academic standing and to graduate.

A maximum of 9 credits of 4xxx-level courses is allowed at the discretion of the faculty advisor.

Required courses

Students must complete the following courses and an area of emphasis listed below.

KIN 5981 · Research Methodology in Kinesiology and Sport Management (3.0 cr)
KIN 8980 · Graduate Research Seminar in Kinesiology (1.0 cr)

Plan A

Plan A students must take 10 credits of KIN 8777.

Plan B

Plan B students must take 4 credits of KIN 8995.

KIN 8995 · Research Problems in Kinesiology (1.0 - 12.0 cr)

Emphasis Areas

Kinesiology MS students concentrate their studies in one of the following areas: behavioral aspects of physical activity, biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and health, sport and exercise psychology, or sport sociology.

Behavioral Aspects of Physical Activity

This emphasis examines behavioral interventions for physical activity adoption and maintenance; the epidemiology of physical activity; psychosocial theories related to physical activity promotion; understanding sedentary behavior; and the objective and subjective
assessment of physical activity. In addition to the MS requirements, students choose courses from the following lists with advisor consultation.

**Recommended courses**
Plan A and Plan B students take a minimum of 10 major course credits chosen from the following list. Registration for KIN 5720 is limited to 3 credits.

- KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
- KIN 5125 - Advances in Physical Activity and Health (3.0 cr)
- KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
- KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- KIN 5371 - Sport and Society (3.0 cr)
- KIN 5375 - Youth Sport Science (3.0 cr)
- KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- KIN 5511 - Sport and Gender (3.0 cr)
- KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
- KIN 8126 - Sports Medicine Psychology (3.0 cr)
- KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)

**Minor or Related Field**
Either minor or related field is chosen, Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed below.

Recommended minor is public health, child psychology or psychology.

- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- PUBH 6094 - Obesity and Eating Disorder Interventions (2.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 6636 - Qualitative Research Methods in Public Health Practice (2.0 cr)
- PUBH 6810 - Survey Research Methods (3.0 cr)
- PUBH 6914 - Community Nutrition Intervention (3.0 cr)

-OR-

**Biomechanics and Neuromotor Control**
The study of human biomechanics with its focus on the mechanical and electrophysiological analysis of human motion is combined with the study of movement neuroscience. This emphasis area provides advanced knowledge for understanding how the human nervous system controls movement and how the neurological disease affects motor function.

**Recommended Courses**
A minimum of 10 major course credits (not including KIN 8777) are needed outside of the requirements and may be chosen from the following list.

- KIN 4441 - Movement Neuroscience (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
- KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
- KIN 8132 - Seminar: Motor Development (3.0 cr)
- KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- KIN 8995 - Research Problems in Kinesiology (1.0 - 12.0 cr)

**Minor or related field**
Either minor or related field is chosen, Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed below. Recommended minor is clinical physiology and movement science.

- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
Exercise Physiology

Exercise physiology is the study of issues related to acute and chronic effects of physical activity on human physiological systems and health, and how fundamental concepts of human energetics and mechanics apply to exercise, sport, physical exertion, and health promotion. In addition to the MS requirements, students choose courses from the following lists with advisor consultation. Plan A and Plan B students take a minimum of 10 major course credits chosen from the following list.

Plan A and Plan B students take a minimum of 10 major course credits chosen from the following list.

KIN 5122 - Applied Exercise Physiology (3.0 cr)
KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
KIN 5142 - Applied Nutrition for Sport Performance and Optimal Health (3.0 cr)
KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
KIN 5435 - Advanced Theory and Techniques of Exercise Science (3.0 cr)
KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)
KIN 8122 - Seminar: Exercise Physiology (2.0 cr)

Minor or related field

Either minor or related field is chosen. Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed below.

Plan A and Plan B students take a minimum of 10 major course credits chosen from the following list.

KIN 4133 - Perceptual-Motor Control and Learning (3.0 cr)
KIN 4134 - The Aging Motor System (3.0 cr)
KIN 4136 - Embodied Cognition (3.0 cr)
KIN 4441 - Movement Neuroscience (3.0 cr)
KIN 4520 - Current Topics in Kinesiology (2.0 - 4.0 cr)
HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)
KIN 8132 - Seminar: Motor Development (3.0 cr)
KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
KIN 8211 - Seminar: Perception and Action (3.0 cr)

Minor or related field

Either minor or related field is chosen. Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed below.

EPSY 5261 - Introductory Statistical Methods (3.0 cr)
-OR-
EPSY 5261 - Introductory Statistical Methods (3.0 cr)

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Information current as of August 31, 2018
Physical Activity and Health

The emphasis area in Physical Activity and Health is intended to provide students with advanced study in physical activity and health promotion and disease prevention, as well as study designs from an epidemiological approach. The emphasis area provides a solid foundation sufficient to understand and conduct research in this field. In addition to the MS requirements, students choose courses from the following lists with advisor consultation.

**Recommended Courses**

A minimum of 10 semester course credits with KIN prefix. 4xxx level courses can only be taken at the discretion of the advisor.

- KIN 4214 - Health Promotion (3.0 cr)
- or KIN 5202 - Current Issues in Health (2.0 cr)
- or KIN 5203 - Health Media, Consumerism, and Communication (2.0 cr)
- or KIN 5122 - Applied Exercise Physiology (3.0 cr)
- or KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
- or KIN 5125 - Advances in Physical Activity and Health (3.0 cr)
- or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- or KIN 5142 - Applied Nutrition for Sport Performance and Optimal Health (3.0 cr)
- or KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
- or KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
- or KIN 8211 - Seminar: Perception and Action (3.0 cr)

**Minor or related field**

Either minor or related field is chosen, Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed.

- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- or EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- or PUBH 6450 - Biostatistics I (4.0 cr)
- or PUBH 6451 - Biostatistics II (4.0 cr)

-OR-

**Sport and Exercise Psychology**

The Sport and Exercise Psychology emphasis focuses on the thoughts, feelings, and actions of participants and professionals within physical activity contexts such as competitive sports, sports medicine and rehabilitation, exercise, and physical education. Scholars seek to understand the cognitive, affective, behavioral, and social mechanisms underlying interactions between the psychology of individual participants and influences of psychological climates within physical activity settings.

**Recommended Courses**

For Plan A and Plan B, a minimum of 10 major course credits are needed outside the requirements and may be chosen from the following list:

- KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
- or KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
- or KIN 5136 - Psychology of Coaching (3.0 cr)
- or KIN 5375 - Youth Sport Science (3.0 cr)
- or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
- or KIN 5723 - Psychology of Sport Injury and Rehabilitation (3.0 cr)
- or KIN 8126 - Sports Medicine Psychology (3.0 cr)
- or KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)
- or KIN 8696 - Internship: Applied Sport Psychology (3.0 - 6.0 cr)

**Minor or related field**

Either minor or related field is chosen, Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed.

Recommended minor is educational psychology.

- CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
- or CPSY 5302 - Cognitive and Biological Development (3.0 cr)
- or CSPH 5706 - Lifestyle Medicine (2.0 cr)
- or CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
- or EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- or EPSY 8404 - Group Counseling: Theory, Applications, and Skills (3.0 cr)
- or EPSY 8406 - Professional Ethics for Counselors and Psychologists (3.0 cr)
- or GRAD 8101 - Teaching in Higher Education (3.0 cr)
- or GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
- or KIN 5371 - Sport and Society (3.0 cr)
Sport and Gender (3.0 cr)
Sport Management Ethics and Policy (3.0 cr)
Organization and Management of Physical Education and Sport (3.0 cr)
Prevention Science: Principles and Practices (3.0 cr)
Prevention Science Research Methodology (3.0 cr)
New Topics in Prevention: Implementation and Dissemination (3.0 cr)
Personality and Social Behavior (3.0 cr)
Social Psychology: The Self (3.0 cr)
Professional Standards and Ethics in Clinical Psychology (3.0 cr)
Fundamentals of Social and Behavioral Science (2.0 cr)
Injury Prevention in the Workplace, Community, and Home (2.0 cr)
Fundamentals of Epidemiology (3.0 cr)

OR-

Sport sociology is the scientific study of human behavior and social organization in the sport context, focusing on behavior patterns and social processes that occur in the organizational and management systems in which sport exists. The program is housed in the Tucker Center for Research on Girls & Women in Sport, an interdisciplinary research institute. In addition to the MS requirements, students choose courses from the following lists with advisor consultation.

Recommended Courses
For Plan A and Plan B, a minimum of 10 major course credits are needed outside the requirements and may be chosen from the following list:
- Motivational Interventions in Physical Activity (3.0 cr)
- Social Psychology of Sport & Physical Activity (3.0 cr)
- Psychology of Coaching (3.0 cr)
- Sport and Society (3.0 cr)
- Sport and Gender (3.0 cr)
- Organization and Management of Physical Education and Sport (3.0 cr)
- Legal Aspects of Sport and Recreation (4.0 cr)
- Developmental Sport and Exercise Psychology (3.0 cr)

Minor or related field
Either minor or related field is chosen. Plan A and Plan B students must take one statistics course with the consultation with their advisor. Plan A students take an additional 3 related-field (other emphasis areas of KIN or outside programs) credits and Plan B students take an additional 9 related-field credits in consultation with the advisor. Recommended courses for related fields are listed below.
- Comparative Indigenous Feminisms [GP] (3.0 cr)
- Media, Race, and Identity (3.0 cr)
- Qualitative Methods in Educational Psychology (3.0 cr)
- Introductory Statistical Methods (3.0 cr)
- Statistical Methods in Education I (3.0 cr)
- Statistical Methods in Education II (3.0 cr)
- Transnational Feminist Theory (3.0 cr)
- Topics: Theory, Knowledge, and Power (3.0 cr)
- Black Feminist Thought in the American and African Diasporas (3.0 cr)
- Intellectual History of Feminism (3.0 cr)
- Advanced Studies in Sexuality (3.0 cr)
- Feminist Theories of Knowledge (3.0 cr)
- Sport Management Ethics and Policy (3.0 cr)
- Research Methods in Social Psychology (3.0 cr)
- Sport, Culture & Society (3.0 cr)
- Sociological Research Methods (4.0 cr)
Twin Cities Campus
Kinesiology Minor
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700).
Email: kin@umn.edu
Website: http://cehd.umn.edu/kin

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Master's students can choose a kinesiology minor in the following emphasis areas: behavioral aspects of physical activity, biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and health, sport and exercise psychology, and sport sociology. Doctoral students can pursue a kinesiology minor in these same emphasis areas, with the addition of the sport management emphasis.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A master's minor requires at least 6 credits of graduate-level kinesiology courses. A doctoral minor requires at least 12 credits of graduate-level kinesiology courses. Courses should be chosen in consultation with the student's major adviser and the School of Kinesiology's director of graduate studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's
Minor Courses
Minor requires at least 6 credits of graduate-level kinesiology courses. Courses should be chosen in consultation with the student's major adviser and the School of Kinesiology's director of graduate studies.

Doctoral
Minor Courses
Minor requires at least 12 credits of graduate-level kinesiology courses. Courses should be chosen in consultation with the student's major adviser and the School of Kinesiology's director of graduate studies.
Twin Cities Campus
Kinesiology Ph.D.
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 1900 University Avenue SE, Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700)
Email: kin@umn.edu
Website: http://cehd.umn.edu/kin

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60 to 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Kinesiology spans a wide range of inquiry connected by the common thread of the study of human movement. Graduate programs reflect a broad study of physical activity ranging from exercise science, movement science, and human performance, to physical activity and sport science and sport management. Much of the research conducted in the school is interdisciplinary in nature and involves collaborative partnerships with life science disciplines such as medicine, neuroscience, and epidemiology and fosters links with business, education, and social sciences. MS students pursue an individualized program with an emphasis in one of the following areas: behavioral aspects of physical activity; biomechanics and neuromotor control; exercise physiology; perceptual-motor control and learning; physical activity and health; sport and exercise psychology; sport sociology.

PhD students pursue an individualized program with an emphasis in behavioral aspects of physical activity, biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and health, sport and exercise psychology, sport management or sport sociology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

It is preferred that applicants have completed a master's degree in the field of kinesiology or a related field and achieved an overall minimum GPA of 3.50.

Other requirements to be completed before admission:
Applicants must have completed a baccalaureate degree, generally in the following areas: kinesiology; exercise science; sport management; sport psychology/sociology; movement science; or related preparation and significant background and interest in the scientific study of physical activity.

Special Application Requirements:
Applicants must submit a University of Minnesota application which includes a written statement of academic interests, goals, and objectives; scores from the General Test of the GRE (verbal, quantitative, and analytical writing) that are less than five years old; three recommendations from persons familiar with their scholarship and research potential; a scholarly writing sample; and transcripts. Submission of all application materials by December 1 ensures priority consideration for admission and for teaching and research assistantships awarded for the next academic year. Students are admitted for the fall semester only.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4.5
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

24 to 29 credits are required in the major.
12 to 19 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires 36 to 48 course credits and 24 thesis credits. A minimum total of 60 credits and a maximum total of 72 credits are required to complete the program. Course credits include a minimum of 15 major program credits (including 3 credits of KIN 8980 Graduate Research Seminar), 6 credits in a supporting program or 12 credits in a doctoral minor, 6 research skills course credits, and 9 credits of mentored research experience. At least 6 major course credits, 6 research skills course credits, and 6 mentored experience course credits must be taken as a U of M enrolled student. A GPA of at least 3.00 is required to maintain good standing and to graduate.

**Required Kinesiology Courses**

A minimum of 3 credits of KIN 8980 and a minimum of 9 credits of KIN 8995 are required over the course of the program for all emphasis areas listed below.

- **KIN 8980** - Graduate Research Seminar in Kinesiology (1.0 cr)
- **KIN 8995** - Research Problems in Kinesiology (1.0 - 12.0 cr)

**Emphasis Areas**

Kinesiology PhD students pursue an individualized program with an emphasis in behavioral aspects of physical activity, biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and health, sport and exercise psychology, sport management or sport sociology.

**Behavioral Aspects of Physical Activity**

Behavioral Aspects of Physical Activity examines behavioral interventions for physical activity adoption and maintenance; the epidemiology of physical activity; psycho-social theories related to physical activity promotion; understanding sedentary behavior; and the objective and subjective assessment of physical activity. Interdisciplinary research is conducted with other departments including medicine, nursing, public health, epidemiology, physiology, nutrition, psychology, etc.

**Emphasis courses**

A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.

- **KIN 5123** - Motivational Interventions in Physical Activity (3.0 cr)
- **KIN 5125** - Advances in Physical Activity and Health (3.0 cr)
- **KIN 5126** - Social Psychology of Sport & Physical Activity (3.0 cr)
- **KIN 5141** - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
- **KIN 5371** - Sport and Society (3.0 cr)
or KIN 5375 - Youth Sport Science (3.0 cr)
or KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
or KIN 5511 - Sport and Gender (3.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 8126 - Sports Medicine Psychology (3.0 cr)
or KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)

Research skills courses
A minimum 6-9 research skills courses credits are required, selected from the following list or in consultation with the advisor. Courses taken to fulfill the research skills courses requirement cannot be double counted to fulfill the supporting program requirement.

KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
or EPSY 8252 - Statistical Methods in Education II (3.0 cr)
or EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
or EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 6636 - Qualitative Research Methods in Public Health Practice (2.0 cr)
or PUBH 6673 - Grant Writing for Public Health (1.0 cr)
or PUBH 6810 - Survey Research Methods (3.0 cr)
or PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
or PUBH 7405 - Biostatistics: Regression (4.0 cr)
or PUBH 7406 - Advanced Regression and Design (4.0 cr)

Minor
Choose either minor or supporting program. A minimum of 12 course credits is required for a University of Minnesota doctoral minor. Recommended minor is: CSPH, PSY or PUBH.

Supporting program
Recommended supporting programs and courses include combining 6-13 credits of advisor-approved selections from other emphasis areas of kinesiology (KIN), such as (but not limited to) sport sociology or sport and exercise psychology.

PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)
or PUBH 6094 - Obesity and Eating Disorder Interventions (2.0 cr)
or PUBH 6102 - Issues in Environmental Health (2.0 cr)
or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6914 - Community Nutrition Intervention (3.0 cr)
-OR-

Biomechanics and Neuromotor Control
The study of human biomechanics with its focus on the mechanical and electrophysiological analysis of human motion is combined with the study of movement neuroscience. This emphasis area provides advanced knowledge for understanding how the human nervous system controls movement and how the neurological disease affects motor function.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.

KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
or KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
or KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
or KIN 8211 - Seminar: Perception and Action (3.0 cr)
or KIN 8132 - Seminar: Motor Development (3.0 cr)
or KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
or RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
or NSC 5661W - Behavioral Neuroscience [WI] (3.0 cr)

Research skills courses
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. Courses taken to fulfill the research skills courses requirement cannot be double counted to fulfill the supporting program requirement.

EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 7405 - Biostatistics: Regression (4.0 cr)
or PUBH 7406 - Advanced Regression and Design (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)
or STAT 5601 - Nonparametric Methods (3.0 cr)
Minor
Choose either minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: CGSC, CPMS, GERO, HUMF, NSC, or PREV.

Supporting program
Any combination of at least 6 KIN or non-KIN course credits may be used for the supporting program and must be approved by the advisor. Recommended kinesiology emphasis areas for supporting courses include exercise physiology, perceptual-motor control and learning, physical activity and sport science, or sport management. Recommended program areas for supporting courses include: BMEN, ME, NURS, OT, OTOL, PUBH, NSC and RSC.

KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
or KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)

-OR-

Exercise Physiology
Exercise physiology is the study of issues related to acute and chronic effects of physical activity on human physiological systems and health, and how fundamental concepts of human energetics and mechanics apply to exercise, sport, physical exertion, and health promotion. Doctoral students learn to apply principles of physiology to solving problems related to functional responses and adaptations involved in human skeletal muscular activity.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx. KIN 8122 may be taken multiple times.

KIN 5122 - Applied Exercise Physiology (3.0 cr)
or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
or KIN 5142 - Applied Nutrition for Sport Performance and Optimal Health (3.0 cr)
or KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
or KIN 5435 - Advanced Theory and Techniques of Exercise Science (3.0 cr)
or KIN 5485 - Advanced Electrocardiogram Interpretation (3.0 cr)
or KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
or KIN 5641 - Scientific Theory and Application of Training and Conditioning in Sport (3.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)
or KIN 8122 - Seminar: Exercise Physiology (2.0 cr)

Research skills courses
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. It is recommended to take a statistical sequence in either EPSY, STAT, or PUBH. It is not recommended to switch courses between departments unless agreed to by the advisor. Courses taken to fulfill the research skills courses requirement can't be double counted to fulfill the supporting program requirement.

EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 7405 - Biostatistics: Regression (4.0 cr)
or PUBH 7406 - Advanced Regression and Design (4.0 cr)
or PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
or PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)
or STAT 5601 - Nonparametric Methods (3.0 cr)

Minor
Choose either a minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: CGSC, CPMS, GERO, HUMF, NSC, or PREV.

Supporting program
Any combination of at least 6 KIN or non-KIN course credits may be used for the supporting program and must be approved by the advisor. Recommended kinesiology emphasis areas for supporting courses include biomechanics and neuromotor control, perceptual-motor control and learning, physical activity and sport science, or sport management. Recommended areas for supporting program include: BIOC, FSCN, OT, PHSL, PUBH, NSC, and RSC.

-OR-

Perceptual-Motor Control and Learning
Perceptual-motor control and learning includes related areas of movement behavior inquiry. Motor learning is the study of the learning of movement skills and the factors that mediate learning, such as practice, perceptual guidance, or knowledge of results. Although a lifespan approach is emphasized, students may focus on one or more specific age periods, such as early childhood, adolescence, adulthood or aging.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.
KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
KIN 5941 - Clinical Movement Neuroscience (3.0 cr)
KIN 8211 - Seminar: Perception and Action (3.0 cr)
KIN 8132 - Seminar: Motor Development (3.0 cr)
KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)

Research skills courses
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. It is recommended to take a statistical sequence in either EPSY, STAT, or PUBH. It is not recommended to switch courses between departments unless agreed to by the advisor. Courses taken to fulfill the research skills courses can't be double counted to fulfill the supporting program requirement.

EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 7405 - Biostatistics: Regression (4.0 cr)
PUBH 7406 - Advanced Regression and Design (4.0 cr)
STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
STAT 5302 - Applied Regression Analysis (4.0 cr)
STAT 5303 - Designing Experiments (4.0 cr)
STAT 5601 - Nonparametric Methods (3.0 cr)

Minor
Choose either a minor or supporting program. All University of Minnesota doctoral minors require a minimum of 12 credits. Recommended minors include CGSC, CPMS, GERO, HUMF, NSC, or PREV.

Supporting program
Any combination of at least 6 KIN or non-KIN course credits may be used for the supporting program and must be approved by the advisor. Recommended kinesiology emphasis areas for supporting courses include biomechanics and neuromotor control, exercise physiology, physical activity and sport science, or sport management. Recommended programs for supporting courses include: BMEN, ME, NURS, OT, OTOL, PubH, NSC, and RSC. Specific KIN course recommendations include:
KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)

Physical Activity and Health
The emphasis area in Physical Activity and Health is intended to provide students with advanced study in physical activity and health promotion and disease prevention, as well as study designs from an epidemiological approach. The emphasis area will provide a solid foundation sufficient to understand and conduct research in this field.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.

KIN 5202 - Current Issues in Health (2.0 cr)
KIN 5203 - Health Media, Consumerism, and Communication (2.0 cr)
KIN 5122 - Applied Exercise Physiology (3.0 cr)
KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
KIN 5125 - Advances in Physical Activity and Health (3.0 cr)
KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
KIN 5142 - Applied Nutrition for Sport Performance and Optimal Health (3.0 cr)
KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)
KIN 8122 - Seminar: Exercise Physiology (2.0 cr)
KIN 8211 - Seminar: Perception and Action (3.0 cr)

Research skills courses
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. Courses taken to fulfill the research skills courses can't be double counted to fulfill the supporting program requirement.

KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 7405 - Biostatistics: Regression (4.0 cr)
PUBH 7406 - Advanced Regression and Design (4.0 cr)
or STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)

**Minor**

Choose either minor or supporting program, may include only 5xxx level courses or higher. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: CGSC, CPMS, GERo, CSPH, NSC, PREV, or PUBH.

**Supporting program**

Any combination of at least 6 KIN or non-KIN course credits may be used for the supporting program and must be approved by the advisor. Recommended kinesiology emphasis areas for supporting courses include biomechanics and neuromotor control, exercise physiology, physical activity and sport science, or sport management. Recommended programs for supporting courses include: NURS, PUBH, NSC, RSC, CSPH, or PREV.

-OR-

**Sport and Exercise Psychology**

The Sport and Exercise Psychology emphasis focuses on the thoughts, feelings, and actions of participants and professionals within physical activity contexts such as competitive sports, sports medicine and rehabilitation, exercise, and physical education. Scholars seek to understand the cognitive, affective, behavioral, and social mechanisms underlying interactions between the psychology of individual participants and influences of psychological climates within physical activity settings.

**Emphasis courses**

A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.

- KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
- KIN 5136 - Psychology of Coaching (3.0 cr)
- KIN 5375 - Youth Sport Science (3.0 cr)
- KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
- KIN 5723 - Psychology of Sport Injury and Rehabilitation (3.0 cr)
- KIN 8126 - Sports Medicine Psychology (3.0 cr)
- KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)
- KIN 8696 - Internship: Applied Sport Psychology (3.0 - 6.0 cr)

**Research skills courses**

A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. Courses taken to fulfill the research skills courses requirement can't be double counted to fulfill the supporting program requirement.

- KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)

**Minor**

Choose either minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: CPSY, EPSY or PSY.

**Supporting Program**

Recommended supporting program courses include combining 6-13 credits of advisor-approved selections from other emphasis areas within kinesiology (KIN), such as (but not limited to) behavioral aspects of physical activity (e.g.KIN 5123), sport sociology (e.g.KIN 5371 or KIN 5511) or sport management (e.g.KIN 5601 or KIN 5725) and/or from other graduate programs [e.g., CPSY, EPSY, PSY, CSPH, GRAD, PREV, or PUBH.]

- CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
- CPSY 5302 - Cognitive and Biological Development (3.0 cr)
- CPSH 5706 - Lifestyle Medicine (2.0 cr)
- EPSY 8402 - Individual Counseling: Theories, Applications & Counseling Skills (4.0 cr)
- EPSY 8404 - Group Counseling: Theory, Applications, and Skills (3.0 cr)
- EPSY 8406 - Professional Ethics for Counselors and Psychologists (3.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
- KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
- KIN 5371 - Sport and Society (3.0 cr)
- KIN 5511 - Sport and Gender (3.0 cr)
- KIN 5601 - Sport Management Ethics and Policy (3.0 cr)
- KIN 5725 - Organization and Management of Physical Education and Sport (3.0 cr)
- PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)
- PREV 8002 - Prevention Science Research Methodology (3.0 cr)
- PREV 8003 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)
PSY 8208 - Social Psychology: The Self (3.0 cr)
PSY 8542 - Professional Standards and Ethics in Clinical Psychology (3.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)
PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)

-OR-

Sport Management
This emphasis concentrates on the theoretical and practical dimensions of the management of athletic events, sports teams and facilities, and the sporting process. The management areas studied include those in the public sector (interscholastic and intercollegiate sport) as well as fitness and facility management. Sport management policy and ethics are also a focus of this emphasis area and research agenda.

Required courses
KIN 8128 - Doctoral Sport Management Seminar (3.0 cr)

Program courses
A minimum of 9 credits must be selected from the following list:
KIN 5375 - Youth Sport Science (3.0 cr)
or KIN 5511 - Sport and Gender (3.0 cr)
or KIN 5371 - Sport and Society (3.0 cr)
or KIN 5421 - Sport Finance (3.0 cr)
or KIN 5461 - Issues in the Sport Industry (3.0 cr)
or KIN 5601 - Sport Management Ethics and Policy (3.0 cr)
or KIN 5631 - Programming and Promotion in Sport (3.0 cr)
or KIN 5725 - Organization and Management of Physical Education and Sport (3.0 cr)
or KIN 5801 - Legal Aspects of Sport and Recreation (4.0 cr)

Research skills courses
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor. Courses taken to fulfill the research skills courses requirement can't be double counted to fulfill the supporting program requirement.
KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
or OLPD 5056 - Case Studies for Policy Research (3.0 cr)
or OLPD 5061 - Ethnographic Research Methods (3.0 cr)
or OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
or EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
or EPSY 8252 - Statistical Methods in Education II (3.0 cr)
or EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
or EPSY 8265 - Factor Analysis (3.0 cr)
or EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
or FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
or SOC 8801 - Sociological Research Methods (4.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)

Minor
Choose either a minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: public policy, COMM, EPSY, BA, or CI.

Supporting program
Any combination of at least 6 KIN or non-KIN course credits may be used for the supporting program and must be approved by the advisor. Recommended kinesiology emphasis areas for supporting courses include biomechanics and neuromotor control, exercise physiology, physical activity and sport science, and perceptual-motor control and learning. Recommended program areas for supporting program courses include: OLPD, PA, COMM, marketing, and management.

-OR-

Sport Sociology
Sport Sociology is the scientific study of human behavior and social organization in the sport context with the primary objective to attempt to identify, describe and explain the role and relationship of sport in society. It focuses on the behavior patterns and social processes that occur in the sporting domain and explores the organizational and management systems and structures in which sport exists.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 3 credits must be KIN 8xxx.
KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
or KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
or KIN 5136 - Psychology of Coaching (3.0 cr)
or KIN 5371 - Sport and Society (3.0 cr)
or KIN 5375 - Youth Sport Science (3.0 cr)
or KIN 5511 - Sport and Gender (3.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 5723 - Psychology of Sport Injury and Rehabilitation (3.0 cr)
or KIN 8126 - Sports Medicine Psychology (3.0 cr)
or KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)
or KIN 8696 - Internship: Applied Sport Psychology (3.0 - 6.0 cr)

**Research skills courses**

A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the advisor.

Courses taken to fulfill the research skills courses requirement can't be double counted to fulfill the supporting program requirement.

- AMST 8250 - Popular Culture and Politics in the 20th Century: Research Strategies (3.0 cr)
- AMST 8289 - Ethnographic Research Methods: Research Strategies in American Studies (3.0 cr)
- COMM 8211 - Critical Communication Studies: History, Theory, Method (3.0 cr)
- COMM 8451 - Seminar: Intercultural and Diversity Research (3.0 cr)
- COMM 8502 - Seminar: Communication Theory Construction (3.0 cr)
- EPSY 5247 - Research Methodology in Kinesiology and Sport Management (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- GWSS 8997 - Dissertation Seminar (1.0 - 3.0 cr)
- PSY 8209 - Research Methods in Social Psychology (3.0 cr)
- PUBH 6810 - Survey Research Methods (3.0 cr)
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)
- SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)

**Minor**

Choose either minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: AMST, COMM, CPSY, CSPH, EPSY, GWSS, PUBH, PSY or SOC.

**Supporting program**

Recommended supporting programs and courses include selections from EPSY, PSY, and CPSY minor programs as well as from other emphasis areas of kinesiology (KIN), such as behavioral aspects of physical activity, sport sociology, or sport management. Other relevant supporting program courses can be found in public health (PUBH), sociology (SOC), center for spirituality and healing (CSPH), or prevention science (PREV).

- AMST 5412 - Comparative Indigenous Feminisms [GP] (3.0 cr)
- AMST 8202 - Theoretical Foundations and Current Practice in American Studies (3.0 cr)
- AMST 8240 - Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development (3.0 cr)
- COMM 5221 - Media, Race, and Identity (3.0 cr)
- COMM 8210 - Seminar: Selected Topics in U.S. Electronic Media (3.0 cr)
- COMM 8211 - Critical Communication Studies: History, Theory, Method (3.0 cr)
- GWSS 5104 - Transnational Feminist Theory (3.0 cr)
- GWSS 5190 - Topics: Theory, Knowledge, and Power (3.0 cr)
- GWSS 5406 - Black Feminist Thought in the American and African Diasporas (3.0 cr)
- GWSS 8101 - Intellectual History of Feminism (3.0 cr)
- GWSS 8102 - Advanced Studies in Sexuality (3.0 cr)
- GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)
- GWSS 8107 - Feminist Pedagogies (3.0 cr)
- GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
- GWSS 8109 - Feminist Knowledge Production (3.0 cr)
- GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)
- GWSS 8220 - Seminar: Cultural Criticism and Media Studies (3.0 cr)
- GWSS 8220 - Seminar: Race, Representation and Resistance (3.0 cr)
- GWSS 8270 - Seminar: Theories of Body (3.0 cr)
- SOC 4451 - Sport, Culture & Society (3.0 cr)
- SOC 5455 - Sociology of Education (3.0 cr)
- SOC 8001 - Sociology as a Profession (1.0 cr)
- SOC 8011 - Teaching Sociology: Theory & Practice (3.0 cr)
- SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
- SOC 8221 - Sociology of Gender (3.0 cr)
or SOC 8290 - Topics in Race, Class, Gender and other forms of Durable Inequality (3.0 cr)
or SOC 8701 - Sociological Theory (4.0 cr)
Twin Cities Campus
Leadership in Education M.Ed.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377).
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of education (MEd)/professional studies program in leadership in education, offered jointly by the Department of Organizational Leadership, Policy, and Development (OLPD) and the Department of Curriculum and Instruction (C&I) in the College of Education and Human Development (CEHD), builds leadership skills and facilitates analysis of K-12 school culture, policies, and practice.

This program develops educational leaders who can serve in schools that foster continuous learning and improvement. Program participants are prepared to advance team, school-wide, and district-wide reform initiatives for coherent educational systems and programs. This program addresses formal and informal leadership methods, emphasizing the roles and contributions of teachers as leaders of instructional improvement, including ways that teachers and principals work together to promote collaborative school cultures.

This 30-semester credit program emphasizes the essential components of leadership, including collaboration, group dynamics, continuous professional learning, school policy, school culture, design and facilitation of improvement initiatives, innovations in teaching and assessment practice, creation of coherent learning experiences, cross-cultural education, and technology.

Students are encouraged to begin the program with other educators from the same school or district. Most students complete the degree in two to three years while continuing to teach full time. Some degree coursework is offered at convenient, off-campus sites in the Twin Cities area.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have teaching experience.

Special Application Requirements:
Applications are reviewed on an ongoing basis, but students are advised to submit application materials by the following preferred dates: November 1 (Spring), March 1 (Summer), July 1 (Fall). International students must apply six weeks earlier than those dates listed.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Course Requirements**

- OLPD 5364 - Context and Practice of Educational Leadership (3.0 cr)
- OLPD 5374 - Leadership for Professional Development (4.0 cr)
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
  - or OLPD 5387 - Leadership for Teaching and Learning (3.0 cr)
- CI 5177 - Practical Research (1.0 - 3.0 cr)
  - or OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5361 - Project in Teacher Leadership (3.0 cr)

**Electives**

14 or more credits of elective courses with adviser approval. Students often choose elective credits aligned with certificates in staff development, school technology, reading, and school administration.

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

**Rochester**

This sub-plan is not accepting new students at this time. Course requirements are the same as the Twin Cities program.

**Singapore**

Course requirements are the same as the Twin Cities program.
Twin Cities Campus
Literacy Education M.Ed.
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: Clinfo@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of education (MED)/professional studies program in literacy education is designed to improve the quality of literacy education in K-12 schools. The program aims to address the growing state and national emphasis on pupils' reading skills and achievement.

The literacy education program provides instruction on current developments in literacy theory and research, as well as teaching methods for reading, writing, language, speech, and media studies. Students will learn to develop instructional units, evaluate and assess K-12 pupils' literacy skills, and develop technology tools to teach them. The program also encourages students to become "literacy leaders" in their schools and school systems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A bachelor's degree from an accredited college or university.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a clearly written statement of career interests, goals, and objectives. Master's applications are reviewed by department faculty three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 30 major credits and up to null credits outside the major. The is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Coursework (6 credits)
- CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)

Literacy Education Requirements (18 credits)
Take 18 or more credit(s) from the following:
- CI 5402 - Introduction to Special Collections (3.0 cr)
- CI 5403 - Writing For and By Children (3.0 cr)
- CI 5404 - Multicultural Literature for Children and Adolescents (3.0 cr)
- CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
- CI 5417 - Elementary literacy Instruction for ESL Students (3.0 cr)
- CI 5422 - Teaching Writing in Schools (3.0 cr)
- CI 5431 - Introduction to Instructional Leadership in K-12 Reading (3.0 cr)
- CI 5432 - Instructional Leadership in Reading in Kindergarten and the Elementary Grades (3.0 cr)
- CI 5433 - Instructional Leadership in Reading for the Middle and Secondary Grades (3.0 cr)
- CI 5434 - Professional Development and Evolving Practice in K-12 Reading (3.0 cr)
- CI 5435 - Instructional Leadership in Preventing Reading Difficulties (3.0 cr)
- CI 5441 - Teaching Literature in the Secondary School (2.0 - 3.0 cr)
- CI 5442 - Literature for Adolescents (3.0 cr)
- CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
- CI 5461 - Teaching Composition in the Secondary School (3.0 cr)
- CI 5462 - Evaluating and Assessing Writing (3.0 cr)
- CI 5472 - Teaching Critical Media Analysis in Schools (3.0 cr)
- CI 5475 - Teaching Digital Writing (3.0 cr)

Electives (6 credits)
Courses will be selected in consultation with faculty advisor. Students are advised to select courses that reflect learning issues faced in their classroom, including special education, secondary language, or cultural diversity issues.

Take 6 or more credit(s) from the following:
- CI 5331 - Introduction to Learning Technologies (3.0 cr)
- CI 5361 - Teaching and Learning with the Internet (2.0 - 3.0 cr)
- CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
- CI 5641 - Language, Culture, and Education (3.0 cr)
- CI 5642 - Assessing English Learners (3.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
- CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
- YOST 5952 - Everyday Lives of Youth (3.0 cr)
- YOST 5954 - Experiential Learning: Pedagogy for Community and Classroom (3.0 cr)
- ENGL 5090 - Readings in Special Subjects (1.0 - 4.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5151 - Cooperative Learning (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
Twin Cities Campus
Multicultural College Teaching and Learning M.A.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of arts in multicultural college teaching and learning offered by the Department of Organizational Leadership, Policy, and Development (OLPD) provides an opportunity for intensive study of a transformative approach to teaching and learning to promote access to and success for traditionally underserved students. The program is multidisciplinary and a broad understanding of multiculturalism is employed that includes race, ethnicity, class, gender, sexual orientation, disability, age, and religion, so as to acknowledge that personal identity is complex and intersectional. Students engage in a critical examination of contemporary frameworks in educational theory, as well as the study of best practices for addressing them, such as multicultural education, critical pedagogy, assessment, and classroom research. Students are required to complete a semester-long supervised practicum and a one-semester supervised internship.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must submit two letters of recommendation from persons familiar with their scholarship and research potential, transcripts, a current résumé, and answer to two essay questions found within the University’s online application. The GRE is not required for EPL and MCTL M.A. applicants but is required for application to other M.A. program tracks (CIDE, ES, HE, and HRD). International students must also submit a TOEFL or IELTS score, but international applicants to the M.A. program are exempt from the GRE. All applications for admission are reviewed once a year. All new students begin in fall semester unless permission to start earlier is granted by the track coordinator. The annual deadline is February 1 for the two-year M.A. program. The annual deadline is February 1 for one-year M.A. program options (not available for the HRD or MCTL tracks).

Letters of recommendation, résumé, essays, and other department application materials are submitted via the University online application system. Unofficial GRE scores, transcripts, and TOEFL/IELTS score may also be submitted via the online application for admission review purposes only. Admitted students must submit official GRE scores (as applicable), transcripts (sent directly from institution[s]), and TOEFL/IELTS scores (as applicable) to the University as a condition of any admission offer.

Applicants must have completed appropriate undergraduate and graduate study. In some cases, where previous coursework or degrees are marginally related, otherwise qualified applicants will be asked to complete additional background courses after admission. Applications are encouraged from individuals who may have completed undergraduate and/or master's programs in social science, liberal arts, public affairs, and business fields. The department offers study opportunities for professionals who are employed full time as well as for those who wish to pursue graduate studies full time.

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

IELTS
- Total Score: 6.5
MELAB
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 15 major credits, 9 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 18 major credits and 12 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The Plan B master's degree requires students to complete a capstone project. Students must demonstrate familiarity with the tools of research or scholarship in multicultural college teaching and learning, the ability to work independently, and the ability to present the results of their investigation effectively. The capstone project will involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The OLPD graduate faculty will specify the nature and extent of the options available to satisfy this requirement. In conjunction with the capstone project, students must enroll in the 3 credit OLPD 5087 MA Research Seminar.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The Plan A master's requires a minimum of 34 credits. Students must complete a minimum of 15 credits in the major field (including practicum and internship), a minimum of 6 elective credits outside, one additional 3 credit research methods course, as well as 10 thesis credits and a master's thesis. The Plan B master's degree requires a minimum of 30 credits. Students must complete 15 credits in the major field, the 3 credit MA Research Seminar, and a capstone project, as well as a minimum of 12 elective credits.

Required core courses (15 cr minimum)

The following courses are required for both the Plan A and the Plan B. Student must take 3 credits of OLPD 8796. Additional credits of OLPD 8796 may be taken with advisor approval.

- CI 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
- OLPD 5796 - Supervised Practicum in Multicultural Postsecondary Teaching and Learning (3.0 cr)
- CI 5116 - Action Research in Educational Settings (3.0 cr)
- OLPD 5712 - Multicultural Theories of College Student Development Applied to Teaching and Learning (3.0 cr)
- OLPD 8796 - Supervised Internship in Postsecondary Teaching and Learning (3.0 - 12.0 cr)

Electives (Plan A 6 cr) (Plan B 12 cr)

To be determined with advisor; used to reach total of 34 credits Plan A or 30 credits Plan B. Options include:

- CI 5145 - Critical Pedagogy (3.0 cr)
- CI 5323 - Online Learning Communities (3.0 cr)
- CI 5325 - Designing and Developing Online Distance Learning (3.0 cr)
- CI 5331 - Introduction to Learning Technologies (3.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)
- CI 5367 - Interactive Multimedia Instruction (3.0 cr)
- CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)
- CI 8131 - Curriculum and Instruction Core: Critical Examination of Curriculum in Context (3.0 cr)
- CI 8461 - Sociocultural Theory, Education, and Literacy (3.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
Plan A and Plan B requirements

Plan A
All Plan A students must take 10 thesis credits and 6 elective credits and one research methods course to be selected in consultation with advisor.

OLPD 8777 - Thesis Credits: Master’s (1.0 - 18.0 cr)

-OR-

Plan B
All Plan B students must take the MA Research Seminar and elective credits to be selected in consultation with advisor to reach required total of 30 credits.

OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)
Twin Cities Campus
Multicultural College Teaching and Learning Minor
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 178 Pillsbury Dr S E Minneapolis, MN 55455 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Organizational Leadership, Policy, and Development's (OLPD) graduate minor in multicultural college teaching and learning is designed for current University of Minnesota graduate students who want to study innovative strategies to increase access and success of diverse undergraduate students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
To obtain a minor, graduate students should work with the MCTL director of graduate studies (DGS) to map out coursework that will enhance their ability to teach in diverse postsecondary contexts.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Courses (Select 6 cr)
Coursework planned with MCTL director of graduate studies to total 6 credits.
CI 5105 - Increasing Access and Success in Undergraduate Classrooms (3.0 cr)
CI 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
CI 5116 - Action Research in Educational Settings (3.0 cr)
OLPD 5712 - Multicultural Theories of College Student Development Applied to Teaching and Learning (3.0 cr)

Doctoral
Courses (12 cr)
Coursework planned with MCTL director of graduate studies to total 12 credits.

CI 5105 - Increasing Access and Success in Undergraduate Classrooms (3.0 cr)
CI 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
CI 5116 - Action Research in Educational Settings (3.0 cr)
OLPD 5712 - Multicultural Theories of College Student Development Applied to Teaching and Learning (3.0 cr)
Twin Cities Campus
Multimedia Design and Development Postbaccalaureate Certificate
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://www.cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: T E L: Multimedia Design & Dev PBacc Cert Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This certificate program in multimedia design and development prepares students to use technology (computers and the Internet) to develop instructional materials for use in a wide range of educational and training contexts (note that a university certificate program or certificate is distinct from a state certificate or certification).

The program is designed for K-12 teachers, higher education instructors, corporate trainers, and other professionals interested in using technology to support instruction.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preffered undergraduate GPA for admittance to the program is 2.80.

A completed bachelor's degree is required for admission.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a one page goal statement. Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Courses (12 credits)
Take 4 or more course(s) totaling 12 or more credit(s) from the following:

- CI 5336 - Planning for Multimedia Design and Development (3.0 cr)
- CI 5362 - Foundations of Interactive Design for Web-based Learning (3.0 cr)
- CI 5363 - New Media and Interaction Design for Online and Mobile Learning (3.0 cr)
- CI 5365 - Contemporary Software Development Issues and Tools (3.0 cr)
- CI 5367 - Interactive Multimedia Instruction (3.0 cr)
Twin Cities Campus
Online Distance Learning Postbaccalaureate Certificate
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, 125 Peik Hall, 159 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Online Distance Learning Postbaccalaureate Cert.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The online distance learning certificate is designed to prepare educators and other professionals to design and deliver distance learning opportunities in academic or business settings (note that a university certificate program or certificate is distinct from a state certificate or certification). Technology experience is not required, and courses are designed for learners with a wide range of experience.

This 12-credit certificate program will prepare students to successfully design, develop, and deliver curriculum on the Internet; use interactive online media; and create online learning communities for business and K-12 and postsecondary schools. As schools and businesses embrace online education, a variety of instructional design guidelines and pedagogical approaches have been developed to effectively guide online education and enhance learning.

Goals of the distance learning certificate include:
- Developing knowledge and skills in the best practices for designing and delivering online distance learning
- Engaging with current research about distance learning, current practices, and learning theory
- Providing opportunities to practice designing, developing, and delivering online distance learning
- Creating learning communities where students can reflect on their own teaching, reading, designing, and writing
- Allowing students to learn from each other

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A completed bachelor's degree is required for admission.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn't earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, and a one page goal statement. Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
MELAB
- Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Courses (12 credits)
CI 5321 - Foundations of Distance Education (3.0 cr)
CI 5323 - Online Learning Communities (3.0 cr)
CI 5325 - Designing and Developing Online Distance Learning (3.0 cr)
CI 5327 - Designing Online Adventure Learning (3.0 cr)
Twin Cities Campus
Organizational Leadership, Policy, and Development Ed.D.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 58 to 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Admission to the Education Policy and Leadership track, the Higher Education track, and the Human Resource Development track of the Ed.D. are currently suspended.

The Department of Organizational Leadership, Policy, and Development is a leader in advancing knowledge about educational and organizational change in local, national, and international contexts. Its research, teaching, and outreach reflect a commitment to interdisciplinary and intercultural engagement with educators, scholars, and policy makers seeking to enhance leadership, policy, and development around the globe. Students in the EdD programs choose from one of three complementary but distinct program tracks: education policy and leadership (EPL), higher education (HE), and human resource development (HRD). The department offers M.A. and Ph.D. degrees in the tracks mentioned above, as well as comparative and international development education (CIDE) and evaluation studies (ES). Undergraduate programs focus on human resource development and business and marketing education. In addition, the department offers a variety of programs for practicing professionals and various licensure programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A master's degree is required. The preferred graduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
Applicants must submit scores from the General Test of the GRE, two letters of recommendation from persons familiar with their scholarship and research potential, a complete set of academic transcripts, and a current résumé, as well as answer required essay questions via the University's online application system. International students must also submit a TOEFL or IELTS score. Unofficial GRE scores, transcripts, and TOEFL/IELTS score may be submitted via the online application for admission review purposes only. Admitted students must submit official GRE scores (as applicable), transcripts (sent directly from institution[s]), and TOEFL/IELTS scores (as applicable) to the University as a condition of any admission offer. Applicants to the international cohorts should have at least three years of experience in international education.

Special Application Requirements:
Admission to the Education Policy and Leadership track, the Higher Education track, and the Human Resource Development track of the Ed.D. are currently suspended.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
Program Requirements
34 credits are required in the major.
12 to 14 credits are required outside the major.
12 to 24 thesis credits are required.
This program may not be completed with a minor.
Use of 4xxx courses towards program requirements is not permitted.
A minimum GPA of 3.00 is required for students to remain in good standing.
The doctor of education (Ed.D.) is a professionally oriented degree program for those who will provide leadership in educational institutions and work and community education environments. Students combine study and related experiences to develop, apply, analyze, synthesize, and evaluate knowledge of the purposes, practices, issues, and problems of their program area. The Ed.D. is offered in 3 OLPD tracks: EPL (pre-K-12 schools), higher education and HRD. Cohorts for the EPL and higher education tracks include those in the metropolitan area, out state Minnesota, and international schools. Those two Ed.D. degree tracks are offered only in the context of cohort programs of 20-30 students each. All Ed.D. cohort programs include department core courses, program core courses, inquiry and research courses, supporting program or minor, and field research project credits. Through courses, seminars, and independent study, students learn to apply the products of disciplined inquiry to educational policy issues and practical situations in various educational environments and conduct types of research that contribute and/or apply that knowledge to the specialization. Within the overall framework (some credits may be brought in from previous graduate work), specific course requirements are developed for each program area and cohort when applicable. See the department website for requirements in specific cohorts. Preliminary written and oral exams are required. Students must complete a professional field project that contributes to the improvement of policy or practice.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Education Policy and Leadership
The EPL EdD track is not accepting new students at this time. Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.

Higher Education
The higher education EdD track is not accepting new students at this time. Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.

Human Resource Development
The HRD EdD track is not accepting new students at this time. Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.

Research Courses
Students should consult with advisers about the appropriate time to register for each course.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
a 3 credit statistics course to be determined by student and adviser (3 cr inside or outside department)
a qualitative course to be determined by student and adviser (3 cr; inside or outside department)
a quantitative course to be determined by student and adviser (3 cr inside or outside department)
OLPD 8890 - Research Seminar (1.0 cr)
Additional Rsch Course
a 3 credits qualitative course taken with adviser approval
    or OLPD 8812 - Quantitative Research in Education (3.0 cr)
Skills and Special Topics
19 credits minimum. OLPD 8011 must be taken during the first year of the program.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)
18 credits of HRD elective coursework jointly determined by student and adviser based around the student's professional role
Specialization
Must total 12 credits.
A 3 credit OLPD 8xxx level theory seminar course as determined by the adviser
9 additional credits of appropriate coursework as determined by the faculty adviser

Rochester
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

Same as general program description.

This sub-plan is not accepting new students.
Twin Cities Campus
Organizational Leadership, Policy, and Development M.A.
Organizational Leadership, Policy and Development
College of Education and Human Development
Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Organizational Leadership, Policy, and Development is a leader in advancing knowledge about educational and organizational change in local, national, and international contexts. Our research, teaching, and outreach reflect a commitment to interdisciplinary and intercultural engagement with educators, scholars, and policy makers seeking to enhance leadership, policy, and development around the globe. Students in the MA and PhD programs choose from one of five complementary but distinct program tracks: education policy and leadership (EPL), evaluation studies (ES), higher education (HE), comparative and international development education (CIDE), and human resource development (HRD). Our undergraduate programs focus on human resource development and business and marketing education. In addition, the department offers a variety of programs for practicing professionals and various licensure programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE, two letters of recommendation from persons familiar with their scholarship and research potential, transcripts, a current résumé, and answer to two essay questions found within the University's online application. The GRE is not required for EPL and MCTL M.A. applicants but is required for application to other M.A. program tracks (CIDE, ES, HE, and HRD). International students must also submit a TOEFL or IELTS score, but international applicants to the M.A. program are exempt from the GRE. All applications for admission are reviewed once a year. All new students begin in fall semester unless permission to start earlier is granted by the track coordinator. The annual deadline is February 1 for the two-year MA program. The annual deadline is February 1 for one-year MA program options (not available for the HRD or MCTL tracks).

Letters of recommendation, résumé, essays, and other department application materials are submitted via the University online application system. Unofficial GRE scores, transcripts, and TOEFL/IELTS score may also be submitted via the online application for admission review purposes only. Admitted students must submit official GRE scores (as applicable), transcripts (sent directly from institution[s]), and TOEFL/IELTS scores (as applicable) to the University as a condition of any admission offer.

Applicants must have completed appropriate undergraduate and graduate study. In some cases, where previous coursework or degrees are marginally related, otherwise qualified applicants will be asked to complete additional background courses after admission. Applications are encouraged from individuals who may have completed undergraduate and/or master's programs in social science, liberal arts, public affairs, and business fields. The department offers study opportunities for professionals who are employed full time as well as for those who wish to pursue graduate studies full time.

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

**IELTS**
- Total Score: 6.5
**MELAB**
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A**: Plan A requires 15 to 26 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 24 to 28 major credits and 6 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Comparative and International Development Education**

**Plan A**
Total Plan A CIDE Credits: 34 credits

**Plan A or Plan B**

**Plan A**
Total Plan A CIDE Credits: 34 credits

**Program Core**
Offered only in the fall term and normally taken during the year in which the student is writing the masters thesis. Student must take 3 credits of OLPD 5087

**OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)**

**Program Specialization**
Select one of the specializations below and choose two of its three core courses.

**Comparative and international development education**

**OLPD 5103 - Comparative Education (3.0 cr)**
**OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)**
**OLPD 5121 - Educational Reform in International Context (3.0 cr)**

**or Intercultural/international education**

**OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)**
**OLPD 5124 - Critical Issues in International Education and Educational Exchange (3.0 cr)**
**OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)**

**Research Design and Methods**
3 credits to be selected in consultation with advisor.

**Related Fields (6 cr outside CIDE)**
The master's degree requires 6 semester credits taken outside the CIDE program track that directly relate to the student's area of study. These credits should be selected in consultation with the advisor and should constitute a solid coursework foundation for the student's thesis. These courses may include additional methods courses taught outside the department.

**Electives**
Take 6 or more credit(s) from the following list with advisor approval as needed to reach 34 credits total in the program:
Note: 8xxx courses should be taken only with the consent of the instructor.

OLPD 5044 - Introduction to the Economics of Education (3.0 cr)

or
OLPD 5056 - Case Studies for Policy Research (3.0 cr)

or
OLPD 5061 - Ethnographic Research Methods (3.0 cr)

or
OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)

or
OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

or
OLPD 5107 - Gender, Education, and International Development (3.0 cr)

or
OLPD 5128 - Anthropology of Education (3.0 cr)

or
OLPD 8022 - Education and Globalization: Anthropological Perspectives (3.0 cr)

or
OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

or
OLPD 8101 - International Education and Development (3.0 cr)

or
OLPD 8103 - Comparative Education (3.0 cr)

or
OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)

or
OLPD 8302 - Educational Policy Perspectives (3.0 cr)

Thesis Credits
Take 10 or more credit(s) from the following:

OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Total Plan B CIDE Credits: 30 credits

Program Core
This is a course (OLPD 5087) or an independent study under the adviser (OLPD 5095) to prepare Plan B paper. Students pursuing the degree as a one-year program must take a total of 6 cr of OLPD 5087 over 3 semesters (three of those credits will count towards the electives requirement). Students pursing the degree as a two-year program must take a minimum of 3 credits of OLPD 5087 or OLPD 5095.

OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)

or
OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Program Specializations
Select one of the specializations below and choose two of its three core courses.

Comparative and international development education

OLPD 5103 - Comparative Education (3.0 cr)

OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)

OLPD 5121 - Educational Reform in International Context (3.0 cr)

or
Intercultural/international education

OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)

OLPD 5124 - Critical Issues in International Education and Educational Exchange (3.0 cr)

OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)

Research Design and Methods

3 credits to be selected in consultation with advisor.

Electives
Take 12 or more credit(s) from the following list with advisor approval as needed to reach 30 credits total in the program:

OLPD 5044 - Introduction to the Economics of Education (3.0 cr)

or
OLPD 5056 - Case Studies for Policy Research (3.0 cr)

or
OLPD 5061 - Ethnographic Research Methods (3.0 cr)

or
OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)

or
OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

or
OLPD 5107 - Gender, Education, and International Development (3.0 cr)

or
OLPD 5128 - Anthropology of Education (3.0 cr)

or
OLPD 8022 - Education and Globalization: Anthropological Perspectives (3.0 cr)

or
OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

or
OLPD 8101 - International Education and Development (3.0 cr)

or
OLPD 8103 - Comparative Education (3.0 cr)

or
OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)

or
OLPD 8302 - Educational Policy Perspectives (3.0 cr)

Related Fields (6 cr outside CIDE)
The master's degree requires 6 semester credits taken outside the CIDE program track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor and should constitute a solid coursework foundation for the student's thesis. These courses may include additional methods courses taught outside the department.

Education Policy and Leadership
Plan A or Plan B

Plan A

Program Core (Minimum 6 cr)
Take from the following including subgroup 1:
- OLPD 5041 - Sociology of Education (3.0 cr)
  - OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
  - OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
  - OLPD 5344 - School Law (3.0 cr)
  - OLPD 5364 - Context and Practice of Educational Leadership (3.0 cr)
  - OLPD 8302 - Educational Policy Perspectives (3.0 cr)
  - Subgroup 1
    Take OLPD 5001 if it is being offered or one of the two alternatives if OLPD 5001 is not being offered. Note: OLPD 5011 should be taken only with advisor approval.
    - OLPD 5001 - Formal Organizations in Education (3.0 cr)
    - OLPD 5011 - Leading Organizational Change: Theory and Practice (3.0 cr)
    - OLPD 5607 - Organization Development (3.0 cr)

Research Design and Methods (6 cr)
Selected in consultation with advisor.

Related Fields (6 cr outside EPL)
The master's degree requires 6 credits taken outside of the EPL program track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor.

Electives (2-8 cr)
Selected in consultation with advisor.

Thesis Credits (10 cr)
OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Research Project
Plan A students will develop and carry out an empirical research project under the supervision of their advisor.

Total = 30 - 36 credits

-OR-

Plan B

Required Coursework (Minimum 6 cr)
Take a minimum of 6 credits from the following including subgroup 1:
- OLPD 5607 - Organization Development (3.0 cr)
  - OLPD 8302 - Educational Policy Perspectives (3.0 cr)
  - Subgroup 1
    Take OLPD 5001 if it is being offered or the alternative if OLPD 5001 is not being offered. Note OLPD 5011 should only be taken with advisor approval.
    - OLPD 5001 - Formal Organizations in Education (3.0 cr)
    - OLPD 5011 - Leading Organizational Change: Theory and Practice (3.0 cr)

Program Core (6 cr)
Choose one course from each of the following two areas:

Leadership courses
Choose one of the following:
- OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
  - OLPD 5364 - Context and Practice of Educational Leadership (3.0 cr)

Other Coursework
Choose one of the following:
- OLPD 5041 - Sociology of Education (3.0 cr)
  - OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
  - OLPD 5128 - Anthropology of Education (3.0 cr)
  - OLPD 5324 - Strategic Financial Planning and Policy for Educational Leaders (3.0 cr)
  - OLPD 5344 - School Law (3.0 cr)
  - OLPD 5346 - Politics of Education (3.0 cr)

Research Design and Methods (3 cr)
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

Related Fields (6 cr outside EPL)
6 additional credits outside of the EPL program track, selected in consultation with advisor. These usually include additional courses from the program core or other OLPD courses.

Electives (3-8 cr)
Selected in consultation with advisor to meet required 30-32 total credit requirement for this track.

Colloquium Paper (3-6)
Students prepare a paper on an issue of relevance in school administration or revise and expand three course papers. Total of 120
hours of work required. Students in the two-year program must take 3 or more credits of OLPD 5095. Students in the one-year program must take a total of 6 cr of OLPD 5087 or OLPD 5095 over 3 semesters with advisor approval (three of those credits will count towards the electives requirement).

OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)
or OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Evaluation Studies

Plan A or Plan B

Plan A
Total Plan A ES Credits: 31-32 credits

Program Core (6 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5502 - Theory and Models of Evaluation (3.0 cr)

or OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

Research Design and Methods (Minimum 6 cr)
Two qualitative methods courses selected in consultation with advisor for a minimum of 6 credits.

Related Fields (6 cr outside ES)
The master's degree requires 6 semester credits taken outside the ES program track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor. These courses may include additional methods courses taught outside the department such as:
- EPSY 5261- Introductory Statistical Methods (3 cr) or comparable stats course required
- One additional EPSY measurement or methods course

Electives (Minimum 3 cr)
At least 3 cr selected in consultation with advisor to meet required 31-32 total credit requirement.

Thesis Credits (10 cr)
- OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Total Plan B ES Credits: 30-32 credits

Program Core (9 credits)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
- OLPD 5502 - Theory and Models of Evaluation (3.0 cr)

or OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

Research Design and Methods (Minimum 6 cr)
Two qualitative methods courses selected in consultation with advisor.

Related Fields (6 cr outside ES)
The master's degree requires 6 semester credits taken outside the ES program track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor and should constitute a solid coursework foundation for the student's thesis.

Electives (6-7 cr)
Coursework related to the student's specialization, selected in consultation with the advisor. This will total 6-7 credits for students in the one-year or two-year program. These may be OLPD or outside courses.

Colloquium Paper (3-6 cr)
Total of 120 hours of work required. Students in the two-year program must take 3 or more credits of OLPD 5095. Students in the one-year program must take a total of 6 cr of OLPD 5087 or OLPD 5095 over 3 semesters with advisor approval (three of those credits will count towards the electives requirement).

OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)
or OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Higher Education

Plan A or Plan B

Plan A
Total Plan A HE Credits: 34 credits

Required Coursework (6 cr)
- OLPD 5701 - U.S. Higher Education (3.0 cr)
- OLPD 5709 - Critical Issues in Higher Education (3.0 cr)

Program Area (9 cr minimum)
From the following with advisor consultation and approval. Other courses as offered by HE program track faculty may also meet this requirement.
OLPD 5001 - Formal Organizations in Education (3.0 cr)
or OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
or OLPD 5704 - College Students Today (3.0 cr)
or OLPD 5721 - Race and Ethnicity in Higher Education (3.0 cr)
or OLPD 5724 - Leadership and Administration of Student Affairs (2.0 - 3.0 cr)
or OLPD 5732 - The Law and Postsecondary Institutions (3.0 cr)
or OLPD 5734 - Institutional Research in Postsecondary Education (2.0 - 3.0 cr)
or OLPD 5736 - Public Engagement and Higher Education (3.0 cr)

Related Fields (6 cr outside HE)
The master's degree requires 6 semester credits taken outside the HE program track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor and should constitute a solid coursework foundation for the student's thesis. These courses may include additional methods courses taught outside the department.

Research Design and Methods (3 cr minimum)
Select courses in consultation with their advisor.
CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
or EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 5261 - Introductory Statistical Methods (3.0 cr)
or EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
or OLPD 5056 - Case Studies for Policy Research (3.0 cr)
or OLPD 5061 - Ethnographic Research Methods (3.0 cr)
or OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
or OLPD 8812 - Quantitative Research in Education (3.0 cr)
or CI 5116 - Action Research in Educational Settings (3.0 cr)

Thesis Credits (10 cr)
Take 10 or more credit(s) from the following:
OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Total Plan B HE Credits: 30 credits

Required Coursework (6 cr)
OLPD 5701 - U.S. Higher Education (3.0 cr)
OLPD 5709 - Critical Issues in Higher Education (3.0 cr)

Program Area (12 cr minimum)
Selected from the following with advisor consultation and approval. Other courses as offered by HE program track faculty may also meet this requirement.
OLPD 5001 - Formal Organizations in Education (3.0 cr)
or OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
or OLPD 5704 - College Students Today (3.0 cr)
or OLPD 5721 - Race and Ethnicity in Higher Education (3.0 cr)
or OLPD 5724 - Leadership and Administration of Student Affairs (2.0 - 3.0 cr)
or OLPD 5732 - The Law and Postsecondary Institutions (3.0 cr)
or OLPD 5734 - Institutional Research in Postsecondary Education (2.0 - 3.0 cr)
or OLPD 5736 - Public Engagement and Higher Education (3.0 cr)

Related Fields (6 cr)
The master's degree requires 6 semester credits taken outside the HE track that directly relate to the student's area of study. These courses should be selected in consultation with the advisor and should constitute a solid coursework foundation for the student's thesis. These courses may include additional methods courses taught outside the department.

Methods Course (3 cr minimum)
Select courses in consultation with advisor for a minimum of 3 credits. It is strongly recommended that students in the one year program take a methods course with a course designator other than OLPD.
CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
or EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 5261 - Introductory Statistical Methods (3.0 cr)
or EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
or OLPD 5056 - Case Studies for Policy Research (3.0 cr)
or OLPD 5061 - Ethnographic Research Methods (3.0 cr)
or OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
or OLPD 8812 - Quantitative Research in Education (3.0 cr)
or CI 5116 - Action Research in Educational Settings (3.0 cr)

Colloquium Paper (3 - 6 cr)
Plan B paper is prepared under the guidance of advisor and committee. The final paper must represent no fewer than 120 hours of work. Students in the two-year program must take 3 or more credits of OLPD 5087 or 5795. Students in the one-year program must
take a total of 6 cr of OLPD 5087 or OLPD 5795 over 3 semesters with advisor approval (three of those credits will count toward the related fields requirement).

OLPD 5087 - MA Research Seminar (1.0 - 3.0 cr)
or OLPD 5795 - Plan B Research Design (3.0 cr)

Human Resource Development

Plan A or Plan B

Plan A
The masters degree requires 6 credits taken outside the program track that directly relate to the students area of study. Courses totaling 6+ credits should be selected in consultation with the advisor. These courses may include additional methods courses taught outside the department.

General Aspects (3 cr)
OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)

Research (7 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)
OLPD 8815 - Ethics and Responsible Research (1.0 cr)
an 8xxx qualitative or quantitative research course (3 cr)

Program Core (16 cr minimum)
Student must take 4 credits of OLPD 5696. Advisor can substitute courses as appropriate.
OLPD 5605 - Strategic Planning through Human Resources (3.0 cr)
OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
OLPD 5615 - Training and Development of Human Resources (3.0 cr)
OLPD 5667 - Organization Development (3.0 cr)
OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

Thesis Credits (10 cr)
OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Electives
Credits to total a minimum of 36 graduate-level coursework credits
Total = 36 cr

OR

Plan B
The masters degree requires 6 credits taken outside the program track that directly relate to the students area of study. Courses totaling 6+ credits should be selected in consultation with the advisor. These courses may include additional methods courses taught outside the department.

General Aspects (3 cr)
OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)

Research (7 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)
OLPD 8815 - Ethics and Responsible Research (1.0 cr)
an 8xxx qualitative or quantitative research course (3 cr)

Program Core (16 cr minimum)
Student must take 4 credits of OLPD 5696. Advisor can substitute courses as appropriate.
OLPD 5605 - Strategic Planning through Human Resources (3.0 cr)
OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
OLPD 5615 - Training and Development of Human Resources (3.0 cr)
OLPD 5667 - Organization Development (3.0 cr)
OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

Plan B Project Paper (3 - 6 cr)
Plan B project/paper is prepared under the guidance of advisor & committee - must represent no fewer than 120 hours of work. Students should register for between 3-6 credits
OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Electives
With approval of advisor as needed to total a minimum of 34 graduate-level coursework credits overall for this plan.
Total = 34 cr
Twin Cities Campus
Organizational Leadership, Policy, and Development Ph.D.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
The Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 70 to 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Organizational Leadership, Policy, and Development is a leader in advancing knowledge about educational and organizational change in local, national, and international contexts. Its research, teaching, and outreach reflect a commitment to interdisciplinary and intercultural engagement with educators, scholars, and policy makers seeking to enhance leadership, policy, and development around the globe. Students in the MA and PhD programs choose from one of five complementary but distinct program tracks: education policy and leadership (EPL), evaluation studies (ES), higher education (HE), comparative and international development education (CIDE), and human resource development (HRD). Undergraduate programs focus on human resource development and business and marketing education. In addition, the department offers a variety of programs for practicing professionals and various licensure programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have completed appropriate undergraduate and graduate study. In some cases, where previous coursework or degrees are marginally related, otherwise qualified applicants will be asked to complete additional background courses after admission. Applications are encouraged from individuals who may have completed undergraduate and/or master's programs in social science, liberal arts, business, and education fields. The department offers study opportunities for professionals who are employed full-time, as well as for those who wish to pursue graduate studies full-time.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE, two letters of recommendation from persons familiar with their scholarship and research potential, a complete set of academic transcripts, and a current résumé; as well as answer required essay questions via the University online application system. Unofficial GRE scores, transcripts, and TOEFL/IELTS score may be submitted via the online application for admission review purposes only. Admitted students must submit official GRE scores (as applicable), transcripts (sent directly from institution[s]), and TOEFL/IELTS scores (as applicable) to the University as a condition of any admission offer.

The GRE is required for all tracks in the doctoral degree programs (Ed.D. and Ph.D.). International students must also submit a TOEFL or IELTS score. All applications for admission are reviewed once per year for Fall admission. Submission of all application materials for all tracks by December 1 is strongly encouraged to ensure priority consideration for assistantships awarded for the next academic year. All new students begin in fall semester unless special permission to start earlier is granted by the program coordinator.

International applicants must submit score(s) from one of the following tests:
- TOEFL
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
30 to 48 credits are required in the major.
0 to 18 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Credits required by the major vary by track. The PhD is available in five program tracks: education policy and leadership, evaluation studies, higher education, comparative and international development education, and human resource development. All PhD programs include 16 credits in department core courses (which include 15 credits of research methodology courses), 18 or more credits in program core courses, 12-14 credits program approved electives, and 24 thesis credits. The minimum total of course credits varies by track (see the student handbook on the department website for details). Preliminary written and oral exams are required. Students must complete a dissertation. Within the general framework for PhD requirements, the degree program is developed by the student and his or her advisor and is subject to approval by the department's director of Graduate Studies and the University.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Comparative and International Development Education
The doctor of philosophy (PhD) degree with a program emphasis in comparative and international development education (CIDE) is offered by the Department of Organizational Leadership, Policy, and Development (OLPD). CIDE uses an interdisciplinary approach to the study of education's role in economic, political, and sociocultural development; international educational exchange; and the internationalization of education. The two specializations within CIDE are comparative and international development education and intercultural/international education.

Department Core (16 cr)
Professional socialization seminar
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)
Research courses
Take OLPD 8015 spring term of first year.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
Quantitative course to be determined by student and adviser (3 cr in or outside of department)
Qualitative course to be determined by student and adviser (3 cr in or outside of department)
8 credits of additional methods courses to be determined by student and adviser (in or outside of department)

Doctoral Seminars in CIDE (6 cr)
Students take 6 credits; 2 credits in each of 3 semesters starting in the spring term of the first year in the program; course numbers are listed as OLPD 8121, section 002; OLPD 8121, section 003; and OLPD 8121, section 004.

Specialization Courses (6 cr minimum)
Students choose two courses, with a minimum of one 8xxx course for specializations. Any specialization core course not being used as core class can become a CIDE elective.

Comparative and International Development Education
Take 6 or more credit(s) from the following:
OLPD 5103 - Comparative Education (3.0 cr)
or OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
or OLPD 5121 - Educational Reform in International Context (3.0 cr)
or OLPD 8101 - International Education and Development (3.0 cr)
or OLPD 8103 - Comparative Education (3.0 cr)

Intercultural/international education
Take 6 or more credit(s) from the following:
OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
or OLPD 5124 - Critical Issues in International Education and Educational Exchange (3.0 cr)
or OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
or OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

CIDE Elective Courses (8 cr minimum)
OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
or OLPD 5056 - Case Studies for Policy Research (3.0 cr)
or OLPD 5061 - Ethnographic Research Methods (3.0 cr)
or OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
or OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
or OLPD 5107 - Gender, Education, and International Development (3.0 cr)
or OLPD 5128 - Anthropology of Education (3.0 cr)
or OLPD 8022 - Education and Globalization: Anthropological Perspectives (3.0 cr)
or OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
or OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)
or OLPD 8302 - Educational Policy Perspectives (3.0 cr)

Additional Coursework (12 cr minimum)
These credits can be used to meet the requirement that a minimum of 12 credits be taken outside the CIDE track or for a minor. Courses not specifically listed should have advisor approval.

Education Policy and Leadership
The doctor of philosophy (PhD) degree with a program emphasis in education policy and leadership (EPL) provides an opportunity for intensive study of the field of education. It is especially suitable for students who wish to pursue careers in policy, research, or college and university teaching. It is also available to students who are interested in careers in school, district, and statewide administration, though it is more theory and research-oriented than the doctorate of education (Ed.D.) degree, which is also offered by OLPD. Educational administration offers coursework and research opportunities for those interested in making a difference in educational systems and settings that involve PreK-12 children and youth. The program is committed to supporting the development of leaders and scholars who work to continuously improve educational quality and effectiveness so that young people graduate from secondary education well prepared to continue their learning and to contribute to their communities. The program promotes understanding of schools as organizations and emphasizes application of knowledge and research to varied contexts of educational practice.

Department Core (16 cr)
Professional socialization seminar
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)
Research courses
Take OLPD 8015 spring term of first year.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
3 credit quantitative course (in or outside of department) in consultation with adviser
3 credit qualitative course (in or outside of department) in consultation with adviser
6 credits of additional methods courses in consultation with adviser

Program Core: Education Policy and Leadership (18 cr)
OLPD 5346 - Politics of Education (3.0 cr)
OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)
OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)
OLPD 8302 - Educational Policy Perspectives (3.0 cr)
Subgroup 1
Take OLPD 5001 if it is being offered or one of the two alternatives if OLPD 5001 is not being offered.
OLPD 5001 - Formal Organizations in Education (3.0 cr)
or OLPD 5011 - Leading Organizational Change: Theory and Practice (3.0 cr)
or OLPD 5607 - Organization Development (3.0 cr)
OLPD Electives (Minimum 3 cr)
Electives selected with approval of advisor.

Additional Coursework (12 cr minimum)
These credits can be used to meet the requirement that a minimum of 12 credits be taken outside the EPL track or for a minor. Courses not specifically listed should have advisor approval. Students who have successfully completed enrollment in the University of Minnesota's Principals Academy may use transfer credits to fulfill this requirement.
Evaluation Studies
The doctor of philosophy (PhD) degree with a program emphasis in evaluation studies (ES) provides an opportunity for intensive study of the techniques and process of evaluation and policy research and of the social and political context within which program evaluation occurs. Graduates leave with a portfolio filled with evidence of their expertise with the tools of the evaluation trade—qualitative and quantitative inquiry methods, communication skills, and computer database analysis experience. Evaluation knowledge and skills are gleaned not only from time in the classroom but also from internships and collaboration with evaluation professionals in real-world settings. Evaluation studies students have access to some of the best evaluators in the field.

Department Core (16 cr)
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

Research Courses
Take OLPD 8015 spring term of first year.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
3 credit quantitative course (in or outside of department) in consultation with adviser
3 credit qualitative course (in or outside of department) in consultation with adviser
6 credits of additional methods courses in consultation with adviser

Program Core: Evaluation Studies (15 cr)
Student must take OLPD 8595 for 3 credits. Student must take OLPD 8596 twice in two different semesters for 3 credits each time.
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
OLPD 8595 - Evaluation Problems (1.0 - 6.0 cr)
OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)

Additional Coursework (17 cr minimum)
These credits can be used to meet the requirement that a minimum of 12 credits be taken outside the ES track or for a minor. Courses not specifically listed should have advisor approval.

Higher Education
The doctor of philosophy (PhD) degree with a program emphasis in higher education (HIED) provides an opportunity for intensive study of the policies and organizational issues in higher education institutions and systems. HIED focuses on the experiences, practices, and decisions of those involved in postsecondary education, as well as on the sociopolitical contexts in which higher education exists. Areas of specialization include administration and organization, policy, college students, external relations, equity-oriented change, and research integrity.

Department Core (16 cr)
Professional socialization seminar
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

Research Design and Methods
Take OLPD 8015 spring term of first year.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
3 credit quantitative course (in or outside of department) in consultation with adviser
3 credit qualitative course (in or outside of department) in consultation with adviser
6 credits of additional methods courses in consultation with adviser

Program Core: Higher Education (12 cr)
OLPD 5701 - U.S. Higher Education (3.0 cr)
OLPD 5704 - College Students Today (3.0 cr)
OLPD 8702 - Administration and Leadership in Higher Education (3.0 cr)
OLPD 8703 - Public Policy in Higher Education (3.0 cr)

Electives (9 cr)
Focused on issues relevant to the HE track with advisor approval.

Additional Coursework (11 cr minimum)
These credits can be used to meet the requirement that a minimum of 12 credits be taken outside the HE track or for a minor. Courses not specifically listed should have advisor approval.

Human Resource Development
The doctor of philosophy (PhD) degree with a program emphasis in human resource development (HRD) is offered by the Department of Organizational Leadership, Policy, and Development (OLPD). Students in HRD combine study and related experiences to develop, apply, analyze, synthesize, and evaluate knowledge of the purposes, practices, issues, and problems of work and community education; social, economic, historical, political, cultural, educational, technological, and psychological contexts within which work and community education exist; and types of research that contribute to or apply that knowledge to the specialization.

Department Core (16 cr)
Professional socialization seminar
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

Dept Research Courses
Take OLPD 8015 spring term of first year.
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
3 credit quantitative foundations course (in or outside of department) in consultation with adviser
3 credit qualitative foundations course (in or outside of department) in consultation with adviser
6 credits of additional methods courses in consultation with adviser

Specialization (9 cr)
Courses must have advisor approval.
One 8xxx level theory seminar (3 cr)
2 or 3 8xxx level seminars offered by various HRD faculty (2-3 credits each for a total of 6 cr)

Additional Research Courses (9 cr)
In addition to the research/methodology courses mentioned in the department core, the following are required for students in HRD:
- 3 credit statistics course selected in consultation with advisor
- The Capstone Research Experience Course (OLPD 8603) is offered every other year. When it is offered take six credits over two semesters, three credits to be taken in fall semester and three credits to be taken in spring semester. Is usually taken during the second year if student is full time.

OLPD 8603 - HRD Capstone Research Experience (3.0 cr)

Additional Coursework (14 cr minimum)
These credits can be used to meet the requirement that a minimum of 12 credits be taken outside the HRD track or for a minor. Courses not specifically listed should have advisor approval.
Parent Education Postbaccalaureate Certificate
Family Social Science
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Family Social Science, 290 McNeal Hall, 1985 Buford Avenue, St Paul MN 55108 (612-625-2705; fax: 612-625-4227)
Email: famed@umn.edu
Website: http://www.cehd.umn.edu/fsos/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 16
- This program requires summer semesters for timely completion.
- Degree: Parent Education PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The parent education certificate program is designed to prepare professionals to plan, coordinate, and teach parent education programs and services for families with children from early childhood through adolescence.

The 16-credit program prepares professionals who are well qualified to deliver programs designed to address the intellectual, emotional, cultural, social, and physical needs of parents and children. In addition to educational settings that may include public-school parent education programs, preschools, child care centers, and Head Start programs, parent educators may also work in health care and social-service agencies and institutions, and faith-based settings.

Certificate courses are offered online. Online coursework is designed to meet the needs of local and distance learners in Minnesota, around the country and the world.

Students participate in live online chat sessions and weekly reflections with their course instructors. They interview parents, read the latest research, and view presentations by University of Minnesota faculty and noted experts in the field.

The capstone course (FSOS 5949 - Student Teaching in Parent Education) allows students to teach and interact with parents in a parent education setting under the supervision of a licensed or highly qualified parent educator approved by core faculty. This individualized student teaching allows each program participant to integrate and apply what they have learned to parent education experiences, preparing them for professional work in the field.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
Special Application Requirements:
Apply online at https://app.applyyourself.com/AYApplicantLogin/I1_ApplicantConnectLogin.asp?id=UMN-GRAD

For program specific application details see http://www.cehd.umn.edu/FSoS/programs/cert.asp

Complete the equivalent of six semester undergraduate or graduate credits in child development courses before entering the parent education certificate program, completed within 10 years of admission to the certificate program. If these credits have not been completed at the time of application, the applicant may be admitted conditionally until they are completed and recorded on a transcript. The following CEHD courses are examples of child development courses that may meet this requirement:

- CPSY 4302 - Infant Development
- CPSY 4331 - Social and Personality Development
- CPSY 4343 - Cognitive Development
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to [test abbreviations](TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Required Courses**

Note: FSOS 5943 through FSOS 5949 must be taken in the sequence listed. FSOS 5932, FSOS 5937, and FSOS 5942 can be taken in any sequence.

- **FSOS 5932** - Introduction to Parent Education (1.0 cr)
- **FSOS 5937** - Parent-Child Interaction (3.0 cr)
- **FSOS 5942** - Everyday Experiences of Families (2.0 cr)
- **FSOS 5943** - Parent Learning and Development: Implications for Parent Education (2.0 cr)
- **FSOS 5944** - Parent Education Curriculum (2.0 cr)
- **FSOS 5945** - Teaching and Learning in Parent Education (2.0 cr)
- **FSOS 5946** - Assessment and Evaluation in Parent Education (2.0 cr)
- **FSOS 5949** - Student Teaching in Parent Education (2.0 cr)
Twin Cities Campus
Physical Activity and Health M.Ed.
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The M.Ed. in physical activity and Health relates to the M.P.H. in community health promotion in the School of Public Health in the following ways:

1. The ultimate goals of the programs are to promote health and prevent chronic diseases;
2. Both programs study the distribution and determinants of health-related states or events in specified populations; and
3. Both programs adopt population-based interventions.

However, they are essentially different in that the M.P.H. in community health promotion focuses on designing community-based program and policy interventions that improved the health of communities while the proposed M.Ed. in physical activity and health focuses on applied training of physical activity professionals to increase physical activity in various populations.

There are limited prerequisites for this program. Students with a background in kinesiology, exercise science, public health, biology, and/or psychology will be able apply for the program. There is minimal overlap with the existing M.Ed. programs at School of Kinesiology and the existing M.P.H. programs at School of Public Health.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Kinesiology, exercise science, public health, biology, psychology

Master degree

Other requirements to be completed before admission:
There are no course requirements for admission except for a Bachelor degree and acceptance to the University of Minnesota Graduate School.

Special Application Requirements:
The School reviews applications on an ongoing basis. Application reviews for specific academic terms begin by the following dates:
  • November 1: spring semester admission
  • March 1: summer session admission
  • July 1: fall semester admission

Admission requirements for this program include the following criteria:
A bachelor's degree, preferably in kinesiology, exercise science, public health, biology, psychology, with a 3.0 minimum grade point average (GPA) from an accredited institution.

All applicants must submit the following items:
- Online application from Apply Yourself
- Application fee ($75 for U.S. applicants; $95 for international applicants)
- Unofficial transcripts of all previous post-secondary academic study must be downloaded to the application (official transcripts will be
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 26 major credits and 4 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** Students will enroll in 3 hrs of KIN 5995 Research Problems in Kinesiology to complete their Capstone project. The requirement is a literature review on a particular topic approved by their advisor. Below are the details for the literature review.

1. Research Question Development: (20% of Capstone grade)
2. Literature Review Matrix: (20% of Capstone grade)
3. Literature Review Final Draft: (60% of Capstone grade)

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

**Required Courses**

Students are required to take at least 9 credits in this category. Students need to take at least 3 credits of KIN 5995 after the majority of the coursework is completed.

KIN 5181 - Understanding Kinesiology Research (3.0 cr)
KIN 5125 - Advances in Physical Activity and Health (3.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)

**Selected Courses**

Students must take at least 21 credits for selected courses, of which a minimum of 17 credits from KIN and 4 credits from PUBH courses.

KIN 4385 - Exercise Physiology (4.0 cr)
KIN 5122 - Applied Exercise Physiology (3.0 cr)
KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
KIN 5202 - Current Issues in Health (2.0 cr)
KIN 5203 - Health Media, Consumerism, and Communication (2.0 cr)
KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)
PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)
PUBH 6074 - Mass Communication and Public Health (3.0 cr)
PUBH 6094 - Obesity and Eating Disorder Interventions (2.0 cr)
PUBH 6905 - Nutrition for Public Health Promotion and Disease Prevention (2.0 cr)
or PUBH 6914 - Community Nutrition Intervention (3.0 cr)
or PUBH 6950 - From Kid to Community: Personal, Social and Environmental Influences on Youth Obesity (2.0 cr)
Twin Cities Campus
PK-12 Administration Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Leadership, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455 (612-625-9087; fax: 612-624-3377)
Website: http://www.cehd.umn.edu/olpd/grad-programs/Adm-Licensure/default.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 22 to 23
- This program requires summer semesters for timely completion.
- Degree: PK-12 Administration PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Housed within the University of Minnesota’s Department of Organizational Leadership, Policy, and Development (OLPD), the PK-12 Administration certificate offers aspiring educational administrators an individualized program to prepare them for the following licenses:
- K-12 principal
- Superintendent
- Director of special education
- Director of community education

The PK-12 Administration certificate program offers a variety of courses specifically designed to address the competencies required by the state for the various licenses.

Accreditation
This program is accredited by Minnesota Board of School Administrators and the NCATE.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applications are reviewed on a rolling basis.

Please visit http://www.cehd.umn.edu/OLPD/apply/certificate/administrative-licensure/ for information about application process and related fees.

Applications to the doctoral and licensure programs are separate processes. Only three-credit licensure courses that have been approved by the candidate’s adviser may be counted toward an Ed.D. or Ph.D. If you are considering doing both the certificate and a doctoral program, contact our program office.

Please note: This program is not offered full-time and therefore is not intended for international students needing a visa to study in the United States.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Further requirements for K-12 principal, superintendent, or director of special education:
Possess or complete three years of teaching experience
60 credits beyond a bachelor's degree to include a graduate degree
320 hours of field experience

Further requirements for director of community education:
A bachelor's degree plus 20 credits
320 hours of field experience

Exit requirements
Complete all coursework with a grade of S or C or better.
An electronic portfolio presented to a review panel made up of representatives from the University and licensed practitioners is required as the last step to earning licensure.

Required for All Licenses

Note: OLPD 5391 is not required for the director of special education license. OLPD 5387 and 5391 are not required for the director of community education license.

- OLPD 5324 - Strategic Financial Planning and Policy for Educational Leaders (3.0 cr)
- OLPD 5344 - School Law (3.0 cr)
- OLPD 5348 - Leaders of Human Resources Administration (3.0 cr)
- OLPD 5385 - Licensure Seminar: Program Policies and Inclusionary Leadership (1.0 cr)
- OLPD 5386 - Leadership Portfolio Seminar (1.0 cr)
- OLPD 5387 - Leadership for Teaching and Learning (3.0 cr)
- OLPD 5391 - Special Education Law for Leaders (1.0 cr)

Licensure-Specific Course Requirements

K-12 principal
- OLPD 5321 - The Principal as Leader of High-Performing Schools (3.0 cr)
- OLPD 5388 - Leadership for Master(ful) Scheduling (2.0 cr)
- OLPD 5396 - Field Experience in PK-12 Administration: Authentic Practice in Leadership (3.0 cr)
  - OR -
Superintendent
- OLPD 5322 - Leaders in the Superintendency and Central Office (3.0 cr)
- OLPD 5393 - Leading School Finance Elections (1.0 cr)
- OLPD 5396 - Field Experience in PK-12 Administration: Authentic Practice in Leadership (3.0 cr)
  - OR -
Director of Special Education
- OLPD 5368 - Leadership for Special Education Services (3.0 cr)
- OLPD 5392 - Special Education Finance: Program Models, Policy, and Law (2.0 cr)
- OLPD 5396 - Field Experience in PK-12 Administration: Authentic Practice in Leadership (3.0 cr)
  - OR -
Director of Community Education

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Information current as of August 31, 2018
OLPD 5389 - Community Education Leadership (3.0 cr)
OLPD 5394 - Leadership in Community Education Finance and Law (1.0 cr)
OLPD 5396 - Field Experience in PK-12 Administration: Authentic Practice in Leadership (3.0 cr)

**Electives for Director of Community Education**

Plus credits in the following areas of emphasis dependent upon undergraduate coursework or work experience with advisor approval: undereducated adults; strategies for teaching adults; children, youth, in society; early childhood/family education.
Twin Cities Campus
Prevention Science Minor
Family Social Science
College of Education and Human Development

Link to a list of faculty for this program.

**Contact Information:**
Prevention Science Program, 290 McNeal Hall, 1985 Buford Avenue St Paul, MN 55108 (612-625-1900; fax: 612-625-4227)
Email: prevsci@umn.edu
Website: http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp) section of the catalog website for requirements that apply to all major fields.

Prevention science is defined for the purposes of this program as the scientific study of systematic efforts to reduce the incidence of unhealthy or maladaptive behavior, and to promote health and adaptive behavior in populations across the life span through designing and evaluating interventions, and utilizing knowledge about them more strategically.

The fundamental assumption of this free-standing minor is that future researchers and scholars will be most able to meet the challenges and changes occurring in society and in their chosen professions and disciplines if their training is comprehensive and transdisciplinary.

Prevention science is a rapidly expanding interdisciplinary field and this program will increase opportunities for the University's academic researchers to partner with communities to address the complex issues facing society.

Six areas of concentration will be offered. Students will be expected to select one as a major emphasis. Areas of concentration are: 1) promotion of mental health and well being across the life span; 2) interventions in education, health, and social services; 3) social policy; 4) family and community studies (early stage research, needs assessments, action research); 5) methodology; 6) individualized concentration.

For more information about these areas of concentration, visit [http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp](http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp)

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
- Students must have gained admission to a doctoral degree-granting program, and have prepared a minor program of coursework approved by the director of graduate studies in prevention science. Students are required to make formal application to the program.
- Doctoral students must apply prior to submitting their graduate degree program in the Graduate Planner and Audit System (GPAS) for approval. Instructions and form can be found at [http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp](http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp)

For an online application or for more information about graduate education admissions, see the [General Information](http://www.cehd.umn.edu/FSoS/programs/minor-ps.asp) section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

The doctoral minor is developed in consultation with, and should be approved in advance by, the director of graduate studies for prevention science.

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Information current as of August 31, 2018
The purpose of the minor is to provide students with interdisciplinary training in prevention science; therefore, all students will be required to fulfill the elective requirements for the minor by taking courses outside their major. Courses counting toward a student's major may not be counted toward the minor.

**Required Courses**
- PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)
  - or FSOS 5701 - Prevention Science: Principles and Practices (3.0 cr)
- PREV 8002 - Prevention Science Research Methodology (3.0 cr)
  - or FSOS 5702 - Prevention Science Research Methodology (3.0 cr)
- PREV 8003 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)
  - or FSOS 5703 - New Topics in Prevention: Implementation and Dissemination (3.0 cr)

**ELECTIVE**
- Elective course from area of concentration (3.0 cr)

**Program Sub-plans**
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Doctoral**
Twin Cities Campus

Private College Leadership Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development
University of Minnesota--Twin Cities
206 Burton Hall, 178 Pillsbury Dr. S.E.,
Univ of Minnesota, Minneapolis Mn, 55455
612-624-1006
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/default.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- For now the courses will be based on the UM Twin Cities campus.
- Degree: Private College Leadership PBacc Cer

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Private College Leadership Certificate is not accepting new students at this time.

Created for professionals who are in faculty positions or beginning levels of college administration, this graduate-level certificate offers specific knowledge and skills related to organizational development, leadership, entrepreneurship, and decision-making necessary for leading independent colleges. The Emerging Leaders in Independent Colleges curriculum is designed for individuals who seek to move into leadership positions but do not have formal training related to leadership and management of independent colleges.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited institution. The Private College Leadership Certificate is not accepting new students at this time.

Other requirements to be completed before admission:
Two years of experience in a professional position in higher education.

Special Application Requirements:
The Private College Leadership Certificate is not accepting new students at this time.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

The Private College Leadership Certificate is not accepting new students at this time.
Course List
Take exactly 4 course(s) totaling exactly 12 credit(s) from the following:
- OLPD 5002 - Private Colleges as Formal Organizations (3.0 cr)
- OLPD 5332 - Personal Leadership and the Private College (3.0 cr)
- OLPD 5845 - The Entrepreneurial Private College (3.0 cr)
- OLPD 5902 - Leading Change in Private Colleges (3.0 cr)
Twin Cities Campus
Professional Development Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. S.E., Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12 to 15
- This program does not require summer semesters for timely completion.
- Degree: Professional Development PBAcc Certificate Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The certificate in professional development is designed to prepare leaders in designing, implementing, and evaluating learning opportunities for preK-12 educators and related staff.

This 12- to 15-credit graduate-level program offers professional development opportunities for teachers, administrators, and others involved in school improvement initiatives. Throughout the program, students are required to reflect on their learning, make explicit connections between theory and practice, and design staff development processes and materials for use in their own work contexts.

Through the program, participants will:
Learn to apply research-based standards for staff development,
Be prepared for the multifaceted roles and competencies of staff developers,
Identify organizational and leadership capacities for effective staff development policies and practices,
Be able to articulate effective staff learning principles, designs, and strategies,
Evaluate staff development, including its effects on students, staff, and systems,
Learn to work effectively with groups, including both facilitation and training models of learning,
Identify and access staff development resources, including current research and best practices literature,
Gain awareness of individual strengths and areas for continuous improvement as a professional educator and leader of staff learning.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Special Application Requirements:
Admission to the professional development certificate is open to both degree-seeking or non-degree seeking students. Students may pursue the certificate alone or concurrently with a UM masters or doctoral degree. Applicants must have at least three years of experience working as education or related professionals in preK-12 education. Please note that this program is not offered full-time and therefore is not intended for international students needing a visa to study in the United States. Admission for this program is done on a rolling basis.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
A minimum GPA of 2.80 is required for students to remain in good standing.

**Required Courses**
- OLPD 5201 - Strategies for Teaching Adults (3.0 cr)
- OLPD 5374 - Leadership for Professional Development (4.0 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

**Additional Coursework**
- With certificate coordinator approval, students choose and complete 2-5 credits of coursework focusing on a topic that interests them.
- Students can complete this requirement in one of two ways.
- Independently designed study or project [OLPD 5095]
- Focused elective coursework

**Take 2 - 5 credit(s) from the following:**

**Independently designed study or project: OLPD 5095**
- OLPD 5095 Problems: OLPD (1-3 cr). Students submit a proposal for an independently designed study or project to the certificate coordinator for approval by submitting the Proposal for Independent Study or Project as Elective Option [PDF].
- Examples of independently designed studies or projects include:
  - Comprehensive site-level design for staff development, including learning, implementation, and evaluation components.

**Independently designed study or project: OLPD 5095 Cont’d**
- Evaluation of a current staff development or curricular initiative
- Internship focused on staff development research, policy, or practice with personnel in school districts, state departments, or higher education
- Individualized study or research review of a staff development-related topic
- Attendance at a national conference with documentation, reflection on learning, and specified follow-up application

**Focused elective coursework**
- In consultation with the certificate coordinator, students can choose elective coursework that aligns with individual interests and best practices in the staff development field. Students may choose from the wide range of offerings at the University of Minnesota, including coursework with the following course designators:
  - Curriculum and Instruction (CI)
  - Educational Psychology (EPSY)
  - Organizational Leadership, Policy, and Development (OLPD)
  - Public Affairs (PA)
  - Sociology (SOC)

**Please Note:**
- The certificate coordinator must approve elective coursework. Courses taken before formal admission into the program may be accepted as program credits at a later date. Relevant graduate coursework from other graduate institutions may be approved to fulfill the elective requirement after review of relevant course syllabi. However, all coursework must have been taken within five years from the date of acceptance into the certificate program.
Program Evaluation Minor
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 178 Pillsbury Dr S E, Minneapolis, MN 55455 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Program evaluation is an area of inquiry that uses both quantitative and qualitative methods to address questions of concern to policy makers, administrators, managers, and, in some cases, program participants. In this era of competing developments—increased accountability and the democratization of research activity—knowledge of program evaluation is a useful and valuable commodity. The program evaluation minor is an interdisciplinary effort providing intensive study of the techniques and process of evaluation and policy research, in addition to the social and political context within which program evaluation occurs. The graduate minor in program evaluation offers a coordinated set of courses designed for students who wish to have the knowledge and skills necessary to conduct evaluations combined with their graduate majors or professional fields of study. Courses include readings, discussions, and assignments designed to develop the skills essential to professionals intending to use or conduct evaluation in nonprofit and for-profit organizations.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Prior admission into an established MA or PhD is required. Students in the existing evaluation-related concentrations in organizational leadership, policy, and development or educational psychology are not allowed into the minor. Admission to the minor program will therefore be contingent upon enrollment in good standing within a recognized University of Minnesota degree-granting program.

Special Application Requirements:
Students interested in admission to the minor should contact the minor’s Director of Graduate Studies. Students must demonstrate relevant academic background and experience.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Use of 4xxx courses towards program requirements is not permitted.

The program for an individual student will be developed by the student, the major advisor, and the director of graduate studies (DGS) of the program evaluation minor. With permission of the program evaluation minor DGS, students with sufficient background and previous course experience equivalent to one or more courses within the minor field curriculum may apply for a waiver of appropriate requirements, and replace waived courses with additional electives to meet the minimum number of credits required for the minor.
Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Minor Requirements
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

or An alternative course approved by program evaluation steering committee

OLPD 5502 - Theory and Models of Evaluation (3.0 cr)

or OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)

Doctoral
Minor Requirements
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

or or an alternative course approved by program evaluation steering committee

OLPD 5502 - Theory and Models of Evaluation (3.0 cr)

or OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)

OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)

Additional coursework
Additional coursework must be selected in conjunction with, and approved by, the minor adviser.
Twin Cities Campus
Program Evaluation Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12 to 13
- This program does not require summer semesters for timely completion.
- Degree: Program Evaluation Postbaccalaureate Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program evaluation certificate program offers intensive study of applied methods of evaluating programs and services in school, health, government, nonprofit agencies and market research settings. This interdisciplinary program surveys program evaluation techniques and processes, and examines the social and political contexts of the studies. The program allows working professionals from a variety of disciplines to formalize their training in program evaluation by earning a certificate in this area. Demand for trained professionals in program evaluation has increased steadily to meet the reporting needs of funding agencies, policy makers, and program managers in the public and private sectors. Graduates of evaluation studies programs have found employment in county government, social service agencies, state departments, and research consulting firms and businesses.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A completed graduate-level degree, master of education (MEd) or master of arts (MA), in an appropriate content area, including education, social work, public health, or public policy.

Other requirements to be completed before admission:
Students must demonstrate relevant academic background, including research methodology and experience in a field in which program evaluation is practiced (e.g., public health, social work, or education). Admission will be based on an assessment of the applicant’s advanced knowledge and level of professional experience in the field of program evaluation. Applications are reviewed on a rolling basis.

Special Application Requirements:
Enrollment in the certificate program will be limited to a maximum of 10 students per calendar year.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

Required Coursework
8-9 credits required. The following courses (or equivalents approved by the certificate coordinator) are required.
Foundations of evaluation
Take 1 course from the following:
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
PA 5311 - Program Evaluation (3.0 cr)
PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
SW 8603 - Program Evaluation (2.0 cr)

Evaluation theory
OLPD 5502 - Theory and Models of Evaluation (3.0 cr)
or OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

Internship in evaluation
Only 3 credits of this course can count towards this certificate.
OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)

Elective Coursework
Students may choose 3-4 credits of elective coursework from the following list to meet the overall program minimum of 12 credits. Additional courses may be approved by the certificate coordinator.
Take 3 or more credit(s) from the following:
• CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
• CI 8914 - Critical Science Research (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
• OLPD 5056 - Case Studies for Policy Research (3.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
• OLPD 8595 - Evaluation Problems (1.0 - 6.0 cr)
• PUBH 8724 - The Health Care System and Public Health (3.0 cr)
• SW 8602 - Direct Practice Evaluation (2.0 cr)
Twin Cities Campus
Social Work M.S.W.
School of Social Work
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Social Work
105 Peters Hall
1404 Gortner Avenue
St. Paul, MN  55108
612-625-1220
Email: swadmis@umn.edu
Website: http://www.cehd.umn.edu/ssw/Graduate/msw.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34 to 53
- This program does not require summer semesters for timely completion.
- Degree: Master of Social Work

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MSW prepares students for advanced social work practice. A 53-credit program and a 34-credit advanced standing program are available. The curriculum offers concentrations in clinical mental health; community practice; families and children; and health, disabilities and aging.

Accreditation
This program is accredited by Council on Social Work Education.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
A foundation in the liberal arts and one year of work experience in human services is preferred. Work experience may include paid, volunteer, and intern positions.

Special Application Requirements:
In order to apply, applicants are required to submit a specified personal statement, writing sample, resume, transcripts, and three letters of recommendation. All application instructions are posted on the School of Social Work website.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 34 to 53 major credits and up to null credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.
The MSW requires 53 credits; a 34-credit advanced standing program is available to graduates of undergraduate social work programs accredited by the Council on Social Work Education. All credits for the MSW can be completed in two years of full-time study, or three years to four years of part-time study, and must be completed within five years of the date of the earliest coursework taken for the degree.

The 53-credit program includes a set of required foundation courses (19 cr), courses from a selected concentration, two field internships, and social work electives.

A maximum of 26 credits may be transferred from the following sources with School of Social Work approval: up to 8 credits as a non-degree-seeking student registered for social work graduate credit at the University of Minnesota; up to 26 credits from another regionally and professionally accredited school of social work if the student was registered as a graduate student in the program.

The 34-credit advanced standing program includes courses from a selected concentration, one field internship, and social work electives. A maximum of 14 credits may be transferred from the following sources with School of Social Work approval: 14 credits completed as a graduate student in another accredited MSW program; up to 6 credits as a non-degree-seeking student registered for social work graduate credit at the University of Minnesota.

**Foundation Curriculum for Full Program Students**

The 19-cr foundation curriculum is required for full program students. The foundation curriculum is waived for advanced standing students, unless required in a student’s conditions of admission. Advanced standing students who receive a grade of B- or less in a BSW class that is comparable to one of our foundation classes may be asked to repeat that content in our MSW program. Students should take 8010 for 3 cr in fall; 3 cr in spring or 6 cr in summer.

Take exactly 19 credit(s) from the following:

- SW 5051 - Human Behavior and the Social Environment (2.0 - 3.0 cr)
- SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)
- SW 8151 - Social Work Methods: Practice With Individuals and Systems (2.0 cr)
- SW 8152 - Social Work Practice Methods: Families and Groups (2.0 cr)
- SW 8153 - Social Work Practice Methods: Macro Practice and Organizations (2.0 cr)
- SW 8841 - Social Work Research Methods (2.0 cr)
- SW 8010 - Seminar: Field Practicum I (1.0 - 8.0 cr)

**Concentration Areas**

**Clinical Mental Health Concentration**

Prepares students for advanced clinical social work practice with children, adults and families across diverse settings and populations. Students learn contextually based approaches to mental health diagnostic assessment, treatment and practice evaluation, with a strong focus on client systems experiencing significant mental health risk.

**Anchor and Boost**

SW 8451 - Assessment and Engagement in Clinical Social Work Practice (3.0 cr)
SW 8452 - Core Concepts in Clinical Social Work Practice (3.0 cr)

**Concentration Electives**

Take 2 or more course(s) totaling 6 or more credit(s) from the following:

- SW 8352 - Intervention Methods with Families (3.0 cr)
- SW 8461 - Advanced Clinical Social Work Practice with Adults (3.0 cr)
- SW 8462 - Advanced Clinical Practice With Children and Adolescents (3.0 cr)
- SW 8463 - Social Work Practice With Severe and Persistent Mental Illness and Severe Emotional Disturbance (3.0 cr)

**Diversity**

SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

**Advanced Policy**

SW 8806 - Health and Mental Health Policy (3.0 cr)

or SW 8807 - International and Comparative Social Welfare Policy (3.0 cr)

**2nd Focus Anchor**

Students must choose one course from this list. Dual degree students may substitute a course from their other degree program with approval from the MSW program director.

- SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
- SW 8351 - Assessment and Engagement with Families and Children (3.0 cr)
- SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)

**Concentration Field Practicum and Seminar**

Students complete 6 credits of SW 8020. The credits are either split between fall and spring semesters, or 6 credits are taken during summer. Advanced Standing students take SW 8030.

Take exactly 6 credit(s) from the following:

- SW 8020 - Field Practicum II (1.0 - 6.0 cr)

**Advanced Research**

Students must complete 3 credits of SW 8842. The credits are split between fall and spring semesters, or 3 credits are taken during
the summer. Dual degree program students may substitute PA 5311 or PUBH 6034. This course must be taken concurrently with SW 8020 or 8030.

Take exactly 3 credit(s) from the following:
- SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 cr)
- PA 5311 - Program Evaluation (3.0 cr)
- PUBH 6034 - Evaluation (3.0 cr)

Free Electives
Students must complete at least 5 credits of 5000-level or 8000-level courses not used for another program requirement.

-OR-

Community Practice Concentration
Concentration prepares students to improve the effectiveness and responsiveness of human service systems to mobilize groups for social change, and to serve as catalysts for sustainable development and social justice. Students are prepared to fill a variety of community practice roles—leaders, planners, policy advocates, community organizers, mediators, evaluators and agency administrators in a range of settings.

Anchor and Boost
SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)
SW 8552 - Advanced Community Practice: Leadership, Planning, and Program Development (3.0 cr)

Concentration Electives
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
- PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
- SW 5562 - Global Social Work and Social Development (3.0 cr)
- SW 8563 - Advanced Policy Advocacy (3.0 cr)

Diversity
SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

Advanced Policy
SW 8804 - Child Welfare Policy (3.0 cr)
or SW 8805 - Aging and Disability Policy (3.0 cr)
or SW 8806 - Health and Mental Health Policy (3.0 cr)
or SW 8807 - International and Comparative Social Welfare Policy (3.0 cr)

2nd Focus Anchor
Students must choose one course from this list. Dual degree students may substitute a course from their other program with approval of the MSW Program Director.

SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
or SW 8351 - Assessment and Engagement with Families and Children (3.0 cr)
or SW 8451 - Assessment and Engagement in Clinical Social Work Practice (3.0 cr)

Concentration Field Practicum and Seminar
Students complete 6 credits of SW 8020. The credits are split between fall and spring semesters, or 6 credits are taken during summer. Advanced standing students take SW 8030.
Take exactly 6 credit(s) from the following:
- SW 8020 - Field Practicum II (1.0 - 6.0 cr)

Advanced Research
Students must complete 3 cr of SW 8843. The credits are split between fall and spring semesters. Dual degree students may substitute PA 5311 or PUBH 6034.
Take 3 or more credit(s) from the following:
- SW 8843 - Social Work Program Evaluation (1.0 - 2.0 cr)
- PA 5311 - Program Evaluation (3.0 cr)
- PUBH 6034 - Evaluation (3.0 cr)

Free Electives
Students must complete at least 5 credits of 5000-level or 8000-level courses not used for another program requirement.

-OR-

Families and Children Concentration
Prepares students to work with families and children in a range of settings and organizations, as well as influence relevant organizational structures and policies. Students will be able to identify protective supports and develop interventions that mediate risk and promote resilience.

Anchor and Boost
SW 8351 - Assessment and Engagement with Families and Children (3.0 cr)
SW 8352 - Intervention Methods with Families (3.0 cr)

Concentration Electives
Students must take two courses (6 cr) from the list of concentration electives.
Take 6 or more credit(s) from the following:
- SW 8361 - Identification and Assessment of Family Violence (3.0 cr)
- SW 8363 - Social Work in Child Welfare (3.0 cr)
- SW 8462 - Advanced Clinical Practice With Children and Adolescents (3.0 cr)

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Information current as of August 31, 2018
Diversity
SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

Advanced Policy
SW 8804 - Child Welfare Policy (3.0 cr)
or SW 8805 - Aging and Disability Policy (3.0 cr)
or SW 8806 - Health and Mental Health Policy (3.0 cr)
or SW 8807 - International and Comparative Social Welfare Policy (3.0 cr)

2nd Focus Anchor
Students must complete one course from this list. Dual degree students may substitute a course from their other degree program with approval from the MSW program director.
SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
or SW 8451 - Assessment and Engagement in Clinical Social Work Practice (3.0 cr)
or SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)

Concentration Field Practicum and Seminar
Students complete 6 credits of 8020. The credits are either split between fall and spring semesters or 6 credits are taken during summer. Advanced standing students take SW 8030
Take exactly 6 credit(s) from the following:
• SW 8020 - Field Practicum II (1.0 - 6.0 cr)

Advanced Research
Students must complete 3 credits of SW 8842. The credits are split between fall and spring semesters, or all 3 credits are taken during summer. Dual degree program students may substitute PA 5311 or PUBH 6034. This course must be taken concurrently with SW 8020 or 8030.
Take exactly 3 credit(s) from the following:
• SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 cr)
• PA 5311 - Program Evaluation (3.0 cr)
• PUBH 6034 - Evaluation (3.0 cr)

Free Electives
Students must take at least 5 credits of 5000-level or 8000-level courses not used for another program requirement.

-OR-

Health, Disability and Aging Concentration
Prepares students to work with people affected by distinct and interconnected issues related to health, disability and aging. Students are prepared to work in a variety of settings such as hospitals, primary care clinics, residential care facilities, hospice, community-based programs, and in policy and advocacy organizations.

Anchor and Boost
SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
SW 8261 - Advanced Social Work Practice in Health Care (3.0 cr)

Concentration Electives
Students must take two courses (6 cr) from this list.
Take 6 or more credit(s) from the following:
• SW 8262 - Empowerment Practice With Persons With Disabilities (3.0 cr)
• SW 8263 - Advanced Direct Practice and Community-Based Interventions in Gerontology (3.0 cr)
• SW 8463 - Social Work Practice With Severe and Persistent Mental Illness and Severe Emotional Disturbance (3.0 cr)

Diversity
SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

Advanced Policy
SW 8805 - Aging and Disability Policy (3.0 cr)
or SW 8806 - Health and Mental Health Policy (3.0 cr)
or SW 8807 - International and Comparative Social Welfare Policy (3.0 cr)

2nd Focus Anchor
Students should choose one course from this list. Dual degree students may substitute a course from their other degree program with approval from the MSW program director.
SW 8351 - Assessment and Engagement with Families and Children (3.0 cr)
or SW 8451 - Assessment and Engagement in Clinical Social Work Practice (3.0 cr)
or SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)

Concentration Field Practicum and Seminar
Students complete 6 credits of SW 8020. These credits are either split between fall and spring, or 6 credits are taken during summer.

Advanced Standing students will take SW 8030.
Take 6 or more credit(s) from the following:
• SW 8020 - Field Practicum II (1.0 - 6.0 cr)

Advanced Research
Students must complete 3 credits of SW 8842. The credits are split between fall and spring, or all 3 credits are taken during summer. Dual degree students may substitute PA 5311 or PUBH 6034.
This course must be taken concurrently with SW 8020 or 8030.
Take 3 or more credit(s) from the following:
• SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 cr)
• PA 5311 - Program Evaluation (3.0 cr)
• PUBH 6034 - Evaluation (3.0 cr)

Free Electives
Students must complete at least 5 credits of 5000-level or 8000-level courses not used for another degree requirement.

Joint- or Dual-degree Coursework: MSW/MPH, MSW/MPP, and MSW/MURP
Student may take a total of 22 credits in common among the academic programs.
Twin Cities Campus
Social Work Ph.D.
School of Social Work
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Social Work
105 Peters Hall
1404 Gortner Avenue
St. Paul, MN  55108
(612-625-1220; fax: 612-624-3744)
Email: swadmis@umn.edu
Website: http://cehd.umn.edu/ssw

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD program in social work prepares students to provide intellectual leadership for the social work profession through advanced levels of scholarship, research, theory development, and policy analysis. Students are expected to acquire skill in research design and statistics and to develop a comprehensive knowledge of social work and social welfare history, theory, and policy.

The PhD program does not focus on the development of advanced skills for clinical practice. However, students gain knowledge of practice theory and research related to social work practice. Many graduates assume positions as university faculty. Consequently, the program offers opportunities for students to acquire skills in teaching and curriculum development.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A master's degree is required.

Special Application Requirements:
Priority application deadline is early January in the appropriate year. Final deadline is early March. Applications received by second deadline will be reviewed and applicants accepted on a space-available basis.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
28 to 32 credits are required in the major.
8 to 12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The PhD program emphasizes mastery of student and program determined objectives rather than an accumulation of course credits. Degree requirements vary according to the student's background and educational goals. A minimum of 40 credits plus 24 required thesis credits beyond the MSW are required. Required courses include core seminars in social work research, social welfare history, social welfare policy, and theory and model development; a teaching course; a supervised research practicum and practicum seminar (two-semester sequence); supporting program courses (12 credits of supporting program course work is required - eight credits must be taken outside of social work while four credits may be taken in social work); and statistics courses. Students must also have teaching experience in the School of Social Work while in the program. Students are expected to attend PhD Colloquia and research colloquia for at least the first two years of their participation in the program.

Required Courses
SW 8875, Research Practicum, must be taken two semesters for a total of four credits.
SW 8871 - Social Work Research Seminar I (3.0 cr)
SW 8872 - Social Work Research Seminar II (3.0 cr)
SW 8875 - Research Practicum (2.0 cr)
SW 8861 - Theory and Model Development in Social Work (3.0 cr)
SW 8855 - Social Policy Formulation and Analysis (3.0 cr)
SW 8851 - Social Welfare History and Historical Research Methods (3.0 cr)
GRAD 8101 - Teaching in Higher Education (3.0 cr)

Required Statistics Courses
6 credits of graduate level statistics coursework, as approved by the Program Director.

Supporting Program Coursework
Students must take 12 credits of supporting course work in consultation with their advisor. 8 credits must be taken outside of social work while 4 credits may be taken in social work.
Twin Cities Campus

Sociocultural Studies in Education Minor

Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 178 Pillsbury Dr SE, Minneapolis, MN 55455 (612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The sociocultural studies in education (SCSE) minor (previously known as the social and philosophic studies of education minor) provides a multidisciplinary foundation for the study of social and cultural phenomena that shape educational ideologies and practices. The minor enables students to take courses from a variety of social science, humanities, and interdisciplinary fields in order to generate a particular perspective, lens, or optic that can illuminate problems or processes of interest to them.

The SCSE minor program is shaped to suit the particular needs and interests of the student at either the master's or doctoral level. Courses at either the 5xxx or 8xxx level are selected in consultation with an SCSE faculty member and approved by the SCSE director of graduate studies (DGS). Courses are generally of two types: those that explicitly draw upon a disciplinary or interdisciplinary perspective to examine educational processes (e.g., economics of education); and those that provide an in-depth exploration of a disciplinary or interdisciplinary perspective itself (e.g., contemporary political thought).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to the SCSE minor is contingent upon prior admission to a University masters or doctoral degree-granting program. Interested students should consult with a SCSE faculty member to develop a proposed course of study, then formally declare the minor when they file their degree plan. Students who declare the minor are required to include a member of the SCSE faculty on their masters or doctoral committee. Students may apply to this minor throughout the year.

Special Application Requirements:
The director of graduate studies (DGS) of the SCSE minor must approve the applicant's proposed course of study by signing the student's degree program form in addition to the student's major DGS.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Minor Requirements

Master’s students complete at least 9 graduate credits from the list of approved courses below. These must include a minimum of 3 OLPD course credits and 3 credits from courses outside of OLPD (these courses may be within CEHD). Additional courses may be approved by SCSE faculty in consultation with the SCSE minor DGS.

OLPD Courses

Must take at least 3 credits from the list below.

Take 1 - 2 course(s) from the following:

- **OLPD 5041** - Sociology of Education (3.0 cr)
- **OLPD 5044** - Introduction to the Economics of Education (3.0 cr)
- **OLPD 5103** - Comparative Education (3.0 cr)
- **OLPD 5107** - Gender, Education, and International Development (3.0 cr)
- **OLPD 5323** - Women in Leadership (3.0 cr)
- **OLPD 5128** - Anthropology of Education (3.0 cr)
- **OLPD 5132** - Intercultural Education and Training: Theory and Application (3.0 cr)
- **OLPD 5346** - Politics of Education (3.0 cr)
- **OLPD 5721** - Race and Ethnicity in Higher Education (3.0 cr)
- **OLPD 8022** - Education and Globalization: Anthropological Perspectives (3.0 cr)
- **OLPD 8103** - Comparative Education (3.0 cr)

Non-OLPD Courses

Must take at least 3 credits from the list below.

Take 1 - 2 course(s) from the following:

- **AFRO 5103** - World History and Africa (3.0 cr)
- **AFRO 5120** - Social and Intellectual Movements in the African Diaspora (3.0 cr)
- **AFRO 5854** - Seminar: Gender, Race, Nation, and Policy – Perspectives from Within the African Diaspora (3.0 cr)
- **AMIN 5890** - Readings in American Indian and Indigenous History (3.0 cr)
- **AMST 8288** - Working in the Global Economy: Readings (3.0 cr)
- **ANTH 8001** - Ethnography, Theory, History (3.0 cr)
- **ANTH 8002** - Ethnography: Contemporary Theory and Practice (3.0 cr)
- **ANTH 8207** - Political and Social Anthropology (3.0 cr)
- **ANTH 8215** - Anthropology of Gender (3.0 cr)
- **CI 5136** - History of the American Curriculum (3.0 cr)
- **CI 5137** - Multicultural Gender-Fair Curriculum (3.0 cr)
- **CI 5156** - Popular Culture, Teaching, and Learning (3.0 cr)
- **CI 5541** - Language, Culture, and Education (3.0 cr)
- **CI 8111** - Representations of Knowledge in Curriculum and Culture (1.0 - 3.0 cr)
- **CL 8362** - Modernity and Its Others (4.0 cr)
- **COMM 5451W** - Intercultural Communication Processes [WI] (3.0 cr)
- **CPSY 5251W** - Social and Philosophical Foundations of Early Childhood Education [WI] (3.0 cr)
- **CSCL 5555** - Introduction to Semiotics (3.0 cr)
- **CSCL 5833** - Marx, Freud, Nietzsche: Intellectual Foundations (3.0 cr)
- **CSDS 8001** - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
- **CSDS 8002** - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
- **CSDS 8910** - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- **CSDS 8910** - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- **CSDS 8910** - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- **CSDS 8910** - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- **CSDS 8910** - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- **DSSC 8111** - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (3.0 cr)
- **DSSC 8110** - Topics in Development Studies and Social Change (1.0 - 3.0 cr)
- **EPSY 5157** - Social Psychology of Education (3.0 cr)
- **GLOS 5403** - Human Rights Advocacy (3.0 cr)
- **GLOS 5602** - Other Worlds: Globality and Culture (3.0 cr)
- **GWSS 5190** - Topics: Theory, Knowledge, and Power (3.0 cr)
- **GWSS 8101** - Intellectual History of Feminism (3.0 cr)
- **GWSS 8103** - Feminist Theories of Knowledge (3.0 cr)
- **GWSS 8107** - Feminist Pedagogies (3.0 cr)
- **GWSS 8108** - Genealogies of Feminist Theory (3.0 cr)
- **GWSS 8109** - Feminist Knowledge Production (3.0 cr)
- **HIST 5871** - Readings in U.S. Intellectual History: 19th-20th Centuries (3.0 cr)
- **HIST 5932** - The Production of Knowledge, Negotiating the Past, and the Writing of African Histories (3.0 cr)
- **HIST 8239** - Readings in Gender, Race, Class, and/or Ethnicity in the United States (3.0 cr)
- **HIST 8630** - Seminar in World History (3.0 cr)
- **HIST 8961** - Research Seminar: Intellectual History (3.0 cr)
- **KIN 5371** - Sport and Society (3.0 cr)
• PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
• PA 5414 - Child Human Rights: Work and Education (3.0 cr)
• PHIL 5601 - History of the Philosophy of Science (3.0 cr)
• PHIL 8130 - Seminar: Epistemology (3.0 cr)
• PHIL 8131 - Epistemology Survey (3.0 cr)
• PHIL 8133 - Feminist Theories of Knowledge (3.0 cr)
• POL 8101 - Introduction to Political Science (3.0 cr)
• POL 8215 - Philosophy of Political Inquiry (3.0 cr)
• POL 8225 - American Political Thought (3.0 cr)
• POL 8235 - Democratic Theory (3.0 cr)
• POL 8253 - Late Modern Political Thought (3.0 cr)
• POL 8275 - Contemporary Political Thought (3.0 cr)
• POL 8305 - Interest Groups and Social Movements (3.0 cr)
• SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
• SOC 8731 - Sociology of Knowledge (3.0 cr)
• SOC 8735 - Sociology of Culture (3.0 cr)
• SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)

Doctoral

Minor Requirements

Doctoral students complete at least 12 graduate credits from the list of approved courses below. These must include a minimum of 6 OLPD course credits and 3 credits from courses outside of OLPD (these courses may be within CEHD).

OLPD Courses

Must take at least 6 credits from the list below.
Take 2 - 3 course(s) from the following:
• OLPD 5041 - Sociology of Education (3.0 cr)
• OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
• OLPD 5103 - Comparative Education (3.0 cr)
• OLPD 5107 - Gender, Education, and International Development (3.0 cr)
• OLPD 5128 - Anthropology of Education (3.0 cr)
• OLPD 5132 - Intercultural Education and Training: Theory and Application (3.0 cr)
• OLPD 5323 - Women in Leadership (3.0 cr)
• OLPD 5346 - Politics of Education (3.0 cr)
• OLPD 5721 - Race and Ethnicity in Higher Education (3.0 cr)
• OLPD 8022 - Education and Globalization: Anthropological Perspectives (3.0 cr)
• OLPD 8103 - Comparative Education (3.0 cr)

Non-OLPD Courses

Must take at least 3 credits from the list below.
Take 1 - 2 course(s) from the following:
• AFRO 5103 - World History and Africa (3.0 cr)
• AFRO 5120 - Social and Intellectual Movements in the African Diaspora (3.0 cr)
• AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
• AMIN 5890 - Readings in American Indian and Indigenous History (3.0 cr)
• AMST 8288 - Working in the Global Economy: Readings (3.0 cr)
• ANTH 8001 - Ethnography, Theory, History (3.0 cr)
• ANTH 8002 - Ethnography: Contemporary Theory and Practice (3.0 cr)
• ANTH 8207 - Political and Social Anthropology (3.0 cr)
• ANTH 8215 - Anthropology of Gender (3.0 cr)
• CI 5136 - History of the American Curriculum (3.0 cr)
• CI 5137 - Multicultural Gender-Fair Curriculum (3.0 cr)
• CI 5156 - Popular Culture, Teaching, and Learning (3.0 cr)
• CI 5641 - Language, Culture, and Education (3.0 cr)
• CI 8111 - Representations of Knowledge in Curriculum and Culture (1.0 - 3.0 cr)
• CI 8461 - Sociocultural Theory, Education, and Literacy (3.0 cr)
• CL 8382 - Modernity and Its Others (4.0 cr)
• COMM 5451W - Intercultural Communication Processes [WI] (3.0 cr)
• CPSY 5251W - Social and Philosophical Foundations of Early Childhood Education [WI] (3.0 cr)
• CSSL 5555 - Introduction to Semiotics (3.0 cr)
• CSSL 5833 - Marx, Freud, Nietzsche: Intellectual Foundations (3.0 cr)
• SDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
• SDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
• SDS 8910 - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
• SDS 8920 - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
• DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (3.0 cr)
• DSSC 8310 - Topics in Development Studies and Social Change (1.0 - 3.0 cr)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• GLOS 5403 - Human Rights Advocacy (3.0 cr)
• GLOS 5602 - Other Worlds: Globality and Culture (3.0 cr)
• GWSS 5190 - Topics: Theory, Knowledge, and Power (3.0 cr)
• GWSS 8101 - Intellectual History of Feminism (3.0 cr)
• GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)
• GWSS 8107 - Feminist Pedagogies (3.0 cr)
• GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
• GWSS 8109 - Feminist Knowledge Production (3.0 cr)
• GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)
• HIST 5871 - Readings in U.S. Intellectual History: 19th-20th Centuries (3.0 cr)
• HIST 5932 - The Production of Knowledge, Negotiating the Past, and the Writing of African Histories (3.0 cr)
• HIST 8239 - Readings in Gender, Race, Class, and/or Ethnicity in the United States (3.0 cr)
• HIST 8630 - Seminar in World History (3.0 cr)
• HIST 8961 - Research Seminar: Intellectual History (3.0 cr)
• KIN 5371 - Sport and Society (3.0 cr)
• PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
• PA 5414 - Child Human Rights: Work and Education (3.0 cr)
• PHIL 5601 - History of the Philosophy of Science (3.0 cr)
• PHIL 8130 - Seminar: Epistemology (3.0 cr)
• PHIL 8131 - Epistemology Survey (3.0 cr)
• PHIL 8133 - Feminist Theories of Knowledge (3.0 cr)
• POL 8101 - Introduction to Political Science (3.0 cr)
• POL 8215 - Philosophy of Political Inquiry (3.0 cr)
• POL 8225 - American Political Thought (3.0 cr)
• POL 8235 - Democratic Theory (3.0 cr)
• POL 8253 - Late Modern Political Thought (3.0 cr)
• POL 8275 - Contemporary Political Thought (3.0 cr)
• POL 8305 - Interest Groups and Social Movements (3.0 cr)
• SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
• SOC 8731 - Sociology of Knowledge (3.0 cr)
• SOC 8735 - Sociology of Culture (3.0 cr)
• SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)
Twin Cities Campus

Special Education Initial License M.Ed.
Educational Psychology
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax 612-624-8241)
Email: sped-adm@umn.edu
Website: http://www.cehd.umn.edu/edpsych/Programs/SpecialEd/MEd-prospective.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 51
- This program requires summer semesters for timely completion.
- All instruction and practica related to the residency-based sub-plan in EBD are delivered off-campus. Traditional course instruction is delivered in a meeting room in one of the partner district buildings one night per week. Practica are located in public school settings of our partner districts in Federal Setting III and IV EBD classrooms and take place during regular school hours.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduates of the University of Minnesota special education teacher licensure programs are student-centered, collaborative professionals who deliver robust, high-quality, and specialized educational services, adding value to the learning and development of infants, children, and adults with disabilities from diverse cultural backgrounds.

Program graduates are knowledgeable in the following areas:
- Engaging in collaborative problem solving with families and professionals to meet the academic, social, behavioral, and life skills needs of individuals with disabilities;
- Implementing and supporting others' implementation of evidence-based instruction and intervention with fidelity to improve student outcomes;
- Using reliable and valid assessment data to make individualized educational decisions;
- Systematically selecting and adapting instructional supports to meet individual needs, based on data and knowledge of individual learning, developmental, and cultural differences;
- Maximizing expectations and learning opportunities for individuals with disabilities in the Least Restrictive using the full continuum of services; and
- Upholding principles of professionalism and ethics in their practice.

Accreditation
This program is accredited by NCATE/BOT, Council of Exceptional Children (CEC) and Council on Education of the Deaf (CED).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
Experience in working with children and/or people with disabilities is preferred.

Special Application Requirements:
The application deadline is March 1 for summer or fall admission.

Upload the following additional materials into the appropriate areas of the online application:
- One to two page applicant statement outlining goals, interests, experiences, etc.
Résumé
- Two letters of recommendation [.pdf], preferably from individuals in the education field (for the online application, applicant's will be asked to enter recommenders' information into the online application; a message will be automatically sent to those recommenders with further instructions on how to submit their letters)
- MLTE Basic Skills Tests
- Unofficial transcripts from all collegiate institutions attended (Students who are accepted will need to send official transcripts in a sealed envelope. University of Minnesota graduates need not submit University of Minnesota transcripts to Student Services.)
- International applicants should submit a foreign transcript evaluation from an accredited reviewer (ECS http://www.ece.org/ or WES http://www.wes.org/students/index.asp)

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
**Plan C:** Plan C requires 30 to 51 major credits and 0 credits outside the major. The is no final exam. A capstone project is required.
**Capstone Project:** A portfolio and integrated paper/mini research project/comprehensive exam is required in conjunction with registration for EPSY 5690. The student and advisor will develop the individual's MEd graduate plan.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may complete the program with more than one sub-plan.

**Academic Behavioral Strategist**
Professional development in special education offers a program of study that leads to K-12 licensure as an Academic Behavior Strategist (ABS) and an MEd degree. This degree is designed to prepare teachers to work in a variety of educational settings with students who have mild to moderate disabilities. Graduates of the program are student-centered, collaborative professionals who implement evidence-based instructional interventions with fidelity to improve learner outcomes. The program incorporates maximizing learner expectations and learning opportunities including cultural and social diversity. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with disabilities and their families.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

**Required Courses**
EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)
Electives
Take 12 or more credit(s) from the following:
• OLPD 5005 - School and Society (2.0 cr)
• CI 5307 - Technology for Teaching and Learning (1.5 cr)
• OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
• EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
• EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
• EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
• EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
• EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
• EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
• EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
• EPSY 5741 - Student Teaching: Academic and Behavioral Strategist (3.0 - 6.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Autism Spectrum Disorder
Professional development in special education offers a program in Autism Spectrum Disorder (ASD) that leads to Birth-12 licensure and an MEd degree. This degree is designed to prepare teachers to work in a variety of educational settings including home- and school-based programs with children who have been identified with ASD and their families. Graduates are prepared to assess, analyze, and provide intervention and remediation of academic, social, and communicative challenges for students with ASD. This program focuses on the implementation of evidence-based practices, specialized educational services, and outcomes that add value to the learning and development of infants, children, and adults with ASD from diverse cultural backgrounds.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses
EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

Electives
Take 12 or more credit(s) from the following:
• OLPD 5005 - School and Society (2.0 cr)
• CI 5307 - Technology for Teaching and Learning (1.5 cr)
• OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
• EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
• EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
• EPSY 5632 - Module 2: Evidence-based Methods for AAC Assessment and Intervention (2.0 cr)
• EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
• EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
• EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
• EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
• EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
• EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
• EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
• EPSY 5742 - Student Teaching: Autism Spectrum Disorders (6.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Deaf and Hard of Hearing
The deaf education program within special education leads to an M.Ed degree with potential for MN Licensure with additional coursework. It is designed to prepare reflective educators to work with students (and their families) with diverse linguistic and cultural backgrounds. Our program philosophy focuses on providing students with an in depth understanding of advocacy, identity development, language and literacy development, and how to facilitate and assess development across ages and curricular areas giving equal value to ASL and English. The program will prepare graduates to have bilingual and bicultural competence along with the ability to demonstrate best practices and effective instructional strategies to meet the needs of individual learners; in addition, to engage
in and value partnerships with deaf adults, parents, community and professional organizations.

For the M.Ed degree, students complete 30 credits: 15 credits required courses and 15-16 credits electives. Those interested in being prepared to apply for licensure, teaching children who are deaf and hard of hearing (Birth-Grade 12) need to take additional credits (25-30).

**Required Courses**
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5641 - Foundations of Deaf Education (3.0 cr)
- EPSY 5654 - Current Research, Issues Trends in Deaf Education (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

**Electives**
Take 15 - 16 credit(s) from the following:
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5642 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5643 - Seminar: Identity, Culture and Diversity in Deaf Education (2.0 cr)
- EPSY 5644 - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5645 - Deaf Plus: Educating and Understanding Deaf Students with Disabilities (1.0 cr)
- EPSY 5646 - Best Practices Teaching Reading and Writing for School Age: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5647 - Spoken Language Practices and Assistive Technology: Deaf and Hard of Hearing (2.0 cr)
- EPSY 5651 - Best Practices Teaching Content Areas: Deaf Education (3.0 cr)
- EPSY 5652 - Incorporating Academic ASL in the Classroom: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5653 - ASL/English Structure and Application (3.0 cr)
- EPSY 5654 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5657 - Technology for Teaching and Learning (3.0 cr)
- EPSY 5658 - Multicultural Literature for Children and Adolescents (3.0 cr)
- EPSY 5659 - Elementary literacy Instruction for ESL Students (3.0 cr)
- EPSY 5660 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
- EPSY 5661 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)
- OLDP 5005 - School and Society (2.0 cr)

**Developmental Disabilities**
The professional development program in special education specializing in developmental disabilities leads to K-12 classroom licensure and a MEd degree and is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity and meeting the needs of individual students who have developmental disabilities. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with developmental disabilities and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

**Required Courses**
- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

**Electives**
Take 12 or more credit(s) from the following:
- OLDP 5005 - School and Society (2.0 cr)
• CI 5307 - Technology for Teaching and Learning (1.5 cr)
• OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
• EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
• EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
• EPSY 5621 - Assessment and Instructional Design for Students with Developmental Disabilities (3.0 cr)
• EPSY 5622 - Programs and Curricula for Students with Developmental Disabilities (3.0 cr)
• EPSY 5624 - Biomedical and Physical Impairments of Students with Developmental Disabilities (2.0 cr)
• EPSY 5632 - Module 2: Evidence-based Methods for AAC Assessment and Intervention (2.0 cr)
• EPSY 5636 - Sensory Impairments of Students With Developmental Disabilities (2.0 cr)
• EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
• EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
• EPSY 5756 - Student Teaching: Developmental Disabilities, Moderate/Severe (1.0 - 6.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Early Childhood Special Education

The professional development program in special education specializing in early childhood special education (ECSE) leads to teaching licensure for work with children from birth through age five as well as a M.Ed. This program is designed to prepare teachers to work in a variety of educational settings, including home and school, with children who have a variety of developmental delays and disabilities.

The ECSE program philosophy focuses on cultural and social diversity and meeting the needs of individual children who have disabilities. Further, the ECSE program emphasizes the delivery of evidence-based practices within the natural routines of families and preschools when addressing the individualized needs of children. Graduates are prepared to assess, analyze, monitor, and problem solve the developmental and educational needs of young children and their families. With that, graduates of the ECSE program are prepared to be leaders in the field for the identification intervention needs, provision of research-based services, and facilitation of successful transitions to kindergarten.

Students complete 30 credits: 17 credits required courses and 13 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses
• EPSY 5609 - Family-centered Services (2.0 cr)
• EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
• EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
• EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
• EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

Electives
Take 13 or more credit(s) from the following:
• CPSY 5252 - Facilitating Social and Emotional Learning in Early Childhood Education (3.0 cr)
• CPSY 5253 - Facilitating Cognitive and Language Learning in Early Childhood Education (3.0 cr)
• CPSY 5254 - Facilitating Creative and Motor Learning in Early Childhood Education (2.0 cr)
• OLPD 5005 - School and Society (2.0 cr)
• CI 5307 - Technology for Teaching and Learning (1.5 cr)
• OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
• EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
• EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
• EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
• EPSY 5682 - Education of Infants and Toddlers with Disabilities: Methods and Materials (3.0 cr)
• EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
• EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
• EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
• EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
• EPSY 5761 - Student Teaching in Early Childhood Special Education Settings for Children Aged Three to Five Years (3.0 cr)
• EPSY 5762 - Student Teaching in Early Childhood Special Education for Children Aged Birth to Three Years (3.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
Learning Disabilities

The professional development program in special education specializing in learning disabilities leads to K-12 classroom licensure and a M.Ed degree. It is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity, and meeting the needs of individual students who have learning disabilities. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with learning disabilities and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses

- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

Electives

Take 12 or more credit(s) from the following:

- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5514 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5627 - Seminar: Advanced issues in Learning Disabilities (3.0 cr)
- EPSY 5628 - Characteristics of Moderate to Severe Learning Disabilities (3.0 cr)
- EPSY 5629 - Strategic Instructional Methods for Students Academically At-Risk (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5707 - Practicum in Moderate to Severe Learning Disabilities (3.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5752 - Student Teaching: Learning Disabilities (1.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Emotional and Behavioral Disabilities

Note: New student applications to Emotional and Behavioral Disorders are not being accepted.

The professional development program in special education specializing in emotional and behavioral disorders leads to K-12 classroom licensure and a M.Ed. degree and is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity and meeting the needs of individual students who have emotional and behavioral disorders. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with emotional and behavioral disorders and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses

- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)
Electives
Take 12 or more credit(s) from the following:
- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5629 - Strategic Instructional Methods for Students Academically At-Risk (3.0 cr)
- EPSY 5656 - Advanced Issues in Emotional Behavior Disorders (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5658 - Characteristics of Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5708 - Practicum in Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5754 - Student Teaching: Social and Emotional Disabilities (1.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Emotional and Behavioral Disabilities Residency-Based
The professional development program in special education specializing in emotional and behavioral disorders leads to K-12 classroom licensure and a M.Ed. degree and is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity and meeting the needs of individual students who have emotional and behavioral disorders. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with emotional and behavioral disorders and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete required courses for a total of 30 credits. Additional credits (5-6) are required for adding licensure to degree.

Required Courses
Students take the following courses including one credit of EPSY 5991.
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5629 - Strategic Instructional Methods for Students Academically At-Risk (3.0 cr)
- EPSY 5637 - Core Practices in Special Education: Foundations of Special Education (1.0 cr)
- EPSY 5638 - Core Practices in Special Education: IEP Writing (1.0 cr)
- EPSY 5656 - Advanced Issues in Emotional Behavior Disorders (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5658 - Characteristics of Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
- EPSY 5708 - Practicum in Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
**Twin Cities Campus**

**Special Education M.Ed.**

*Educational Psychology*

**College of Education and Human Development**

Link to a list of faculty for this program.

**Contact Information:**
Department of Educational Psychology, 250 Educational Science Building, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax 612-624-8241)
Email: sped-adm@umn.edu
Website: [http://www.cehd.umn.edu/edpsych/Programs/SpecialEd/MEd-prospective.html](http://www.cehd.umn.edu/edpsych/Programs/SpecialEd/MEd-prospective.html)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 51
- This program requires summer semesters for timely completion.
- All instruction and practica related to the residency-based sub-plan in EBD are delivered off-campus. Traditional course instruction is delivered in a meeting room in one of the partner district buildings one night per week. Practica are located in public school settings of our partner districts in Federal Setting III and IV EBD classrooms and take place during regular school hours.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduates of the University of Minnesota special education teacher licensure programs are student-centered, collaborative professionals who deliver robust, high-quality, and specialized educational services, adding value to the learning and development of infants, children, and adults with disabilities from diverse cultural backgrounds.

Program graduates are knowledgeable in the following areas:
- Engaging in collaborative problem solving with families and professionals to meet the academic, social, behavioral, and life skills needs of individuals with disabilities;
- Implementing—and supporting others’ implementation of—evidence-based instruction and intervention with fidelity to improve student outcomes;
- Using reliable and valid assessment data to make individualized educational decisions;
- Systematically selecting and adapting instructional supports to meet individual needs, based on data and knowledge of individual learning, developmental, cultural differences;
- Maximizing expectations and learning opportunities for individuals with disabilities in the Least Restrictive using the full continuum of services; and
- Upholding principles of professionalism and ethics in their practice.

**Accreditation**

This program is accredited by NCATE/BOT, Council of Exceptional Children (CEC) and Council on Education of the Deaf (CED).

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
- Experience in working with children and/or people with disabilities is preferred.

**Special Application Requirements:**

The application deadline is March 1 for summer or fall admission.

Upload the following additional materials into the appropriate areas of the online application:
- One to two page applicant statement outlining goals, interests, experiences, etc.
- Résumé
- Two letters of recommendation [.pdf], preferably from individuals in the education field (for the online application, applicant's will be asked to enter recommenders' information into the online application; a message will be automatically sent to those recommenders with further instructions on how to submit their letters)
- MLTE Basic Skills Tests
- Unofficial transcripts from all collegiate institutions attended (Students who are accepted will need to send official transcripts in a sealed envelope. University of Minnesota graduates need not submit University of Minnesota transcripts to Student Services.)
- International applicants should submit a foreign transcript evaluation from an accredited reviewer (ECS http://www.ece.org/ or WES http://www.wes.org/students/index.asp)

International applicants must submit score(s) from one of the following tests:

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  - Internet Based - Total Score: 79
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  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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**Program Requirements**

**Plan C:** Plan C requires 30 to 51 major credits and 0 credits outside the major. The is no final exam. A capstone project is required.

**Capstone Project:** A portfolio and integrated paper/mini research project/comprehensive exam is required in conjunction with registration for EPSY 5690. The student and advisor will develop the individual's M.Ed. graduate plan.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

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**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

**Academic Behavioral Strategist**

Professional development in special education offers a program of study that leads to K-12 licensure as an Academic Behavior Strategist (ABS) and an M.Ed. degree. This degree is designed to prepare teachers to work in a variety of educational settings with students who have mild to moderate disabilities. Graduates of the program are student-centered, collaborative professionals who implement evidence-based instructional interventions with fidelity to improve learner outcomes. The program incorporates maximizing learner expectations and learning opportunities including cultural and social diversity. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with disabilities and their families.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPSY 5605</td>
<td>Collaborative Practices for the Special Educator (3.0 cr)</td>
</tr>
<tr>
<td>EPSY 5613</td>
<td>Foundations of Special Education I [DSJ] (3.0 cr)</td>
</tr>
<tr>
<td>EPSY 5614W</td>
<td>Assessment and Due Process in Special Education [WI] (3.0 cr)</td>
</tr>
<tr>
<td>EPSY 5616</td>
<td>Classroom Management and Behavior Analytic Problem Solving (3.0 cr)</td>
</tr>
<tr>
<td>EPSY 5618</td>
<td>Specialized Interventions for Students With Mild/Moderate Disabilities in Reading &amp; Written Language (3.0 cr)</td>
</tr>
<tr>
<td>EPSY 5631</td>
<td>Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)</td>
</tr>
<tr>
<td>EPSY 5690</td>
<td>Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)</td>
</tr>
</tbody>
</table>

**Electives**
Take 12 or more credit(s) from the following:
- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5741 - Student Teaching: Academic and Behavioral Strategist (3.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Autism Spectrum Disorder
Professional development in special education offers a program in Autism Spectrum Disorder (ASD) that leads to Birth-12 licensure and an M.Ed. degree. This degree is designed to prepare teachers to work in a variety of educational settings including home and school based programs with children who have been identified with ASD and their families. Graduates are prepared to assess, analyze, and provide intervention and remediation of academic, social and communicative challenges for students with ASD. This program focuses on the implementation of evidence-based practices, specialized educational services, and outcomes that add value to the learning and development of infants, children and adults with ASD from diverse cultural backgrounds.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses
- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

Electives
Take 12 or more credit(s) from the following:
- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5632 - Module 2: Evidence-based Methods for AAC Assessment and Intervention (2.0 cr)
- EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
- EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
- EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5742 - Student Teaching: Autism Spectrum Disorders (6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Deaf and Hard of Hearing
The deaf education program within special education leads to an M.Ed. degree with potential for MN Licensure with additional coursework. It is designed to prepare reflective educators to work with students (and their families) with diverse linguistic and cultural backgrounds. Our program philosophy focuses on providing students with an in depth understanding of advocacy, identity development, language and literacy development, and how to facilitate and assess development across ages and curricular areas giving equal value to ASL and English. The program will prepare graduates to have bilingual and bicultural competence along with the ability to demonstrate best practices and effective instructional strategies to meet the needs of individual learners; in addition, to engage in and value partnerships with deaf adults, parents, community and professional organizations.
For the M.Ed degree, students complete 30 credits: 15 credits required courses and 15-16 credits electives. Those interested in being prepared to apply for licensure, teaching children who are deaf and hard of hearing (Birth-Grade 12) need to take additional credits (25-30).

**Required Courses**

- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5641 - Foundations of Deaf Education (3.0 cr)
- EPSY 5654 - Current Research, Issues Trends in Deaf Education (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

**Electives**

Take 15 - 16 credit(s) from the following:

- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5642 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5643 - Seminar: Identity, Culture and Diversity in Deaf Education (2.0 cr)
- EPSY 5644 - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5645 - Deaf Plus: Educating and Understanding Deaf Students with Disabilities (1.0 cr)
- EPSY 5646 - Best Practices Teaching Reading and Writing for School Age: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5647 - Spoken Language Practices and Assistive Technology: Deaf and Hard of Hearing (2.0 cr)
- EPSY 5651 - Best Practices Teaching Content Areas: Deaf Education (3.0 cr)
- EPSY 5652 - Incorporating Academic ASL in the Classroom: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5653 - ASL/English Structure and Application (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5751 - Student Teaching for Deaf Education (1.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- CI 5404 - Multicultural Literature for Children and Adolescents (3.0 cr)
- CI 5417 - Elementary literacy Instruction for ESL Students (3.0 cr)
- OLPD 5005 - School and Society (2.0 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)

**Developmental Disabilities**

The professional development program in special education specializing in developmental disabilities leads to K-12 classroom licensure and a M.Ed. degree and is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity and meeting the needs of individual students who have developmental disabilities. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with developmental disabilities and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

**Required Courses**

- EPSY 5605 - Collaborative Practices for the Special Educator (3.0 cr)
- EPSY 5613 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

**Electives**

Take 12 or more credit(s) from the following:

- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
Early Childhood Special Education
The professional development program in special education specializing in early childhood special education (ECSE) leads to teaching licensure for work with children from birth through age five as well as a M.Ed. This program is designed to prepare teachers to work in a variety of educational settings, including home and school, with children who have a variety of developmental delays and disabilities.

The ECSE program philosophy focuses on cultural and social diversity and meeting the needs of individual children who have disabilities. Further, the ECSE program emphasizes the delivery of evidence-based practices within the natural routines of families and preschools when addressing the individualized needs of children. Graduates are prepared to assess, analyze, monitor, and problem solve the developmental and educational needs of young children and their families. With that, graduates of the ECSE program are prepared to be leaders in the field for the identification early intervention needs, provision of research-based services, and facilitation of successful transitions to kindergarten.

Students complete 30 credits: 17 credits required courses and 13 credits electives. Additional credits (25-30) are required for adding licensure to degree.

Required Courses
- EPSY 5609 - Family-centered Services (2.0 cr)
- EPSY 5615 - Foundations of Special Education I [DSJ] (3.0 cr)
- EPSY 5614W - Assessment and Due Process in Special Education [WI] (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5631 - Module 1 (3.0 cr)
- EPSY 5680 - Experimental Teaching Seminar: MEd Culminating Project (2.0 cr)

Electives
Take 13 or more credit(s) from the following:
- CPSY 5252 - Facilitating Social and Emotional Learning in Early Childhood Education (3.0 cr)
- CPSY 5253 - Facilitating Cognitive and Language Learning in Early Childhood Education (3.0 cr)
- CPSY 5254 - Facilitating Creative and Motor Learning in Early Childhood Education (2.0 cr)
- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
- EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
- EPSY 5682 - Education of Infants and Toddlers with Disabilities: Methods and Materials (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special ED Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5706 - Practicum in Moderate to Severe Developmental Disabilities (2.0 cr)
- EPSY 5707 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5755 - Student Teaching: Developmental Disabilities, Mild/Moderate (1.0 - 6.0 cr)
- EPSY 5756 - Student Teaching: Developmental Disabilities, Moderate/Severe (1.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
Learning Disabilities

The professional development program in special education specializing in learning disabilities leads to K-12 classroom licensure and a M.Ed. degree. It is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity, and meeting the needs of individual students who have learning disabilities. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with learning disabilities and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

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<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5613</td>
<td>Foundations of Special Education I [DSJ]</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5614W</td>
<td>Assessment and Due Process in Special Education [WI]</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5616</td>
<td>Classroom Management and Behavior Analytic Problem Solving</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5618</td>
<td>Specialized Interventions for Students With Mild/Moderate Disabilities in Reading &amp; Written Language</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5631</td>
<td>Module 1: Introduction to Augmentative and Alternative Communication</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>EPSY 5690</td>
<td>Experimental Teaching Seminar: MEd Culminating Project</td>
<td>2.0 cr</td>
</tr>
</tbody>
</table>

**Electives**

Take 12 or more credits from the following:

- OLPD 5005 - School and Society (2.0 cr)
- CI 5307 - Technology for Teaching and Learning (1.5 cr)
- OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
- EPSY 5627 - Seminar: Advanced issues in Learning Disabilities (3.0 cr)
- EPSY 5628 - Characteristics of Moderate to Severe Learning Disabilities (3.0 cr)
- EPSY 5629 - Strategic Instructional Methods for Students Academically At-Risk (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
- EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
- EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
- EPSY 5707 - Practicum in Moderate to Severe Learning Disabilities (3.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- EPSY 5752 - Student Teaching: Learning Disabilities (1.0 - 6.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

Emotional and Behavioral Disabilities

The professional development program in special education specializing in emotional and behavioral disorders leads to K-12 classroom licensure and a M.Ed. degree and is designed to prepare teachers to work in a variety of educational settings.

The program philosophy focuses on cultural and social diversity and meeting the needs of individual students who have emotional and behavioral disorders. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for students with emotional and behavioral disorders and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30 credits: 18 credits required courses and 12 credits electives. Additional credits (25-30) are required for adding licensure to degree.

**Required Courses**

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</tr>
<tr>
<td>EPSY 5613</td>
<td>Foundations of Special Education I [DSJ]</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5614W</td>
<td>Assessment and Due Process in Special Education [WI]</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5616</td>
<td>Classroom Management and Behavior Analytic Problem Solving</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5618</td>
<td>Specialized Interventions for Students With Mild/Moderate Disabilities in Reading &amp; Written Language</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EPSY 5631</td>
<td>Module 1: Introduction to Augmentative and Alternative Communication</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>EPSY 5690</td>
<td>Experimental Teaching Seminar: MEd Culminating Project</td>
<td>2.0 cr</td>
</tr>
</tbody>
</table>

**Electives**

Take 12 or more credits from the following:

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Information current as of August 31, 2018
• OLPD 5005 - School and Society (2.0 cr)
• CI 5307 - Technology for Teaching and Learning (1.5 cr)
• OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
• EPSY 5611 - Research-based Practices in Academic and Behavior Disabilities (3.0 cr)
• EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
• EPSY 5619W - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities [WI] (3.0 cr)
• EPSY 5629 - Strategic Instructional Methods for Students Academically At-Risk (3.0 cr)
• EPSY 5656 - Advanced Issues in Emotional Behavior Disorders (3.0 cr)
• EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
• EPSY 5658 - Characteristics of Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
• EPSY 5701 - Practicum: Field Experience in General Education - Inclusive Classrooms (1.0 - 2.0 cr)
• EPSY 5704 - Practicum: Special Education Field Experience in Middle and Secondary School Classrooms (1.0 - 2.0 cr)
• EPSY 5705 - Practicum: Special Ed Field Experience in Early Childhood SpEd (ECSE) & Elementary School Classrooms (1.0 - 2.0 cr)
• EPSY 5708 - Practicum in Moderate to Severe Emotional/Behavioral Disorders (3.0 cr)
• EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
• EPSY 5754 - Student Teaching: Social and Emotional Disabilities (1.0 - 6.0 cr)
• EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)
Twin Cities Campus
Specialist in Education and General Education Administration Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Certificate of Specialist in Educ/Genl Educ/Admin

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Applications to this certificate currently are not being accepted.

The Department of Organizational Leadership, Policy, and Development is a leader in advancing knowledge about educational and organizational change in local, national, and international contexts. Our research, teaching, and outreach reflect a commitment to interdisciplinary and intercultural engagement with educators, scholars, and policy makers seeking to enhance leadership, policy, and development around the globe. Students in the MA and PhD programs choose from one of five complementary but distinct program tracks: education policy and leadership (EPL), evaluation studies (ES), higher education (HE), comparative and international development education (CIDE), and Human Resource Development (HRD). Our undergraduate programs focus on human resource development and business and marketing education. In addition, the department offers a variety of programs for practicing professionals and various licensure programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Note: Applications to this certificate currently are not being accepted.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

This program's structure is currently under review. In the past, it has been customized based on the student's prior coursework. A final paper is required for completion.
Twin Cities Campus

Sport and Exercise Science M.Ed.
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Email: kin@umn.edu
Website: http://www.cehd.umn.edu/kin/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The sport and exercise science M.Ed. is a practitioner-oriented, graduate-level program designed to prepare students for or advance students in careers related to physical activity, such as sport coaching, athletic training, health promotion, fitness leadership, strength and conditioning coaching, personal training, and physical education teaching.

With guidance from faculty advisers, students choose at least 30-semester credits, which may include coursework, independent study, internships, workshops, and professional, site-based experiences. Students must maintain a minimum 3.0 GPA.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.50.

A bachelor's degree, preferably in kinesiology or physical education.

Special Application Requirements:
The department reviews applications on an ongoing basis. Application reviews for specific academic terms begin by the following dates:

- November 1: spring semester admission
- March 1: summer session admission
- July 1: fall semester admission

Admission requirements for this program include the following criteria:

A bachelor's degree, preferably in physical education or kinesiology, with a 2.50 minimum grade point average (GPA) from an accredited institution. Applicants who do not hold a degree in physical education or kinesiology may need to take some undergraduate prerequisite courses after admission.

All applicants must submit the following items:
- Online application from Apply Yourself
- Application fee
- Unofficial transcripts of all previous post-secondary academic study must be uploaded to the application (official transcripts will be required if accepted)
- Personal statement describing career goals and rationale for interest in the program
- Resume

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21

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Information current as of August 31, 2018
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

\[ \text{IELTS} \]
- Total Score: 6.5
- Reading Score: 6.5
- Writing Score: 6.5

\[ \text{MELAB} \]
- Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 20 major credits and 10 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: See department for more details.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Required Courses

Students must consult with their advisor to determine their appropriate coursework. Students register for 3 credits of KIN 5995 and must consult with their advisor before registering for the course.

KIN 5181 - Understanding Kinesiology Research (3.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)

Elective Courses

Students take a minimum of 14 credits of KIN electives from the list below, and a minimum of 10 additional credits from KIN or non-KIN courses. Students consult with their advisor before registering for electives. Up to 9 4xxx level credits are allowed to meet M.Ed. requirements.

KIN 4214 - Health Promotion (3.0 cr)
or KIN 4385 - Exercise Physiology (4.0 cr)
or KIN 4641 - Training Theory & Analytics I for Sport Performance (3.0 cr)
or KIN 4741 - Training Theory & Analytics 2 for Sport Performance (3.0 cr)
or KIN 5122 - Applied Exercise Physiology (3.0 cr)
or KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)
or KIN 5126 - Social Psychology of Sport & Physical Activity (3.0 cr)
or KIN 5136 - Psychology of Coaching (3.0 cr)
or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
or KIN 5142 - Applied Nutrition for Sport Performance and Optimal Health (3.0 cr)
or KIN 5202 - Current Issues in Health (2.0 cr)
or KIN 5203 - Health Media, Consumerism, and Communication (2.0 cr)
or KIN 5371 - Sport and Society (3.0 cr)
or KIN 5375 - Youth Sport Science (3.0 cr)
or KIN 5385 - Exercise for Healthy Aging & Disease Prevention and Management (3.0 cr)
or KIN 5441 - Applied Sport Science Research (3.0 cr)
or KIN 5585 - Pediatric Physiology and Health: Concepts and Applications (2.0 cr)
or KIN 5641 - Scientific Theory and Application of Training and Conditioning in Sport (3.0 cr)
or KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
or KIN 5696 - Practicum in Kinesiology (1.0 - 6.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 5723 - Psychology of Sport Injury and Rehabilitation (3.0 cr)
or KIN 5841 - Elite Performance and Environmental Considerations (3.0 cr)
or KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)
or KIN 6126 - Sports Medicine Psychology (3.0 cr)
Twin Cities Campus

Sport Management M. A.

Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 1900 University Avenue SE, Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700)
Email: kin@umn.edu
Website: http://cehd.umn.edu/kin

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of arts in sport management provides academic excellence by combining theoretical instruction and practical experience to prepare tomorrow's leaders for success in the sports industry and marketplace. Students develop the tools of research and learn core concepts through an interdisciplinary curriculum with an emphasis on cultivating new ideas and improving operations in the sport industry.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must submit a University of Minnesota application which includes a written statement of academic interests, goals, and objectives; scores from the General Test of the GRE (verbal, quantitative, and analytical writing) or the GMAT (verbal, quantitative, and analytical writing) that are less than five years old; three letters of recommendation from persons familiar with their scholarship and research potential; a scholarly writing sample; and transcripts. Submission of all application materials by December 1 is strongly encouraged to ensure priority consideration for admission and for teaching and research assistantships awarded for the next academic year. Students are admitted for the fall semester.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4.5
- GMAT
  - Verbal section score: 33
  - Quantitative section score: 44
  - Analytical writing assessment score: 5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 26 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 36 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is an independent research project with the advisor that meets the following guidelines: involves a total of approximately 120 hours of work; demonstrates familiarity with the tools of research and scholarship in the field of sport management; demonstrates the ability to work independently; demonstrates the ability to effectively present the results of the investigation.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with advisor approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Core Coursework (16 Credits)

KIN 5421 - Sport Finance (3.0 cr)
KIN 5631 - Programming and Promotion in Sport (3.0 cr)
KIN 5601 - Sport Management Ethics and Policy (3.0 cr)
KIN 5725 - Organization and Management of Physical Education and Sport (3.0 cr)
KIN 5801 - Legal Aspects of Sport and Recreation (4.0 cr)

Required Research Course (3 Credits)

KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)

Required Research Analysis Course (3 Credits)

Take one research analysis course for 3 credits from the following list, or consult with advisor for an alternative course.

CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
EPSY 5261 - Introductory Statistical Methods (3.0 cr)
EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
FSOS 8013 - Qualitative Family Research Methods (3.0 cr)

Electives (4 to 10 Credits)

Plan A students take at least 4 credits, and Plan B students take at least 10 credits from the following list, in consultation with the advisor. Registration for KIN 5992, KIN 5995, and KIN 5720 is limited to 3 credits.

KIN 5371 - Sport and Society (3.0 cr)
KIN 5375 - Youth Sport Science (3.0 cr)
KIN 5461 - Issues in the Sport Industry (3.0 cr)
KIN 5511 - Sport and Gender (3.0 cr)
KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)
MKTG 6088 - Strategic Marketing (2.0 cr)

Plan Options

Plan A

Take 10 master's thesis credits.

KIN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Take KIN 8995 for 4 credits.

KIN 8995 - Research Problems in Kinesiology (1.0 - 12.0 cr)
Twin Cities Campus
Sport Management M.Ed.
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The sport management master of education (MEd) is a practitioner-oriented, graduate-level program designed to prepare students for advanced study or careers in sport administration, sport management, or sport and fitness related professions. With guidance from professional program advisers, students choose at least 30 semester credits, which may include coursework, independent study, internships, workshops, and professional site-based experiences. Required courses will provide students with a well-balanced perspective of the industry; multiple options in elective courses allow students to focus on topics they find applicable and interesting in relation to the sport and physical activity industry. Students must maintain a minimum 3.0 GPA.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.50.

A bachelor's degree, preferably in kinesiology or physical education.

Special Application Requirements:
The college reviews applications on an ongoing basis. Application reviews for specific academic terms begin by the following dates:
- November 1: spring semester admission
- March 1: summer session admission
- July 1: fall semester admission

Admission requirements for this program include the following criteria:

A bachelors degree, preferably in physical education or kinesiology, with a 2.50 minimum grade point average (GPA) from an accredited institution. Applicants who do not hold a degree in physical education or kinesiology may need to take some undergraduate prerequisite courses after admission.

All applicants must submit the following items:
- Online application from Apply Yourself
- Application fee ($75 for U.S. applicants; $95 for international applicants)
- Unofficial transcripts of all previous post-secondary academic study must be downloaded to the application (official transcripts will be required if accepted)
- Personal statement describing career goals and rationale for interest in the program
- Resume

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
- Writing Score: 6.5
  • MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 22 major credits and 8 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Students work with teaching faculty on this final project. It is recommended that students complete the project during the final semester of the program.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Departmental Core Courses

Students will complete a total of 30 credits, including 22 credits of core course requirements.

KIN 5421 - Sport Finance (3.0 cr)
KIN 5601 - Sport Management Ethics and Policy (3.0 cr)
KIN 5631 - Programming and Promotion in Sport (3.0 cr)
KIN 5725 - Organization and Management of Physical Education and Sport (3.0 cr)
KIN 5801 - Legal Aspects of Sport and Recreation (4.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)

Take either KIN 5181 or KIN 5981 in consultation with adviser.

  KIN 5181 - Understanding Kinesiology Research (3.0 cr)
  or KIN 5981 - Research Methodology in Kinesiology and Sport Management (3.0 cr)

Elective Courses

In consultation with advisor, students select elective courses for a minimum of 8 credits. It is highly recommended that electives be selected from the following list. One course may be selected from outside kinesiology, such as from the Department of Organizational Leadership, Policy and Development, or Carlson School of Management. KIN 5461 is required for students without baseline knowledge of sport management. KIN 5720 is limited to 3-4 credits.

KIN 5371 - Sport and Society (3.0 cr)
or KIN 5461 - Issues in the Sport Industry (3.0 cr)
or KIN 5511 - Sport and Gender (3.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 5804 - National Collegiate Athletic Association (NCAA) Compliance (2.0 cr)
or KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)
or MBA 6240 - Competing in a Data-Driven Digital Age (2.0 cr)
or MBA 6300 - Strategic Management (3.0 cr)
or PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
Twin Cities Campus
Sport Management Minor
Kinesiology, School of
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 1900 University Avenue S.E., Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700)
Email: kin@umn.edu
Website: http://cehd.umn.edu/kin

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Sport management is an interdisciplinary field that provides students with academic training and field experience for careers in sport and fitness management professions. The sport management program encompasses many different subjects, including sociology, business, marketing, communications, and psychology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Take at least 6 sport management course credits, selected in consultation with the major advisor and the School of Kinesiology director of graduate studies, for the master's-level minor.

Doctoral
Take at least 12 sport management credits, selected in consultation with the major advisor and the School Kinesiology director of graduate studies, for the doctoral-level minor.
**Twin Cities Campus**

Talent Development and Gifted Education Postbaccalaureate Certificate

*Educational Psychology*

*College of Education and Human Development*

Link to a list of faculty for this program.

**Contact Information:**
Department of Educational Psychology, 56 East River Road, Minneapolis, MN 55455 (612-624-6083; fax: 612-624-8241)
Email: psyf-adm@umn.edu
Website: [http://www.cehd.umn.edu/edpsych](http://www.cehd.umn.edu/edpsych)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Talent Development/Gifted Education PBac Cert Grad

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This 12-credit certificate program is intended to give teachers, administrators, education professionals, and other individuals with an interest in the education of gifted and talented students the opportunity to obtain the knowledge and skills necessary to develop, implement, and supervise programs in the education of gifted and talented students.

**Program Delivery**

This program is available:
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

**Prerequisites for Admission**

**Special Application Requirements:**
Applicants to this post-baccalaureate certificate must have completed a bachelor's degree from an accredited institution. Student applications will be reviewed by a committee of individuals affiliated with the program. Detailed application instructions are available at the Educational Psychology website under the certificates link. Applications are accepted year-round.

Applicants must submit the following application materials:
- Unofficial transcripts from all post-secondary institutions attended or currently attending, including the University of Minnesota. Transcripts can be uploaded directly into the Apply Yourself online application system (see Educational Psychology's program website).
- For coursework completed outside of the United States, transcripts must be evaluated by a professional credential evaluation center. Request a "course-by-course" evaluation. This process can take 4-6 weeks; please plan accordingly. Students can use any provider that is an accredited member of the National Association of Credential Evaluation Services (NACES). A suggested provider is Educational Credential Evaluators (ECE), P.O. Box 514070, Milwaukee, WI 53203-3470 (414-289-3400, fax: 414-289-3411).
- Answer the following certificate-specific questions on a separate sheet of paper and upload into the online application system: 1) Why are you interested in the talent development and gifted education certificate program? 2) What are your primary areas of interest related to talent development and gifted education?

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Required Courses**

- EPSY 5991 should be taken for 3 credits.
- EPSY 5101 - Intelligence and Creativity (3.0 cr)
- EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
- EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

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Information current as of August 31, 2018
Elective course
One course (minimum 3 credits) selected with the approval of the certificate program director. Examples include coursework in learning and cognition, social psychology of education, measurement, or coursework in another discipline such as curriculum and instruction, educational administration, child development, or psychology.
Twin Cities Campus
Teaching M.Ed.
Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://www.cehd.umn.edu/ci

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 32 to 55
- This program requires summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of education (MEd)/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with the Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

Accreditation
This program is accredited by Minnesota Board of Teaching and the NCATE (National Council for Accreditation of Teacher Education).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Each program area has a subset of prerequisite courses. A transcript review is recommended to be completed before applying in order to determine if an applicant is ready to apply or should continue to work on additional prerequisite coursework. Unofficial transcript(s) can be submitted for evaluation to the attention of the appropriate C&I MEd advisor. Students with international coursework must arrange for a transcript evaluation from a foreign transcript evaluation service.

When ready to apply, applicants must submit the following materials in the online application system:
Upload unofficial transcripts from all schools attended, even if a degree was not earned.
Upload resume
Upload essay
Upload one letter of recommendation
Upload extenuating circumstances statement (if applicable)
Upload TOEFL/IELTS/MELAB score (if applicable)

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 32 to 55 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: For specific language sub-plans only

A minimum GPA of 2.80 is required for students to remain in good standing.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may complete the program with more than one sub-plan.

Arts in Education

This sub-plan is limited to students completing the program under Plan C.

The arts in education initial licensure program at the University of Minnesota is designed to help students become inquiring, analytical, and reflective professional educators who can help all students understand and appreciate visual art, theatre and dance. The program seeks to develop thoughtful practitioners who are enthusiastic about and prepared for leadership roles in the schools.

Master of education (MEd)/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

The teaching MEd arts in education sub-plan requires a minimum of 32 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

Arts in Education

Total: 32 credits

Summer session

1 additional credit will be required during the summer session to meet licensure requirements by all Visual Arts, Dance and Theatre students by the Minnesota Department of Education. In addition, theatre students will take TH 5183 in the summer session to meet licensure requirements by the Minnesota Department of Education.

CI 5049 - Digital Media & Technology Integration: Arts Education Theory & Practice (3.0 cr)
CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)
CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)

Fall session

4 additional credits will be required during the fall session to meet licensure requirements by all Visual Arts, Dance and Theatre students by the Minnesota Department of Education.

CI 5065 - Improving Arts Programs in the Schools (3.0 cr)
CI 5069 - Curriculum Innovations in Arts Education (3.0 cr)
CI 5075 - The Social, Historical and Cultural Foundations of Arts Education (3.0 cr)
CI 5617 - Academic Language and English Learners I (1.0 cr)
CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Spring session
CI 5008 and CI 5452 should each be taken for 2 credits. 8 additional credits will be required during the spring session to meet licensure requirements by all Visual Arts, Dance and Theatre students by the Minnesota Department of Education.

**CI 5008 - Theory and Practice of Arts Teaching (1.0 - 2.0 cr)**
**CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)**
**CI 5618 - Academic Language and English Learners II (1.0 cr)**
**OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)**

**MED Completion Coursework**

CI 5050 should be taken for 3 credits.

CI 5050 - Issues in Art Education (1.0 - 4.0 cr)

**Elementary**

This sub-plan is limited to students completing the program under Plan C.

The elementary education initial licensure program is designed to help students become inquiring, analytical, and reflective professional educators who can help students succeed in school. The program also seeks to develop thoughtful practitioners who are enthusiastic about and prepared for leadership roles in the schools.

The MED/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with the Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

The teaching MED elementary sub-plan requires a minimum of 54.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

The teaching MED elementary sub-plan for those who completed the University of Minnesota BS elementary education foundations degree, requires a minimum of 39 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**Elementary Education sub-plans**

**Elementary Education**

Total: 54.5 credits

**May session**

CI 5111 - Introduction to Elementary School Teaching (3.0 cr)
EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)

**Summer session**

1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.

CI 5307 - Technology for Teaching and Learning (1.5 cr)
CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
EPSY 5017 - Teaching Exceptional Students in General Education Classrooms (2.0 cr)
OLPD 5005 - School and Society (2.0 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)

**Fall session**

CI 5283 - Practicum: Applying Instructional Methods in the Elementary Classroom (3.0 cr)
CI 5425 - Reading Instruction in the Elementary Grades (3.0 cr)
CI 5426 - Language Arts Instruction in the Elementary Grades (3.0 cr)
CI 5502 - Science Instruction in the Elementary Grades (3.0 cr)
CI 5645 - Teaching English Learners in the Elementary Classroom (3.0 cr)
CI 5702 - Social Studies Instruction in the Elementary Grades (3.0 cr)
CI 5822 - Mathematics Instruction in the Elementary Grades (3.0 cr)

**Spring session**

CI 5285 - Clinical Experience in Elementary School Teaching (12.0 cr)
CI 5286 - Student Teaching Seminar: Elementary Education (3.0 cr)
CI 5287 - Capstone Project: Improvement of Teaching in Elementary and Pre-Kindergarten Schools (3.0 cr)

-OR-

**Elementary Education - U of M BS Degree Transitioners**

Total: 39 credits

**Fall session**

CI 5283 - Practicum: Applying Instructional Methods in the Elementary Classroom (3.0 cr)
CI 5425 - Reading Instruction in the Elementary Grades (3.0 cr)
CI 5426 - Language Arts Instruction in the Elementary Grades (3.0 cr)
CI 5502 - Science Instruction in the Elementary Grades (3.0 cr)
CI 5645 - Teaching English Learners in the Elementary Classroom (3.0 cr)
CI 5702 - Social Studies Instruction in the Elementary Grades (3.0 cr)
CI 5822 - Mathematics Instruction in the Elementary Grades (3.0 cr)

Spring session
CI 5285 - Clinical Experience in Elementary School Teaching (12.0 cr)
CI 5286 - Student Teaching Seminar: Elementary Education (3.0 cr)
CI 5287 - Capstone Project: Improvement of Teaching in Elementary and Pre-Kindergarten Schools (3.0 cr)

English
This sub-plan is limited to students completing the program under Plan C.

The English education initial licensure program is designed to develop inquiring, analytical, and reflective professional educators prepared to teach in the classroom and lead in the schools. These educators can help students succeed in mastering a wide range of written and spoken communication skills.

The MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

The teaching MEd English sub-plan requires a minimum of 39.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

English Education
Total: 39.5 credits

Summer session
1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.
CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)
EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)

Fall session
CI 5441 should be taken for 3 credits.
CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
CI 5441 - Teaching Literature in the Secondary School (2.0 - 3.0 cr)
CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
CI 5471 - Clinical Experience in Teaching Secondary English (3.0 cr)
CI 5617 - Academic Language and English Learners I (1.0 cr)
EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Spring session
8 additional credits will be required during the spring session to meet licensure requirements by the Minnesota Department of Education.
CI 5461 - Teaching Composition in the Secondary School (3.0 cr)
CI 5481 - Developments in Teaching English and Speech (3.0 cr)
CI 5618 - Academic Language and English Learners II (1.0 cr)
OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)

MEd Completion Coursework
If student chooses CI 5150, the course should be taken for 3 credits under the topic “Teaching Pop Music: Youth Music, Youth Culture”. If student chooses CI 5410, the course should be taken for 3 credits. If student chooses CI 5484, we recommend the student also take CI 5485.
Take 12 or more credit(s) from the following:
• CI 5150 - Curriculum Topics (3.0 cr)
• CI 5156 - Popular Culture, Teaching, and Learning (3.0 cr)
• CI 5404 - Multicultural Literature for Children and Adolescents (3.0 cr)
• CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
• CI 5422 - Teaching Writing in Schools (3.0 cr)
• CI 5442 - Literature for Adolescents (3.0 cr)
• CI 5462 - Evaluating and Assessing Writing (3.0 cr)
• CI 5464 - The Politics of Literacy and Race in Schools (3.0 cr)
• CI 5472 - Teaching Critical Media Analysis in Schools (3.0 cr)
Mathematics
This sub-plan is limited to students completing the program under Plan C.

The mathematics education initial licensure program at the University of Minnesota is designed to help students become accomplished professional mathematics educators, and inquiring, analytical, and reflective professional educators prepared to teach in the classroom and lead in the schools.

MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

The teaching MEd mathematics sub-plan requires a minimum of 34.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

Mathematics Education
Total: 34.5 credits

Summer session
1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.

CI 5307 - Technology for Teaching and Learning (1.5 cr)
EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)
EPSY 5017 - Teaching Exceptional Students in General Education Classrooms (2.0 cr)
MTHE 5011 - Arithmetic Structures in School Mathematics (3.0 cr)

Fall session
CI 5452 should be taken for 2 credits.
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
CI 5617 - Academic Language and English Learners I (1.0 cr)
MTHE 5021 - Algebraic Structures in School Mathematics (3.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Spring session
8 additional credits will be required during the spring session to meet licensure requirements by the Minnesota Department of Education.

MTHE 5031 - Geometric Structures in School Mathematics (3.0 cr)
OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5618 - Academic Language and English Learners II (1.0 cr)

MEd Completion Coursework

MTHE 5314 - Teaching and Learning Mathematics (3.0 cr)
MTHE 5366 - Technology-Assisted Mathematics Instruction (3.0 cr)
MTHE 5993 - Directed Studies in Mathematics Education (2.0 cr)

Elective
A minimum of three elective credits is required from the following list.

Take 1 or more course(s) totaling 3 or more credit(s) from the following:

• MTHE 5155 - Rational Number Concepts and Proportionality (3.0 cr)
• MTHE 5171 - Teaching Problem Solving (3.0 cr)
• MTHE 5172 - Teaching Probability and Statistics (3.0 cr)

Science
This sub-plan is limited to students completing the program under Plan C.

Science teachers are in high demand, and this program will prepare students to step into the classroom with confidence. The college offers a solid mix of theory and practice, as well as all of the resources that come with studying at a top research institution.

MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.
The teaching MEd science sub-plan requires a minimum of 39.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**Science Education**

**Total:** 39.5 credits

**Summer session**

1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.

- **CI 5530 - Secondary Science Methods I (3.0 cr)**
- **EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)**
- **EPSY 5017 - Teaching Exceptional Students in General Education Classrooms (2.0 cr)**

**Fall session**

- **CI 5452 should be taken for 2 credits.**
- **CI 5307 - Technology for Teaching and Learning (1.5 cr)**
- **CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)**
- **CI 5531 - Secondary Science Methods II (3.0 cr)**
- **CI 5541 - Teaching History and Nature of Science (3.0 cr)**
- **CI 5596 - Clinical Experience in Middle School Science (4.0 cr)**
- **CI 5617 - Academic Language and English Learners I (1.0 cr)**
- **OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)**
- **OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)**

**Spring session**

8 additional credits will be required during the spring session to meet licensure requirements by the Minnesota Department of Education.

- **CI 5532 - Secondary Science Methods III (3.0 cr)**
- **CI 5618 - Academic Language and English Learners II (1.0 cr)**
- **OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)**

**MEd Completion Coursework**

No more than 3 credits of CI 5540 can be taken without faculty advisor approval. If student takes CI 5551, student must also take CI 5552. CI 5539 is equivalent to CI 5551/5552. No courses outside of this list will be approved unless exceptional circumstances exist. Take 9 or more credit(s) from the following:

- **CI 5533 - Current Developments in Science Teaching (3.0 cr)**
- **CI 5535 - Foundations of Science Education (3.0 cr)**
- **CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)**
- **CI 5538 - Action Research in Science Education (3.0 cr)**
- **CI 5540 - Special Topics: Science Education (1.0 - 4.0 cr)**
- **CI 5551 - Reflecting on Science Classroom Practices I (1.5 cr)**
- **CI 5552 - Reflecting on Science Classroom Practices II (1.5 cr)**

**Second Language Education**

This sub-plan is limited to students completing the program under Plan C.

The Second Language Education (SLE) initial licensure program at the University of Minnesota is designed to help enrolled students become accomplished professional second language educators for grades K-12. The program integrates the fields of world languages and English as a Second Language (ESL), enabling teachers from both fields to learn from each other. Theory and practice are also linked through concurrent coursework and student teaching, a nationally recognized approach to teacher education.

Native speakers of English who are seeking licensure in a world language must demonstrate proficiency in that language. The following licensure options are available: Arabic, Chinese, French, German, Greek, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Russian, Spanish, and Swedish. Candidates must have advanced proficiency in the language and an understanding of the formal aspects of the language, such as grammar and writing. Nonnative speakers of Arabic, Mandarin Chinese, French, German, Greek, Hebrew, Italian, Japanese, Norwegian, Russian, Spanish, or Swedish who are seeking a K-12 license in any of these languages must obtain a score of at least “advanced low” on the Oral Proficiency Interview (OPI).

The teaching MEd English as a Second Language (ESL) focus area requires a minimum of 36.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

The teaching MEd world language focus area requires a minimum of 33.5 credits. Students will follow the listed curriculum with the exception of CI 5646. In addition to the courses already listed, students also have the option of taking CI 5619 and CI 5658 under the "MEd Completion Coursework" portion of the degree. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

Students seeking two language licenses will have additional credit requirements beyond what is listed.
Second Language Education

Summer session
CI 5452 and CI 5631 should each be taken for 1 credit. 1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.

CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (1.0 - 3.0 cr)
EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Fall session
CI 5631 will be required again in Fall session, this time for 2 credits. 6-8 additional credits, dependent upon language license area, will be required during the spring session to meet licensure requirements by the Minnesota Department of Education.

CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5626 - English Grammar for ESL Teachers (3.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Spring session
6-8 additional credits, dependent upon language license area, will be required during the spring session to meet licensure requirements by the Minnesota Department of Education. Additionally, another 3 credits will be required during the May session for students seeking state licensure in world languages in order to meet licensure requirements by the Minnesota Department of Education.

CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)

MEd Completion Coursework

If student chooses to take CI 5636, we recommend the student also take CI 5637. If student chooses to complete CI 5660, it should be taken for 3 credits.

Take 3 or more credit(s) from the following:

• CI 5636 - Problems of Practice in Second Language Education: Seminar for Early Career Language Teachers Part 1 (1.5 cr)
• CI 5637 - Problems of Practice in Second Language Education: Seminar for Early Career Language Teachers Part 2 (1.5 cr)
• CI 5641 - Language, Culture, and Education (3.0 cr)
• CI 5648 - Advanced Practices in Teaching Academic Language (3.0 cr)
• CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
• CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Second Language Education for Working Professionals

This sub-plan is limited to students completing the program under Plan C.

The Second Language Education (SLE) for working professionals initial licensure post-baccalaureate program at the University of Minnesota is designed for practicing teachers in the areas of ESL and/or any of the 14 world languages available for licensure through the state of Minnesota. This part-time program provides educators with the specific knowledge base and skill set needed to be a K-12 teacher of ESL or a world language.

The teaching MEd English as a second language (ESL) focus area requires a minimum of 38.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

The teaching MEd world languages focus area requires a minimum of 31.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

Students seeking two language licenses will have additional credit requirements beyond what is listed.

ESL or World Languages

SLE Working Professionals - ESL

M.Ed. Required Coursework
CI 5452 should be taken for 1 credit
PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)
OLPD 5005 - School and Society (2.0 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)

**Special Education focus**
Choose either EPSY 5017 for 2 credits, or EPSY 5015 + EPSY 5016
Take exactly 2 credit(s) from the following:
- EPSY 5017 - Teaching Exceptional Students in General Education Classrooms (2.0 cr)
- EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)

**Psychology focus**
Choose either EPSY 5001 + CPSY 5301 or CI 5163 + CI 5164
Take exactly 2 course(s) totaling 3 - 6 credit(s) from the following:
- EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)
- CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
- CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
- CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)

**Additional Required Experiences/Coursework**
100 hours of experience in schools across elementary, middle and high school language classrooms which must be completed before practicum and student teaching. Credit hours allotted to CI 5697 and student teaching course will depend on the teacher candidates current teaching position.
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5642 - Assessing English Learners (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5662 - Second Language Curriculum Design (3.0 cr)
CI 5697 - Practicum: ESL in the Elementary School (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

-OR-

**SLE Working Professionals - World Languages**

**MEd Required Coursework**
CI 5452 should be taken for 1 credit
PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)
OLPD 5005 - School and Society (2.0 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)

**Special Education focus**
Choose either EPSY 5017 for 2 credits, or EPSY 5015 + EPSY 5016
Take exactly 2 credit(s) from the following:
- EPSY 5017 - Teaching Exceptional Students in General Education Classrooms (2.0 cr)
- EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)

**Psychology focus**
Choose either EPSY 5001 + CPSY 5301 or CI 5163 + CI 5164
Take exactly 2 course(s) totaling 3 - 6 credit(s) from the following:
- EPSY 5001 - Learning, Cognition, and Assessment (3.0 cr)
- CPSY 5301 - Advanced Developmental Psychology (3.0 cr)
- CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
- CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)

**Additional Required Experiences/Coursework**
100 hours of experience in schools across elementary, middle and high school language classrooms which must be completed before practicum and student teaching. Credit hours allotted to CI 5696 and student teaching course will depend on the teacher candidates current teaching position.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
CI 5656 - Teaching Literacy in Second Language Classrooms (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5662 - Second Language Curriculum Design (3.0 cr)
or CI 5624 - Content-based Language Instruction and Curriculum Development (2.0 cr)
If student chooses CI 5660, the topic must be "STARTALK for Mandarin Chinese" for 2 credits
CI 5621 - Culture as the Core in the Second Language Classroom (2.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)

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Social Studies
This sub-plan is limited to students completing the program under Plan C.

The social studies education initial licensure program is designed to help students become an inquiring, analytical, and reflective professional educators prepared to teach in grades 5-12 classrooms and lead in the schools. The program seeks to develop educators who are advocates for young people and the social studies, and can help youth to become thoughtful and active citizens in a culturally diverse, democratic society.

The MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching.

The teaching MEd social studies sub-plan requires a minimum of 32.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

Social Studies Education
Total: 32.5 credits

Summer session
CI 5452 should be taken for 2 credits. 1 additional credit will be required during the summer session to meet licensure requirements by the Minnesota Department of Education.
CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
CI 5741 - Introduction to Social Studies Education (3.0 cr)
CI 5743 - The Social Sciences and the Social Studies (3.0 cr)
EPSY 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)

Fall session
5 additional credits will be required during the fall session to meet licensure requirements by the Minnesota Department of Education.
CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)
CI 5617 - Academic Language and English Learners I (1.0 cr)
CI 5742 - Advanced Methods of Teaching the Social Studies (3.0 cr)
CI 5745 - Engaging Youth With Social Studies Texts (3.0 cr)
EPSY 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
OLPD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)

Spring session
7 additional credits will be required during the spring session to meet licensure requirements by the Minnesota Department of Education.
CI 5618 - Academic Language and English Learners II (1.0 cr)
CI 5744 - Seminar: Reflecting on Professional Development in Social Studies Education (3.0 cr)
OLPD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)

Elective
A minimum of three elective credits is required from the following list.
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
• CI 5746 - Global and Multicultural Education in the Secondary Classroom (3.0 cr)
• CI 5762 - Developing Civic Discourse in the Social Studies (3.0 cr)

Alternative Pathway: Elementary Education
This sub-plan is limited to students completing the program under Plan C.

The alternative pathway elementary education initial licensure program is designed to help students become inquiring, analytical, and reflective professional educators who can help students succeed in school. The program also seeks to develop thoughtful practitioners who are enthusiastic about and prepared for leadership roles in the schools. Alternative pathway MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous professional teacher preparation in accordance with the Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching. This Alternative Pathway to Teaching program is for designated cohorts with department approval.

Students must maintain a 2.8 GPA throughout their MEd program in addition to earning a C- or higher in each individual course.

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credits are required to complete this sub-plan. Required coursework includes 15 credits in common content area, 15 credits in elementary education track, and 6 elective credits selected in consultation with faculty advisor.

**Common Content Coursework**
- CI 5980 will be taken a total of four semesters; 1 credit each semester. CI 5452 should be taken for 1 credit.
- CI 5980 - Clinical Experiences for K-12 Teaching (1.0 - 4.0 cr)
- CI 5981 - Introduction to Equity-Based Pedagogy (1.0 cr)
- CI 5982 - Enacting Equity-Based Pedagogy (2.0 cr)
- CI 5983 - Equity-Based Pedagogy/Advocacy (1.0 cr)
- CI 5984 - Planning Design and Management (1.0 cr)
- CI 5985 - Academic Language and English Learners in the Content Areas (1.0 cr)
- CI 5986 - Foundations of Special Education (1.0 cr)
- CI 5987 - Child and Adolescent Development for Teaching, Learning, and Assessment (1.0 cr)
- CI 5988 - Clinical Experience: Improvement of Teaching (2.0 cr)
- CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)

**Elementary Education Coursework**
- CI 5211 - Elementary Education Content and Pedagogy I (4.0 cr)
- CI 5212 - Elementary Education Content and Pedagogy II (3.0 cr)
- CI 5213 - Elementary Education Content and Pedagogy III (3.0 cr)
- CI 5214 - Elementary Education Content and Pedagogy IV (3.0 cr)
- CI 5215 - Elementary Education Content and Pedagogy V (2.0 cr)

**Elective Coursework**
A minimum of six credits is required, selected in consultation with faculty advisor.

**Alternative Pathway: Secondary Mathematics**
- This sub-plan is limited to students completing the program under Plan C.

ALERT: the Teaching MEd degree program in Alternative Pathway: Secondary Mathematics is currently suspended. We are not accepting applications at this time.

The alternative pathway mathematics education initial licensure program at the University of Minnesota is designed to help students become accomplished professional mathematics educators, and inquiring, analytical, and reflective professional educators prepared to teach in the classroom and lead in the schools. alternative pathway MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching. This Alternative Pathway to Teaching program is for designated cohorts with department approval.

Students must maintain a 2.8 GPA throughout their MEd program in addition to earning a C- or higher in each individual course. 36 credits are required to complete this sub-plan. Required coursework includes 15 credits in common content area, 15 credits in secondary mathematics track, and 6 elective credits selected in consultation with faculty advisor.

**Common Content Coursework**
- CI 5980 will be taken a total of four semesters; 1 credit each semester. CI 5452 should be taken for 1 credit.
- CI 5980 - Clinical Experiences for K-12 Teaching (1.0 - 4.0 cr)
- CI 5981 - Introduction to Equity-Based Pedagogy (1.0 cr)
- CI 5982 - Enacting Equity-Based Pedagogy (2.0 cr)
- CI 5983 - Equity-Based Pedagogy/Advocacy (1.0 cr)
- CI 5984 - Planning Design and Management (1.0 cr)
- CI 5985 - Academic Language and English Learners in the Content Areas (1.0 cr)
- CI 5986 - Foundations of Special Education (1.0 cr)
- CI 5987 - Child and Adolescent Development for Teaching, Learning, and Assessment (1.0 cr)
- CI 5988 - Clinical Experience: Improvement of Teaching (2.0 cr)
- CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)

**Secondary Mathematics Coursework**
- CI 5811 - Introduction to Teaching Secondary Mathematics (4.0 cr)
- CI 5812 - Teaching Algebra (3.0 cr)
- CI 5813 - Teaching Geometry (3.0 cr)
- CI 5814 - Teaching and Learning Mathematics (3.0 cr)
- CI 5815 - Leadership in Mathematics Education (2.0 cr)

**Elective Coursework**
A minimum of six credits is required, selected in consultation with faculty advisor.

**Alternative Pathway: Secondary Science**
- This sub-plan is limited to students completing the program under Plan C.
ALERT: the Teaching MEd degree program in Alternative Pathway: Secondary Science is currently suspended. We are not accepting applications at this time.

Science teachers are in high demand, and this program will prepare students to step into the classroom with confidence, taking advantage of the college's solid mix of theory and practice, as well as all the resources that come with studying at a top research institution. Alternative pathway MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching. This alternative pathway to teaching program is for designated cohorts with department approval.

Students must maintain a 2.8 GPA throughout their MEd program in addition to earning a C- or higher in each individual course. 36 credits are required to complete this sub-plan. Required coursework includes 15 credits in common content area, 15 credits in secondary science track, and 6 elective credits selected in consultation with faculty advisor.

<table>
<thead>
<tr>
<th>Common Content Coursework</th>
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<tbody>
<tr>
<td>CI 5980 will be taken a total of four semesters: 1 credit each semester. CI 5452 should be taken for 1 credit.</td>
</tr>
<tr>
<td>CI 5980 - Clinical Experiences for K-12 Teaching (1.0 - 4.0 cr)</td>
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<tr>
<td>CI 5981 - Introduction to Equity-Based Pedagogy (1.0 cr)</td>
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<tr>
<td>CI 5982 - Enacting Equity-Based Pedagogy (2.0 cr)</td>
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<tr>
<td>CI 5983 - Equity-Based Pedagogy/Advocacy (1.0 cr)</td>
</tr>
<tr>
<td>CI 5984 - Planning Design and Management (1.0 cr)</td>
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<tr>
<td>CI 5985 - Academic Language and English Learners in the Content Areas (1.0 cr)</td>
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<tr>
<td>CI 5986 - Foundations of Special Education (1.0 cr)</td>
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<tr>
<td>CI 5987 - Child and Adolescent Development for Teaching, Learning, and Assessment (1.0 cr)</td>
</tr>
<tr>
<td>CI 5988 - Clinical Experience: Improvement of Teaching (2.0 cr)</td>
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<tr>
<td>CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)</td>
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<tr>
<th>Secondary Science Coursework</th>
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<tbody>
<tr>
<td>CI 5511 - Introduction to Secondary Science: Laboratory-based Instruction (4.0 cr)</td>
</tr>
<tr>
<td>CI 5512 - Secondary Science Methods: Understanding the Nature of Science (3.0 cr)</td>
</tr>
<tr>
<td>CI 5513 - Secondary Science Methods: Equity in Science Teaching (3.0 cr)</td>
</tr>
<tr>
<td>CI 5514 - Secondary Science Methods: The Science Learning Environment (2.0 cr)</td>
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<tr>
<td>CI 5515 - Secondary Science Methods: Developing Adaptive Expertise (3.0 cr)</td>
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<tr>
<th>Elective Coursework</th>
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<tbody>
<tr>
<td>A minimum of six credits is required, selected in consultation with faculty advisor.</td>
</tr>
</tbody>
</table>

Alternative Pathway: English as a Second Language
This sub-plan is limited to students completing the program under Plan C.

ALERT: the Teaching MEd degree program in Alternative Pathway: ESL is currently suspended. We are not accepting applications at this time.

The second languages and cultures education (SLC) initial licensure program at the University of Minnesota is designed to help enrolled students become accomplished professional second language educators for grades K-12. The program integrates the fields of world languages and English as a Second Language (ESL), enabling teachers from both fields to learn from each other. Theory and practice are also linked through concurrent coursework and student teaching— a nationally recognized approach to teacher education. Alternative pathway MEd/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with the Standards of Effective Practice for Teachers (SEPT) and content standards adopted by the Minnesota Board of Teaching. This alternative pathway to teaching program is for designated cohorts with department approval.

Students must maintain a 2.8 GPA throughout their MEd program in addition to earning a C- or higher in each individual course. 36 credits are required to complete this sub-plan. Required coursework includes 15 credits in common content area, 15 credits in English as a Second Language track, and 6 elective credits selected in consultation with faculty advisor.

<table>
<thead>
<tr>
<th>Common Content Coursework</th>
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<tbody>
<tr>
<td>CI 5980 will be taken a total of four semesters: 1 credit each semester. CI 5452 should be taken for 1 credit.</td>
</tr>
<tr>
<td>CI 5980 - Clinical Experiences for K-12 Teaching (1.0 - 4.0 cr)</td>
</tr>
<tr>
<td>CI 5981 - Introduction to Equity-Based Pedagogy (1.0 cr)</td>
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<tr>
<td>CI 5982 - Enacting Equity-Based Pedagogy (2.0 cr)</td>
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<tr>
<td>CI 5983 - Equity-Based Pedagogy/Advocacy (1.0 cr)</td>
</tr>
<tr>
<td>CI 5984 - Planning Design and Management (1.0 cr)</td>
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<tr>
<td>CI 5985 - Academic Language and English Learners in the Content Areas (1.0 cr)</td>
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</tbody>
</table>

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CI 5986 - Foundations of Special Education (1.0 cr)
CI 5987 - Child and Adolescent Development for Teaching, Learning, and Assessment (1.0 cr)
CI 5988 - Clinical Experience: Improvement of Teaching (2.0 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)

**English as a Second Language Coursework**
CI 5622 - Growing Learner Language: A Hands-On Approach to Developing the Language Learners Produce (2.0 cr)
CI 5611 - Principles of Linguistics (2.0 cr)
CI 5612 - ESL Methods for Multilingual Development (3.0 cr)
CI 5613 - Testing and Assessment for English Learners (3.0 cr)
CI 5614 - Curriculum and Materials Development for English Learners (3.0 cr)
CI 5615 - Academic English for English Learners: Planning, Assessment, Instruction (2.0 cr)

**Elective Coursework**
A minimum of six credits is required, selected in consultation with faculty advisor.
Teaching Writing and Critical Literacy Postbaccalaureate Certificate

Curriculum & Instruction
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Curriculum and Instruction, University of Minnesota, 125 Peik Hall, 159 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-4006; fax: 612-624-8277)
Email: CIinfo@umn.edu
Website: http://www.cehd.umn.edu/ci

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program requires summer semesters for timely completion.
- Degree: Teaching, Writing & Critical Literacy PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The certificate in teaching writing and critical literacy prepares preK-college educators to strengthen their skills and knowledge of current practice and research in the teaching of critical reading and writing (note that a university certificate program or certificate is distinct from a state certificate or certification).

Writing and reading complement one another, and their interconnectedness is critical to literacy instruction. This certificate will offer advanced knowledge of the teaching of literacy through a focused, rigorous program while developing practicing educators’ skills as teachers and writers in a supportive learning community.

Changing literacy needs of students from all socioeconomic and educational backgrounds demand highly qualified teachers of reading and writing at the K-12 and postsecondary levels. Educators must prepare K-12 students to meet testing requirements at the state and national levels. In addition, teachers must meet the increasing literacy needs that accompany Minnesota’s changing demographics of growing immigrant and English language learner (ELL) populations. Educators also must prepare students to communicate effectively by using new technologies.

The certificate program seeks to accomplish the following goals:
- Develop effective strategies for teaching the writing process to English-language learners and diverse populations, as well as reading and writing across the curriculum.
- Engage educators in current research about composition, reading, and learning theory.
- Create learning communities where educators reflect on their own teaching, reading, and writing.
- Give educators opportunities to learn from other practicing educators.

This program begins with a three-week, 3-credit Minnesota Writing Project (MWP) Invitational Institute and then extends to allow educators to choose from a wider range of courses from multiple University departments throughout the academic year.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A completed bachelor’s degree is required for admission.

Applicants must be licensed teachers or administrators. Non-licensed teachers may be admitted with faculty letters of recommendation if program space is available.

Special Application Requirements:
Applicants must submit transcripts from every college attended (even those where a degree wasn’t earned), scores from the TOEFL/IELTS/MELAB (if applicable), a resume, a goal statement that explains the relationship of courses and research to your
professional goals, and two letters of recommendation addressing your teaching accomplishments and potential for further study. Certificate applications are reviewed by the department three times per academic year: Fall, Spring and Summer.

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language. Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Core Courses (9 credits)**

- **CI 5463** - Minnesota Writing Project Annual Invitational Summer Institute (3.0 cr)

**Teaching Core**

Students must complete one of the following courses in the teaching of reading and/or writing.

- **CI 5422** - Teaching Writing in Schools (3.0 cr)
- **CI 5462** - Evaluating and Assessing Writing (3.0 cr)

**Directed Study**

3 credits of “directed study” will be taken in consultation with faculty adviser.

**Elective Courses (6 credits)**

Take 2 or more course(s) totaling 6 or more credit(s) from the following:

- **CI 5145** - Critical Pedagogy (3.0 cr)
- **CI 5177** - Practical Research (1.0 - 3.0 cr)
- **CI 5404** - Multicultural Literature for Children and Adolescents (3.0 cr)
- **CI 5410** - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
- **CI 5417** - Elementary literacy Instruction for ESL Students (3.0 cr)
- **CI 5442** - Literature for Adolescents (3.0 cr)
- **CI 5462** - Evaluating and Assessing Writing (3.0 cr)
- **CI 5475** - Teaching Digital Writing (3.0 cr)
- **CI 5641** - Language, Culture, and Education (3.0 cr)
- **CI 5656** - Teaching Literacy in Second Language Classrooms (3.0 cr)
- **CI 5660** - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)
- **ENGL 5790** - Topics in Rhetoric, Composition, and Language (3.0 cr)
- **LING 5001** - Introduction to Linguistics (4.0 cr)
- **LING 5461** - Conversation Analysis (3.0 cr)
- **LING 5990** - Topics in Linguistics (1.0 - 4.0 cr)
- **WRIT 5531** - Introduction to Writing Theory and Pedagogy (3.0 cr)
- **EPSY 5618** - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- **EPSY 5644** - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
- **EPSY 5646** - Best Practices Teaching Reading and Writing for School Age: Deaf and Hard of Hearing (3.0 cr)
- **EPSY 8116** - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- **EPSY 8117** - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
Twin Cities Campus

Undergraduate Multicultural Teaching and Learning Postbaccalaureate Certificate
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Ugrd Multicultural Tchng & Lrnng PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The post baccalaureate certificate in undergraduate multicultural teaching and learning aims to improve the quality of instruction and academic support for all undergraduates, particularly those who traditionally have been underprepared for and underserved in higher education. The required core courses are designed to provide opportunities to apply multicultural theory to practice and engage as reflective practitioners.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Special Application Requirements:
Students may apply to the undergraduate multicultural teaching and learning graduate certificate any time; there is no set application deadline. All applicants must complete the ApplyYourself online application and submit a personal statement. The personal statement should address: interest in the program; professional/academic or community qualifications; what the student will bring to the program, and; how completion of the certificate will build on the applicant's capacity to transform.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.
To obtain the undergraduate multicultural teaching and learning graduate certificate, students must take 3 core courses (9 credits) and 1 elective course (3 credits), for a minimum of 12 course credits. The 3 core courses are listed below. Contact the director of Graduate Studies for information regarding the 3-credit elective requirement.

Core Courses

CI 5105 - Increasing Access and Success in Undergraduate Classrooms (3.0 cr)
CI 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
OLPD 5712 - Multicultural Theories of College Student Development Applied to Teaching and Learning (3.0 cr)
Twin Cities Campus
Work and Human Resource Education M.Ed.
Organizational Leadership, Policy and Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Organizational Leadership, Policy, and Development, 206 Burton Hall, 178 Pillsbury Dr. SE, Minneapolis, MN 55455
(612-624-1006; fax: 612-624-3377)
Email: olpd@umn.edu
Website: http://www.cehd.umn.edu/olpd/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Admission to the Work and Human Resource Education (WHRE) MED program is currently suspended.

The Department of Organizational Leadership, Policy, and Development is a leader in advancing knowledge about educational and organizational change in local, national, and international contexts. The department's research, teaching, and outreach reflect a commitment to interdisciplinary and intercultural engagement with educators, scholars, and policy makers seeking to enhance leadership, policy, and development around the globe. Students in the MA and PhD programs choose from one of five complementary but distinct program tracks: education policy and leadership (EPL), evaluation studies (ES), higher education (HE), comparative and international development education (CIDE), and human resource development (HRD). Undergraduate programs focus on human resource development and business and marketing education. In addition, the department offers a variety of programs for practicing professionals and various licensure programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
Professional experience in a work and human resource education field or an undergraduate major in education with an appropriate content field.

Special Application Requirements:
Admission to the Work and Human Resource Education (WHRE) MED program are currently suspended.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements
Plan C: Plan C requires 17 to 21 major credits and 9 to 13 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The work and human resource education (WHRE) MEd program is not accepting new students at this time. Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.

Required Coursework

Two plans are offered:

Plan I is for licensed educators planning to pursue advanced professional study and requires a minimum of 17 semester credits of OLPD courses.

Plan II is for professionals seeking additional education and requires a minimum of 21 semester credits. Students must complete all Plan I requirements. However, the Plan II specialization area must include at least one methods of instruction course.

General Aspects
- OLPD 5806 - Philosophy and Practice of Career and Technical Education (2.0 cr)
- or OLPD 5811 - Education for Work (3.0 cr)
- or OLPD 5813 - Enhancing Work-based Learning Through Collaboration (2.0 cr)
- or OLPD 5823 - Work-Based Learning Policies (2.0 cr)

Specialization
- 8-12 credits of OLPD courses with advisor approval depending if Plan I or Plan II.

Research
- OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)

Students electing Plan II must take an advisor approved methods of instruction course.

Electives
- Up to 13 credits with advisor approval, a minimum of 6 credits must come from outside the OLPD department.

Integrating Project
- Students work with their faculty advisor to select specialization courses consistent with their professional goals, select the course(s) to meet the general aspects requirement, and design and complete the integrating project. The proposed program must be reviewed and approved by departmental faculty.

- OLPD 5893 - Directed Study in OLPD (1.0 - 4.0 cr)

Program Sub-plans

A sub-plan is not required for this program.

Students may complete the program with more than one sub-plan.

Comprehensive Work and Human Resource Education
- This sub-plan is limited to students completing the program under Plan C.

Rochester
- This sub-plan is limited to students completing the program under Plan C.

All subplans in this major use same curriculum. The work and human resource education (WHRE) MEd program is not accepting new students at this time. Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.

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Information current as of August 31, 2018
Information about degree requirements for current students can be found at http://www.cehd.umn.edu/olpd/grad-programs/.
Twin Cities Campus
Youth Development Leadership M.Ed.
School of Social Work
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Social Work, University of Minnesota, 105 Peters Hall, 1404 Gortner Avenue, St. Paul, MN 55108 (612-625-1220)
Email: pavlo002@umn.edu
Website: http://www.cehd.umn.edu/SSW/Graduate/ydl.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- N/A
- Degree: Master of Education

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Youth development leadership (YDL) understands leadership as a practice everyone does every day, regardless of age. You will be invited to reflect on your own leadership experiences within a learning community that includes fellow students, community practitioners, and faculty. You will learn about your own leadership, deepen your understanding of the young people you work with, and expand your connection within the larger youth work community both locally and globally. You will be invited to think critically about how communities often understand and respond to young people and work to create innovative interventions for young people in schools, community organizations, and the workplace that challenge these typical understandings and create opportunities for young people to fully flourish. How can we collaborate with young people when responding to the most pressing current issues and needs? What organizational structures and strategies support and sustain young people's authentic and meaningful involvement in inclusive, socially just, and equitable opportunities? How can organizations, schools, and communities transform to provide developmentally rich and meaningful opportunities for young people?

Utilizing the most current understanding of youth development joined to issues of inclusion, equity, and social justice, you will graduate with the necessary knowledge and skills to work collaboratively, think critically, and act intentionally to create sustainable opportunities for young people and to transform youth-serving organizations to better respond to all young people and the communities they live in.

The YDL M.Ed. emphasizes:
- A community-based model of positive youth development;
- Experiential learning models;
- Leadership and community building by encouraging consultation among faculty, professional youth workers, fellow students, and young people;
- Diverse, flexible, and interdisciplinary faculty and curriculum that provide an informed understanding of practices, policies, and ethics of youth development work;
- Positive professional development;
- Collaborative approach to learning;
- Interdisciplinary curriculum;
- Cohort of other youth work professionals, for supportive learning environment;
- Diverse faculty dedicated to healthy youth development and committed to helping students develop a course of study that meets their professional and personal needs and interests.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

A bachelor's degree from an accredited institution.
Other requirements to be completed before admission:
At least two years of experience working with youth.

**Special Application Requirements:**
All applicants must upload the following items to their online application in Apply Yourself:
- Résumé
- Personal statement describing career goals and rationale for interest in the M.Ed. program (limit two pages)
- Unofficial transcripts from all post-secondary institutions you have attended or are currently attending, including the University of Minnesota
- Letters of recommendation from at least two persons (e.g., administrators, colleagues, instructors) familiar with the applicant's performance who can attest to his or her capacity for youth development leadership
- Application fee, charged when the online application is submitted. Fee must be paid with a credit card.
Applications are accepted on a year-round basis.

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 21 major credits and 9 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** The portfolio is a demonstration and personal assessment of individual learning and leadership in youth development work and in the YDL program. Successful completion of the portfolio presentation to the student’s faculty committee of two or more faculty is the final requirement of the YDL program.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Required Coursework**

*NOTE: Students must take a total two credits of YOST 5960, in one credit increments, during their time in the program.*

- **YOST 5950** - Ways of Knowing in Youth Development Leadership: Using Research and Evaluation to Support Community (3.0 cr)
- **YOST 5952** - Everyday Lives of Youth (3.0 cr)
- **YOST 5954** - Experiential Learning: Pedagogy for Community and Classroom (3.0 cr)
- **YOST 5956** - Organizational Approaches to Youth Development (3.0 cr)
- **YOST 5958** - Community Context for Youth Development Leadership (3.0 cr)
- **YOST 5960** - Seminar in Youth Development Leadership (1.0 cr)
- **YOST 5962** - Leadership Field Experience: Youth Development (4.0 cr)

**Elective Credits**

9 or more 5xxx level elective credits must be selected with approval of faculty adviser.
Twin Cities Campus
Agricultural Education M.S.
Applied Economics
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Agricultural Education
146 Ruttan Hall
1994 Buford Ave.
St. Paul, MN 55108
Email: ageddgs@umn.edu
Website: http://ag-ed.cfans.umn.edu/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 45
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This Master's degree leads to an initial licensure in Agricultural Education. Master of Science (MS)/initial licensure programs are for individuals with bachelor's degrees who want to become licensed teachers. These graduate-level programs provide rigorous, professional teacher preparation in accordance with Standards of Effective Practice for Teachers (SEPT) and content standards of the Minnesota Board of Teaching.

The agricultural education initial licensure program at the University of Minnesota is designed to help students become accomplished professional educators who can help students succeed in the classroom. The program prepares inquiring, analytical, and reflective professional educators who can teach in the classroom and lead in the schools.

Students enter a 12 to 15-month program integrating educational theory with classroom practice. Working closely with experienced teachers, students observe firsthand the daily rewards and pressures of their profession.

Flexibility is an important advantage of this program. Students may enroll in any semester and are welcomed into the entire agriculture education program, building valuable professional support. A second advantage is that most program credits may be applied toward completion of the MS degree.

This program includes two components: initial licensure and the MS degree. After successfully completing licensure requirements and appropriate work experience, students are recommended for state licensure to teach agricultural education in grades 5-12.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.50.

Relevant professional experience and/or a relevant undergraduate major is required.

Other requirements to be completed before admission:
A minimum of 100 hours of experience in youth education.

Special Application Requirements:
In addition to other required materials, applicants must submit Statements #1 and #2, a résumé and two letters of recommendation from individuals who can attest to the applicant's potential in the field.

Admissions is done on a rolling basis with the following semester deadlines: March 1 (Summer), July 1 (Fall), and November 1 (Spring).
Applicants must submit their test score(s) from the following:
• NES Essential Academic Skills for Minnesota Teacher Licensure

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 30 to 45 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Courses must be taken A - F (unless only offered S/N) and students must earn a grade of C- or better.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Initial Licensure
This sub-plan is limited to students completing the program under Plan C.

In addition to the required coursework, content course credits are required for licensure. Students can take these courses as an undergrad prior to entering the program or enroll in these courses concurrently (totaling 39 credits).

Agricultural Science (4)
Animal Science (7)
Applied Economics and Agribusiness (6)
Food Science (3)
Natural Resources (3)
Plant Science (6)
Soil Science (4)
Technology [Ag Mechanics] (6)

General Psychology (3)

Agricultural Education Licensure Courses
AFEE 5111W - Agricultural Education: Methods of Teaching [WI] (4.0 cr)
AFEE 5112 - Agricultural Education Program Organization and Curriculum for Youth (3.0 cr)
AFEE 5114 - Agricultural Education Teaching Seminar (1.0 cr)
AFEE 5116 - Coordination of SAE Programs: Work-based Learning (2.0 cr)
AFEE 5118 - Strategies for Managing and Advising the FFA Organization (2.0 cr)
AFEE 5697 - Teaching Internship: School and Classroom Setting (2.0 cr)
AFEE 5698 - Teaching Internship (2.0 - 8.0 cr)
CI 4602 - English Learners and Academic Language (1.0 cr)
CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
CI 5307 - Technology for Teaching and Learning (1.5 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EPSY 4001 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5005 - School and Society (2.0 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)

Post-Licensure Courses
AFEE 5995 - Integrating Paper--Master of Education: Agricultural and Extension Education (1.0 - 5.0 cr)
AFEE 5220 - Special Topics in Agriculture Education and Extension (1.0 - 3.0 cr)
AFEE 5280 - Current Issues for the Beginning Agricultural Education Teacher (1.0 - 3.0 cr)
AFEE 5993 - Directed Study in Agricultural Education and Extension (1.0 - 4.0 cr)
Twin Cities Campus
Animal Sciences M.S.

Animal Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Animal Science, 305 Haecker Hall, 1364 Eckles Avenue, Saint Paul, MN 55108 (612-624-3491; fax: 612-625-5789)
Email: ansci@umn.edu
Website: http://www.ansci.umn.edu/graduate-program

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the Animal Sciences M.S. concentrate on one of the animal sciences emphasis areas: genetics; growth biology; nutrition; physiology; or production systems. Students have the option of tailoring their individual programs to include study in more than one emphasis area.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The Plan B project requires approximately 120 hours to complete. The nature and extent of the project is agreed
upon in advance by the student and faculty advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Plan A requires a minimum of 14 semester credits in the major and 6 credits in a designated minor or related field outside the major. Selection of courses to fulfill this requirement and development of the thesis project are primarily the responsibility of the student and faculty advisor. Students also must register for a minimum of 10 thesis credits.

Plan B requires a minimum of 30 credits, which must include 14 or more credits in the major area and at least 6 credits in one or more related fields outside the major. The balance of credits is chosen by agreement between the advisor and student. In addition to coursework, students must complete the Plan B capstone project, which requires approximately 120 hours. The nature and extent of the project is agreed upon in advance by the student and faculty advisor.

Ethics Requirement
All students are required to be trained in ethical issues in science. Please select one course from the list below to meet this requirement.

- ANSC 8134 - Ethical Conduct of Animal Research (3.0 cr)
- APEC 8901 - Graduate Seminar: MS & PhD (1.0 cr)
- APEC 8902 - Graduate Research Development Seminar (1.0 cr)
- APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- BBE 8001 - Seminar I (1.0 cr)
- BBE 8002 - Seminar II (1.0 cr)
- CONS 8001 - Conservation Biology Seminar (1.0 cr)
- ENT 8061 - Scientific Communication and Ethics (1.0 cr)
- FSCN 8318 - Current Issues in Food Science (2.0 cr)
- NUTR 8621 - Presentation Skills (1.0 cr)
- PLPA 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
- SOIL 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Seminar Requirement
All master's students are required to take 4 credits of AnSc 8510 Graduate Seminar

ANSC 8510 - Graduate Seminar (1.0 cr)
Twin Cities Campus

Animal Sciences Minor

Animal Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Animal Science, 305 Haecker Hall, 1364 Eckles Avenue, Saint Paul, MN 55108 (612-624-3491; fax: 612-625-5789)
Email: ansci@umn.edu
Website: http://www.ansci.umn.edu/GraduateProgram/index.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students pursuing the Animal Sciences minor concentrate on one of the animal sciences emphasis areas: genetics; growth biology; nutrition; physiology; or production systems. Students have the option of tailoring their minor to include study in more than one emphasis area.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Requirements are designed to fit the student's needs. A master's minor requires 6 credits in areas not closely related to the major; no more than 2 of these credits may be in research or special problems. A doctoral minor requires 12 credits in areas not closely related to the major; no more than 3 of these credits may be in research or special problems.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Minor Requirements
The AnSci program does not require specific courses for completion of the minor. The minor requires at least 6 credits of graduate-level courses to be chosen in consultation with the student's major adviser, the AnSci faculty member who will serve on the student's examination committee as the minor program representative, and the AnSci Director of Graduate Studies.

Doctoral
Minor Requirements
The AnSci program does not require specific courses for completion of the minor. The minor requires at least 12 credits of graduate-level courses to be chosen in consultation with the student's major adviser, the AnSci faculty member who will serve on the student's examination committee as the minor program representative, and the AnSci Director of Graduate Studies.
Twin Cities Campus
Animal Sciences Ph.D.
Animal Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Animal Science, 305 Haecker Hall, 1364 Eckles Avenue, Saint Paul, MN 55108 (612-624-3491; fax: 612-625-5789)
Email: ansci@umn.edu
Website: https://www.ansci.umn.edu/graduate-program

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the PhD program concentrate on one of the animal sciences emphasis areas: genetics, nutrition, physiology, or production systems. Students have the option of tailoring their program to include study in more than one emphasis area and to emphasize basic or applied science.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in agriculture or a biological field with training in biology, chemistry, physics, and mathematics is required.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.
This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Ethics Requirement**
All students are required to be trained in ethical issues in science. Please select one course from the list below to meet this requirement.
- ANSC 5091 - Research Proposals: From Ideas to Strategic Plans [WI] (3.0 cr)
- or ANSC 8134 - Ethical Conduct of Animal Research (3.0 cr)
- or APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- or ENT 8061 - Scientific Communication and Ethics (1.0 cr)
- or PLPA 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
- or SOIL 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- or WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

**Seminar Requirement**
All doctoral students are required to take 6 credits of AnSc 8510 Graduate Seminar

ANSC 8510 - Graduate Seminar (1.0 cr)

**Thesis Requirement**
All doctoral students are required to take 24 thesis credits of AnSc 8888 Graduate Seminar

ANSC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

**Major Coursework**
Students are required to take 15 to 17.5 credits in consultation with adviser.
**Twin Cities Campus**

**Applied Economics M.S.**

**College of Food, Agricultural and Natural Resource Sciences**

Link to a [list of faculty](#) for this program.

**Contact Information:**
Department of Applied Economics Graduate Program, 231 Ruttan Hall, 1994 Buford Avenue, Saint Paul, MN 55108-6040 (612-625-3777; fax: 612-625-6245)
Email: apecdgs@umn.edu
Website: [http://www.catalogs.umn.edu/grad/programs/g004.html](http://www.catalogs.umn.edu/grad/programs/g004.html)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The MS degree in applied economics prepares students for employment opportunities in the public and private sectors, and for further graduate study. This rigorous but flexible program includes core coursework in economic theory and quantitative methods, and offers opportunities for specialized coursework and research in all the fields of study offered by the program.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:

The following coursework is considered the minimum preparation for the MS program: micro and macroeconomic theory at the intermediate undergraduate level, statistics, two semesters of calculus, and introductory linear algebra. Additional coursework in economics, statistics, and math is highly desirable and recommended, especially for students who intend to apply for the doctoral program after completion of the MS degree.

**Special Application Requirements:**

Applicants must submit scores from the General Test of the GRE, three letters of recommendation from persons familiar with the applicant's scholarship and research potential, a complete set of college or university transcripts, and a clearly written statement of academic and career interests, goals, and objectives. For complete application instructions, visit the website: [http://www.apecgrad.umn.edu/Admissions/index.htm](http://www.apecgrad.umn.edu/Admissions/index.htm). Students should apply by the December deadline to ensure priority consideration for admissions and funding.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language.

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Information current as of August 31, 2018
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 to 16 major credits and 10 to 12 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: A project that demonstrates familiarity with the theoretical and empirical tools of economics. The Plan B project requires between 4 and 6 project credits (APEC 8793).

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

MS students are required to complete graduate-level courses in microeconomic theory, macroeconomic theory, and econometrics or statistics, and are required to participate in two 1-credit MS seminars. Both Plan A and Plan B require a minimum of 30 credits, 14 credits of which must be in the major field (APEC, ECON, or STAT classes). These 14 major field credits must include a minimum of 9 credits in applied economics (excluding thesis and special topics, independent study, and APEC 8901-02). Plan A requires 10 thesis credits. Plan B requires a 4- to 6-credit project.

Required Courses

All students must complete one course from each sub-group and both seminar courses, with a minimum of 11 credits. Courses must be taken A-F only excluding seminar.

Complete one of the courses from this group A-F only.

APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
or APEC 8211 - Econometric Analysis I (4.0 cr)
Complete one of the two 5XXX level courses or the 8XXX level series A-F only and a minimum of 3 credits.

APEC 5152 - Applied Macroeconomics: Income and Employment (3.0 cr)
or APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
or Must complete entire series A-F

ECON 8105 - Macroeconomic Theory (3.0 cr)
ECON 8106 - Macroeconomic Theory (2.0 cr)

Complete the 5XXX level course or the 8XXX level series A-F only and a minimum of 3 credits.

APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
or Must complete entire series A-F

APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
APEC 8901 - Graduate Seminar: MS & PhD (1.0 cr)
APEC 8902 - Graduate Research Development Seminar (1.0 cr)

Plan A
Electives

9 credits required (A-F only). 3 credits must be chosen from APEC, ECON, STAT (excluding STAT 5021, 5022, 5031). 6 credits may be chosen from APEC, ECON, STAT or a related field in consultation with advisor. All courses must be at 5XXX or 8XXX level. Recommended course APEC 5032.

10 credits required in APEC 8777.

APEC 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Electives

13 credits required (A-F only). 3 credits must be chosen from APEC, ECON, STAT (excluding STAT 5021, 5022, 5031). 6 credits may be chosen from APEC, ECON, STAT or a related field in consultation with advisor. All courses must be at 5XXX or 8XXX level. Recommended course APEC 5032.

Plan B Project

4 to 6 credits required in APEC 8793.

APEC 8793 - Master's Paper: Plan B Project (1.0 - 6.0 cr)
Joint- or Dual-degree Coursework: MS-Applied Economics/MBA
Student may take a total of 18 credits in common among the academic programs.
**Twin Cities Campus**

**Applied Economics Minor**

*Applied Economics*

*College of Food, Agricultural and Natural Resource Sciences*

Link to a list of faculty for this program.

**Contact Information:**
Department of Applied Economics Graduate Program, 231 Ruttan Hall, 1994 Buford Avenue, Saint Paul, MN  55108-6040 (612-625-3777; fax: 612-625-6245)
Email: apecdgs@umn.edu
Website: [http://www.catalogs.umn.edu/grad/programs/g004.html](http://www.catalogs.umn.edu/grad/programs/g004.html)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate study in applied economics requires an operational knowledge of economic theory and modern methods of quantitative analysis, as well as practical application in specialized fields of inquiry, which include consumer behavior; household economics; health economics; labor economics; policy analysis; production and marketing economics; resource and environmental economics; and trade and development economics.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

**Special Application Requirements:**
Courses for the minor must be approved by the director of graduate studies in the Applied Economics Graduate Program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

The Director of Graduate Studies must approve minor coursework.
Courses must be taken at the 5XXX or 8XXX level.

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Masters**
At least 9 credits of 5xxx or 8xxx coursework in applied economics, approved by the applied economics director of graduate studies, are required. All courses in the minor must be taken A-F and completed with a GPA of 3.00 or higher.

**Doctoral**
At least 15 credits of 5xxx or 8xxx courses in applied economics, approved by the applied economics director of graduate studies, are...
required. All courses in the minor must be taken A-F and completed with a GPA of 3.00 or higher.
Twin Cities Campus

Applied Economics Ph.D.

Applied Economics
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Applied Economics Graduate Program, 231 Ruttan Hall, 1994 Buford Avenue, Saint Paul, MN 55108-6040 (612-625-3777; fax: 612-625-6245)
Email: apecdas@umn.edu
Website: https://www.apec.umn.edu/graduate-program

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48 to 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD degree program in applied economics prepares students for careers in academia, government, and the private sector. This rigorous program includes core coursework in economic theory, quantitative methods, and two fields of specialization selected from the following: consumer behavior and household economics; production and marketing economics; trade and development economics; natural resource and environmental economics; health economics; labor economics; and policy analysis.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The minimum preferred undergraduate GPA for admittance to the program is a B average (3.00/4.00). Most admitted students will have a higher GPA.

Other requirements to be completed before admission:
Applicants for the PhD degree should have completed an MS degree in economics, agricultural economics, or a related field; or have equivalent coursework and research experience. Applicants without a master's degree are, except in a few special cases, considered for admission into the MS program.

Prior training should include micro- and macro-economic theory at the master's level, multivariate calculus, differential equations and linear algebra, and mathematical statistics. Students lacking background in economics or quantitative methods may be required to complete additional coursework before entering the program.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE, three letters of recommendation from persons familiar with the applicant's scholarship and research potential, a complete set of college or university transcripts, and a clearly written statement of academic and career interests, goals, and objectives. For complete application instructions, visit the website: http://www.apecgrad.umn.edu/Admissions/index.htm. Students should apply by the December deadline to ensure priority consideration for admissions and funding.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

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Information current as of August 31, 2018
Paper Based - Total Score: 550

IELTS
- Total Score: 6.5

MELAB
- Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

24 to 42 credits are required in the major.

0 credits are required outside the major.

24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Most students take at least 42 credits of coursework and must take 24 doctoral thesis credits. Required courses in microeconomic theory, macroeconomic theory and applied econometrics, and at least two-thirds of the remaining credits included in the PhD degree program are to be completed on the A-F grade basis.

Students must complete at least 18 course credits in applied economics at the 8xxx-level while enrolled as a current student in the graduate program (not including APEC 8901-04 and APEC 8991), PA, PUBH, and HRIR courses included in the list of fields noted in the Graduate Student Handbook can be applied to this requirement. Up to 6 credits of Department of Economics 8xxx-level field courses may be substituted for these credits (excluding ECON 8001-04, 8101-04, 8105-06, and 8205-08).

Students must pass a written preliminary exam in microeconomic theory and at least one field examination in one of the seven PhD fields offered by the Applied Economics graduate program. In addition, there is a requirement for a qualifying paper written in the second year of the program.

For more details, please see the Graduate Student Handbook at: http://www.apec.umn.edu/sites/apec.umn.edu/files/2015-16_apec_graduatestudenthandbook_final.pdf

Microeconomic Theory

All students must complete one of the three microeconomics theory sequences noted below (A-F only).

APEC - Applied Microeconomic Theory
- APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
- APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)

or ECON - Microeconomic Theory (Majors Sequence)
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)

Macroeconomic Theory

All students must complete the following two courses (A-F only).

ECON 8105 - Macroeconomic Theory (2.0 cr)
ECON 8106 - Macroeconomic Theory (2.0 cr)

Econometrics

All students must complete the following two courses (A-F only).

APEC
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)

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Information current as of August 31, 2018
First Year Seminars
All students must complete the following two courses (S-N only).
APEC 8901 - Graduate Seminar: MS & PhD (1.0 cr)
APEC 8902 - Graduate Research Development Seminar (1.0 cr)

Second Year Seminars
All students must complete the following two courses (S-N only).
APEC 8903 - PhD Qualifying Paper Seminar I (1.0 cr)
APEC 8904 - PhD Qualifying Paper Seminar II (1.0 cr)

Electives
(A-F only). Up to six credits of 8-level ECON courses (excluding micro theory, macro theory, 8105 and 8106) may be accepted as electives.
Take 18 or more credit(s) from the following:
• APEC 8202 - Mathematical Optimization in Applied Economics (3.0 cr)
• APEC 8203 - Applied Welfare Economics and Public Policy (3.0 cr)
• APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
• APEC 8341 - Applied Public Finance (3.0 cr)
• APEC 8401 - Consumer Behavior and Household Economics (2.0 cr)
• APEC 8402 - Information and Behavioral Economics (2.0 cr)
• APEC 8403 - Consumer Theory and Demand Analysis (3.0 cr)
• APEC 8501 - Labor Economics I (2.0 cr)
• APEC 8502 - Labor Economics II (2.0 cr)
• APEC 8601 - Natural Resource Economics (3.0 cr)
• APEC 8602 - Economics of the Environment (3.0 cr)
• APEC 8701 - Trade and Development I (2.0 cr)
• APEC 8702 - Trade and Development II (2.0 cr)
• APEC 8703 - Trade and Development III (2.0 cr)
• APEC 8704 - Trade and Development IV (2.0 cr)
• APEC 8801 - Applied Production Theory (3.0 cr)
• APEC 8803 - Marketing Economics (3.0 cr)
• APEC 8804 - Managerial Economics (3.0 cr)
• ECON 8119 - Cooperative Game Theory (2.0 cr)
• ECON 8205 - Applied Econometrics (2.0 cr)
• ECON 8206 - Applied Econometrics (2.0 cr)
• ECON 8207 - Applied Econometrics (2.0 cr)
• ECON 8208 - Applied Econometrics (2.0 cr)
• ECON 8401 - International Trade and Payments Theory (2.0 cr)
• ECON 8402 - International Trade and Payments Theory (2.0 cr)
• ECON 8403 - International Trade and Payments Theory (2.0 cr)
• ECON 8501 - Wages and Employment (2.0 cr)
• ECON 8502 - Wages and Employment (2.0 cr)
• ECON 8503 - Wages and Employment (2.0 cr)
• ECON 8581 - Advanced Topics in Labor Economics (2.0 cr)
• ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
• ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
• ECON 8603 - Industrial Organization and Government Regulation (2.0 cr)
• ECON 8701 - Monetary Economics (2.0 cr)
• ECON 8702 - Monetary Economics (2.0 cr)
• ECON 8704 - Financial Economics (2.0 cr)
• ECON 8705 - Financial Economics (2.0 cr)
• ECON 8801 - Public Economics (2.0 cr)
• ECON 8803 - Public Economics (2.0 cr)
• HRIR 8801 - Core Seminar: Fundamentals of Economic Analysis for Work and Organizations (4.0 cr)
• PA 8302 - Applied Policy Analysis (4.0 cr)
• PA 8312 - Analysis of Discrimination (4.0 cr)
• PA 8331 - Economic Demography (3.0 cr)
• PUBH 6832 - Economics of the Health Care System (3.0 cr)
• PUBH 8811 - Research Methods in Health Care (3.0 cr)
• PUBH 8821 - Health Economics II (3.0 cr)
• APEC 8221 - Programming for Econometrics (2.0 cr)
• APEC 8222 - Big Data Methods in Economics (2.0 cr)

Doctoral Thesis Credits
Students must enroll for a minimum of 24 thesis credits. Take 24 or more credit(s) from the following:
• APEC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Applied Plant Sciences M.S.
Agronomy & Plant Genetics, Horticultural Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Agronomy and Plant Genetics, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108-6026 (612-625-4742; fax: 612-625-1268)
Email: apsc@umn.edu
Website: http://www.appliedplantsciences.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Applied Plant Sciences is an interdisciplinary program for educating students to become professional scientists well grounded in the applied disciplines of agronomy/agroecology, horticulture, and plant breeding/molecular genetics. Graduates of the program are able to provide innovative leadership and contribute to problem solving within their disciplines in the public or private sector and within society at large. The program develops the quantitative and qualitative research skills necessary to conduct high quality research and scholarship. Students choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics. Students gain broad familiarity with all of the disciplines within the program and gain in-depth knowledge within their area of expertise. The program's graduate faculty is drawn primarily from the Department of Agronomy and Plant Genetics and the Department of Horticultural Science; but also from the Departments of Plant and Microbial Biology; Plant Pathology; Soil, Water, and Climate; Ecology, Evolution and Behavior; and Fisheries, Wildlife and Conservation Biology. The faculty embrace the University of Minnesota's position that promoting and supporting diversity among the student body is central to our academic mission.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students entering the program should have a foundation in the physical and biological sciences, preferably with some emphasis in plant science. A minimum of 10 credits of math and physics, 12 credits of chemistry and biochemistry, and 15 credits of biological and/or agricultural sciences are recommended for admission. In addition, students should have completed a BS or BA degree in agriculture, biology, or other related life science. Students with a BS or BA degree outside these areas may be admitted with the requirement that they take the prerequisite courses noted above at the undergraduate level in addition to their graduate coursework.

Special Application Requirements:
Applicants must submit scores from the General (Aptitude) Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of transcripts; and a clearly written personal statement of career interests, goals, and objectives as part of the online application. Students should apply by December 5 for admission into fall semester of the following year. Students should apply by October 1 for admission into spring semester of the following year.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
  - IELTS
    - Total Score: 6.5
  - MELAB
    - Final score: 550

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A**: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 30 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project**: Determined in consultation with advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

MS students must complete the core curriculum, requirements for their specialization track, and present one graduate seminar. Additional course requirements are flexible and determined in consultation with the students advisor(s) and advisory committee.

**Required Courses**

- AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
- APSC 8270 - Graduate Seminar (2.0 cr)
- APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)

At least 3 credits of graduate-level statistics

- AGRO 5121 - Applied Experimental Design (4.0 cr)
- or BIOL 5272 - Applied Biostatistics (4.0 cr)
- or ENT 5126 - Spatial and Temporal Analysis of Ecological Data (3.0 cr)
- or ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
- or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- or GIS 5555 - Basic Spatial Analysis (3.0 cr)
- or NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
- or PUBH 6450 - Biostatistics I (4.0 cr)
- or STAT 5021 - Statistical Analysis (4.0 cr)
- or STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- or STAT 5302 - Applied Regression Analysis (4.0 cr)
- or STAT 5303 - Designing Experiments (4.0 cr)
- or STAT 5401 - Applied Multivariate Methods (3.0 cr)
- or STAT 5421 - Analysis of Categorical Data (3.0 cr)
- or STAT 5601 - Nonparametric Methods (3.0 cr)

**Plan A Thesis Credits**

Plan A students must take at least 10 master's thesis credits.

- APSC 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Program Sub-plans

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Agronomy and Agroecology**
Students conduct research to increase their knowledge of cropping systems and weed science, including alternative approaches and management strategies. Emphasis is on improving production efficiency and profitability in an environmentally sound approach that benefits society. Mechanisms of crop physiology and ecology underlying plant responses to the environment are a particular emphasis of this track.

In addition to the APS core curriculum, students pursuing the Agronomy and Agroecology specialization track must complete remaining MS credit requirements, which will include 14 credits with at least two agroecology/agronomy courses, one plant biology course, and one additional course. Other specialization courses can be substituted with agreement of the advisor, the advisory committee, and director of graduate studies.

**Agroecology/Agronomy Courses**

Students must complete two courses from this group
- AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
- AGRO 4605 - Strategies for Agricultural Production and Management (3.0 cr)
- AGRO 5021 - Plant Breeding Principles (3.0 cr)
- AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
- AGRO 5999 - Special Topics: Workshop in Agronomy (1.0 - 6.0 cr)
- APSC 8201 - Advanced Plant Breeding (3.0 cr)
- APSC 8280 - Current Topics in Applied Plant Sciences (1.0 - 3.0 cr)
- GCC 5017 - World Food Problems: Agronomics, Economics and Hunger [GP] (3.0 cr)
- SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)

**Plant Biology**

Students must complete one course in plant biology such as:
- PMB 5516 - Plant Cell Biology (3.0 cr)
- PMB 5412 - Plant Physiology (3.0 cr)
- PMB 5601 - Topics in Plant Biochemistry (3.0 cr)

**Suggested Additional Courses**

Students must take at least one course from the following courses
- BIOL 5407 - Ecology (3.0 cr)
- EEB 4068 - Plant Physiological Ecology (3.0 cr)
- EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)
- ESPM 5108 - Ecology of Managed Systems (4.0 cr)
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- ESPM 5609 - GIS in Environmental Science and Management (4.0 cr)
- HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)
- PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
- PLPA 5202 - Field Plant Pathology (2.0 cr)
- PLPA 5480 - Principles of Plant Pathology (3.0 cr)
- PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
- SOIL 4111 - Introduction to Precision Agriculture (3.0 cr)
- SOIL 5611 - Soil Biology and Fertility (4.0 cr)

**Horticulture**

Students conduct research related to fruits, vegetables, potatoes, flowers, ornamental trees and shrubs, or turf; on the physiology, production, environmental impact of cropping systems; and use of horticultural crops. Research areas include the effect of horticultural commodities on human health, hormonal, and stress physiology; flower development and flowering physiology; integrated pest management; post harvest physiology; and cropping system strategies. Students get a broad range of experiences in the field, greenhouse, and/or laboratory using genetic, molecular, biochemical, and ecological tools to answer research questions.

In addition to the APS core curriculum, students pursuing the horticulture specialization track must complete 14 credits in Areas 1, 2 and 3; with at least one course in Area 1 and at least one course in Area 2.

**Area 1: Cross Commodity Horticulture**

Students must complete at least one course in Area 1.
- AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
- AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
- HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
- HORT 4461 - Horticultural Marketing (3.0 cr)
- HORT 4850 - Pollinator Protection in Managed Landscapes (3.0 cr)
- HORT 5007 - Advanced Plant Propagation (3.0 cr)
or HORT 5023 - Public Garden Management (2.0 cr)
or HORT 8280 - Current Topics in Applied Plant Sciences (1.0 cr)
or MBA 6210 - Marketing Management (3.0 cr)
or MKTG 6051 - Marketing Research (4.0 cr)
or MKTG 6055 - Buyer Behavior (4.0 cr)
or MKTG 6082 - Brand Strategy (2.0 cr)
or SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)

Area 2: Commodity-based Horticulture
Students must complete at least one course in Area 2.
HORT 4061W - Turfgrass Management [WI] (3.0 cr)
or HORT 4063 - Turfgrass Science (3.0 cr)
or HORT 5011 - Common Medicinal Plants: Classification, Identification, and Application (3.0 cr)
or HORT 5012 - Common Medicinal Plants: Growing and Processing (3.0 cr)
or HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
or HORT 5032 - Organic Vegetable Production (3.0 cr)
or HORT 5061 - Advanced Turfgrass Science (2.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)

Area 3: Additional Coursework
Courses other than those listed below can be substituted with agreement of the advisor, advisory committee, and director of graduate studies.
AGRO 5021 - Plant Breeding Principles (3.0 cr)
or AGRO 8023 - Evolution of Crop Plants (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or BIOL 5407 - Ecology (3.0 cr)
or EEB 4068 - Plant Physiological Ecology (3.0 cr)
or EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
or EEB 5609 - Ecosystem Ecology (3.0 cr)
or ESPM 5108 - Ecology of Managed Systems (4.0 cr)
or ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)
or PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or PMB 5412 - Plant Physiology (3.0 cr)
or PMB 5516 - Plant Cell Biology (3.0 cr)
or PMB 5601 - Topics in Plant Biochemistry (3.0 cr)
or SOIL 4111 - Introduction to Precision Agriculture (3.0 cr)
or SOIL 5611 - Soil Biology and Fertility (4.0 cr)

Plant Breeding/Plant Molecular Genetics
This track allows students to select from genetic research projects ranging from applied plant breeding projects emphasizing breeding procedures and methodologies to molecular genetic projects doing biotechnology, genetic engineering, and genomic research in agronomic and horticultural crops. These research projects give students the opportunity to integrate the latest developments in the laboratory with applied applications in the field to reach the overarching goal of developing new germplasm that will improve the sustainability of our food/feed/fiber/fuel systems.

In addition to the APS core curriculum, students pursuing the plant breeding and plant molecular genetics specialization track must complete remaining MS credit requirements, which will include at least one course from plant breeding, at least two courses from genetics and genomics, with any additional credits determined in consultation with the students advisor and advisory committee.

Plant Breeding
Take at least one course from the following:
AGRO 5021 - Plant Breeding Principles (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or AGRO 8202 - Breeding for Quantitative Traits in Plants (3.0 cr)

Genetics and Genomics
Take at least two courses from the following:
AGRO 5431 - Applied Plant Genomics and Bioinformatics (3.0 cr)
or AGRO 8023 - Evolution of Crop Plants (3.0 cr)
or AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
or EEB 5042 - Quantitative Genetics (3.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)

Other suggested courses
Courses other than those listed below can be substituted with approval of the advisor, advisory committee, and director of graduate studies.

AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
AGRO 5999 - Special Topics: Workshop in Agronomy (1.0 - 6.0 cr)
HORT 5011 - Common Medicinal Plants: Classification, Identification, and Application (3.0 cr)
HORT 5012 - Common Medicinal Plants: Growing and Processing (3.0 cr)
HORT 5023 - Public Garden Management (2.0 cr)
HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
HORT 5032 - Organic Vegetable Production (3.0 cr)
HORT 5071 - Ecological Restoration (4.0 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
AGRO 5121 - Applied Experimental Design (4.0 cr)
ANSC 5200 - Statistical Genetics and Genomics (4.0 cr)
BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
CSCI 4041 - Algorithms and Data Structures (4.0 cr)
CSCI 4048 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
PMB 5412 - Plant Physiology (3.0 cr)
PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
PLPA 5202 - Field Plant Pathology (2.0 cr)
PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
PLPA 5480 - Principles of Plant Pathology (3.0 cr)
PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
PLPA 58103 - Plant-Microbe Interactions (3.0 cr)
PLPA 58104 - Plant Virology (2.0 cr)
PLPA 8105 - Plant Bacteriology (2.0 cr)
AGRO 5121 - Applied Experimental Design (4.0 cr)
AGRO 5021 - Plant Breeding Principles (3.0 cr)
AGRO 5431 - Applied Plant Genomics and Bioinformatics (3.0 cr)
AGRO 8023 - Evolution of Crop Plants (3.0 cr)
AGRO 8202 - Breeding for Quantitative Traits in Plants (3.0 cr)
AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)

Applied Plant Sciences
Students who choose to complete the Applied Plant Sciences track must complete the APS core curriculum; at least one course from the areas of genetics and plant breeding, organismal biology, and cropping systems, communities, and commodities; and any remaining credits to meet MS credit requirements.

Genetics and Plant Breeding
Take at least one course from the following:
AGRO 5021 - Plant Breeding Principles (3.0 cr)
AGRO 5431 - Applied Plant Genomics and Bioinformatics (3.0 cr)
AGRO 8023 - Evolution of Crop Plants (3.0 cr)
AGRO 8202 - Breeding for Quantitative Traits in Plants (3.0 cr)
AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or EEB 5042 - Quantitative Genetics (3.0 cr)
or GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)
or PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)

Organismal Biology
Take at least one course from the following:
HORT 5007 - Advanced Plant Propagation (3.0 cr)
or PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
or PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 8104 - Plant Virology (2.0 cr)
or PLPA 8105 - Plant Bacteriology (2.0 cr)
or PMB 5412 - Plant Physiology (3.0 cr)
or PMB 5516 - Plant Cell Biology (3.0 cr)
or PMB 5601 - Topics in Plant Biochemistry (3.0 cr)

Cropping Systems, Communities, and Commodities
Take at least one course from the following:
AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
or AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
or HORT 4062 - Turfgrass Weed and Disease Science (3.0 cr)
or HORT 4066 - Turfgrass Science (3.0 cr)
or HORT 4141W - Scheduling Crops for Protected Environments [WI] (4.0 cr)
or HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
or HORT 5032 - Organic Vegetable Production (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or HORT 5131 - Student Organic Farm Planning, Growing, and Marketing (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
or SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)

Integrated BS Plant Science/MS APS Plant Breeding
CFANS offers an integrated Bachelor of Science (BS) in Plant Science and Master of Science (MS) in Applied Plant Sciences (Plant Breeding and Molecular Genetics track). The integrated BS/MS program offers students the opportunity to complete coursework for both degrees in five years by working toward a master's degree while simultaneously working toward their undergraduates degree.
Plant Science undergraduate students in the Plant Breeding and Genetics sub-plan are welcome to apply to this program during their 3rd year of undergraduate study. During the 4th year, students take undergraduate and graduate courses concurrently and are advised by an undergraduate and graduate program adviser. Students must complete undergraduate degree requirements before the end of their fourth year.

Students in this program will complete the 120 undergraduate credits required for a BS degree in Plant Science by the end of the 4th year and must be awarded an undergraduate degree at the 4th year mark or earlier. During the 4th and 5th years, students will complete 30 graduate credits and a Plan A or B research project with a final oral defense as required for the Applied Plant Sciences MS degree. Students cannot double-count credits to meet credit requirements for both the undergraduate and graduate degrees. At least one course must be taken from each of the Plant Breeding areas and at least two courses from the Genetics & Genomics area.
Additional course requirements are flexible and are determined in consultation with the student's advisor(s) and advisory committee.
Twin Cities Campus
Applied Plant Sciences Minor
Agronomy & Plant Genetics, Horticultural Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Agronomy and Plant Genetics, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108-6026 (612-625-4742; fax: 612-625-1268)
Email: apsc@umn.edu
Website: http://www.appliedplantsciences.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in applied plant sciences provides students in other fields an opportunity to gain knowledge and expertise in plant sciences at the molecular, organismal and community levels with applications to sustainable production of horticultural and agronomic crops. Applied Plant Sciences is an interdisciplinary program for educating students to become professional scientists well-grounded in the applied disciplines of agronomy/agroecology, horticulture, and plant breeding/molecular genetics. Graduates of the program are able to provide innovative leadership and contribute to problem solving within their disciplines in the public or private sector and within society at large.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students entering the program should have a foundation in the physical and biological sciences, preferably with some emphasis in plant science. A minimum of 10 credits of math and physics, 12 credits of chemistry and biochemistry, and 15 credits of biological and/or agricultural sciences are recommended for admission. In addition, students should have completed a BS or BA degree in agriculture, biology, or other related life science. Students with a BS or BA degree outside these areas may be admitted with the requirement that they take the prerequisite courses noted above at the undergraduate level in addition to their graduate coursework.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Coursework is determined in consultation with the Applied Plant Sciences director of graduate studies.

Required Course (1 Credit)
All students pursuing the applied plant sciences minor must complete one course from the following:
 APSC 8270 - Graduate Seminar (2.0 cr)
 or APSC 8280 - Current Topics in Applied Plant Sciences (1.0 - 3.0 cr)

Electives
Master's students select at least six credits, and doctoral students select at least eleven credits from the following:
 AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>AGRO 4605</td>
<td>Strategies for Agricultural Production and Management</td>
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<td>AGRO 4888</td>
<td>Issues in Sustainable Agriculture</td>
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<td>AGRO 5021</td>
<td>Plant Breeding Principles</td>
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<td>AGRO 5311</td>
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<td>AGRO 5321</td>
<td>Ecology of Agricultural Systems</td>
<td>3.0 cr</td>
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<tr>
<td>AGRO 5431</td>
<td>Applied Plant Genomics and Bioinformatics</td>
<td>3.0 cr</td>
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<tr>
<td>AGRO 5999</td>
<td>Special Topics: Workshop in Agronomy</td>
<td>1.0 - 6.0 cr</td>
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<td>AGRO 8023</td>
<td>Evolution of Crop Plants</td>
<td>3.0 cr</td>
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<td>Breeding for Quantitative Traits in Plants</td>
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<td>Scheduling Crops for Protected Environments [WI]</td>
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<td>Advanced Plant Propagation</td>
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<td>Common Medicinal Plants: Classification, Identification, and Application</td>
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<td>Common Medicinal Plants: Growing and Processing</td>
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<td>Manipulation of Plant Growth and Reproduction</td>
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**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Masters**
Take at least six credits from the list of electives, in consultation with the applied plant sciences director of graduate studies, to complete the 7-credit minimum. Electives will be chosen from courses on genetics and plant breeding; organismal biology; or cropping systems, communities, and commodities.

**Doctoral**
Take at least eleven credits from the list of electives, in consultation with the applied plant sciences director of graduate studies, to complete the 12-credit minimum. Electives will be chosen from courses on genetics and plant breeding; organismal biology; or cropping systems, communities, and commodities.
Twin Cities Campus

Applied Plant Sciences Ph.D.
Agronomy & Plant Genetics, Horticultural Science
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Agronomy and Plant Genetics, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108-6026 (612-625-4742; fax: 612-625-1268)
Email: apsc@umn.edu
Website: http://www.appliedplantsciences.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 54
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Applied plant sciences is an interdisciplinary program for educating students to become professional scientists well grounded in the applied disciplines of agronomy/agroecology, horticulture, and plant breeding/molecular genetics. Graduates of the program are able to provide innovative leadership and contribute to problem solving within their disciplines in the public or private sector and within society at large. The program develops the quantitative and qualitative research skills necessary to conduct high quality research and scholarship. Students choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics. Students gain broad familiarity with all of the disciplines within the program and gain in-depth knowledge within their area of expertise. The program's graduate faculty is drawn primarily from the Department of Agronomy and Plant Genetics and the Department of Horticultural Science; but also from the Departments of Plant Biology; Plant Pathology; Soil, Water, and Climate; Ecology, Evolution and Behavior; and Fisheries, Wildlife and Conservation Biology. The faculty embrace the University of Minnesota's position that promoting and supporting diversity among the student body is central to our academic mission.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students entering the program should have a foundation in the physical and biological sciences, preferably with some emphasis in plant science. A minimum of 10 credits of math and physics, 12 credits of chemistry and biochemistry, and 15 credits of biological and/or agricultural sciences are recommended for admission. In addition, students should have completed a BS or BA degree in agriculture, biology, or other related life science. Students with a BS or BA degree outside these areas may be admitted with the requirement that they take the prerequisite courses noted above at the undergraduate level in addition to their graduate coursework.

Special Application Requirements:
Applicants must submit scores from the General (Aptitude) Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written personal statement of career interests, goals, and objectives as part of the online application. Students should apply by December 1 for admission into fall semester of the following year. Students should apply by October 1 for admission into spring semester of the following year.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

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Information current as of August 31, 2018
- Paper Based - Total Score: 550
  • IELTS
    - Total Score: 6.5
  • MELAB
    - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
30 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

PhD students must complete the core curriculum, requirements for their specialization, and present one graduate seminar. Additional course requirements are flexible and determined in consultation with the students advisor(s) and advisory committee.

Required Courses
Take the following courses:
AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
APSC 8270 - Graduate Seminar (2.0 cr)

Take one of the following courses:
AGRO 5121 - Applied Experimental Design (4.0 cr)
or BIOL 5272 - Applied Biostatistics (4.0 cr)
or ENT 5126 - Spatial and Temporal Analysis of Ecological Data (3.0 cr)
or ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
or GIS 5555 - Basic Spatial Analysis (3.0 cr)
or NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)
or STAT 5401 - Applied Multivariate Methods (3.0 cr)
or STAT 5421 - Analysis of Categorical Data (3.0 cr)
or STAT 5601 - Nonparametric Methods (3.0 cr)

Take one of the following courses. Consult with the advisor regarding number of credits to take if APSC 8280 is selected.
APSC 8280 - Current Topics in Applied Plant Sciences (1.0 - 3.0 cr)
or SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)

Take one of the following courses:
GRAD 8101 - Teaching in Higher Education (3.0 cr)
or CFAN 8101 - Professional Skills for Scientists (2.0 cr)

Electives
Select courses, in consultation with the advisor, to complete 30 course credits.

Thesis Credits
Take at least 24 doctoral thesis credits.
APSC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Agronomy and Agroecology
Students conduct research to increase their knowledge of cropping systems and weed science, including alternative approaches and management strategies. Emphasis is on improving production efficiency and profitability in an environmentally sound approach that benefits society. Mechanisms of crop physiology and ecology underlying plant responses to the environment are a particular emphasis of this track.

Students pursuing the agroecology/agronomy specialization track must complete at least two agroecology/agronomy courses, one plant biology course, and one ecology course.

Courses listed within agroecology/agronomy, plant biology, and ecology/plant pathology/soil science groups are provided as a guide for students and faculty. Other specialization courses can be substituted with agreement of the advisor, the advisory committee, and director of graduate studies.

Agronomy/Agroecology
Take two courses from the following list. Consult with advisor to determine number of credits to take if AGRO 5999 is selected.
AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
or AGRO 4605 - Strategies for Agricultural Production and Management (3.0 cr)
or AGRO 5021 - Plant Breeding Principles (3.0 cr)
or AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
or AGRO 5999 - Special Topics: Workshop in Agronomy (1.0 - 6.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)

Plant Biology
Take one of the following courses or another course selected in consultation with the advisor:
PMB 5516 - Plant Cell Biology (3.0 cr)
or PMB 5412 - Plant Physiology (3.0 cr)

Ecology/Plant Pathology/Soil Science
Take at least one course from the following list:
BIOL 5407 - Ecology (3.0 cr)
or EEB 4068 - Plant Physiological Ecology (3.0 cr)
or EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
or EEB 5609 - Ecosystem Ecology (3.0 cr)
or ESPM 5108 - Ecology of Managed Systems (4.0 cr)
or ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or SOIL 4111 - Introduction to Precision Agriculture (3.0 cr)
or SOIL 5611 - Soil Biology and Fertility (4.0 cr)

Horticulture
Students conduct research related to fruits, vegetables, potatoes, flowers, ornamental trees and shrubs, or turf; and on the physiology, production, environmental impact of cropping systems, and use of horticultural crops. Research areas include the effect of horticultural commodities on human health, hormonal, and stress physiology; flower development and flowering physiology; integrated pest management; post harvest physiology; and cropping system strategies. Students get a broad range of experiences in the field, greenhouse, and/or laboratory using genetic, molecular, biochemical, and ecological tools to answer research questions.

Students pursuing the PhD with a horticulture specialization track must take at least one course from each area; four courses in total from Areas 1 and 2.

Area 1 - Cross Commodity Horticulture
Students must complete at least one Area 1 course.
HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
or AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
or HORT 4461 - Horticultural Marketing (3.0 cr)

Area 2 - Specialty Horticulture
Students must complete at least one Area 2 course.
HORT 5071 - Ecological Restoration (4.0 cr)
or PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or SOIL 4111 - Introduction to Precision Agriculture (3.0 cr)
or SOIL 5611 - Soil Biology and Fertility (4.0 cr)
or HORT 4850 - Pollinator Protection in Managed Landscapes (3.0 cr)
or HORT 5007 - Advanced Plant Propagation (3.0 cr)
or HORT 5023 - Public Garden Management (2.0 cr)
or AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
or MKTG 6051 - Marketing Research (4.0 cr)
or MKTG 6055 - Buyer Behavior (4.0 cr)
or MKTG 6082 - Brand Strategy (2.0 cr)
or MBA 6210 - Marketing Management (3.0 cr)
or HORT 8044 - Manipulation of Plant Growth and Reproduction (2.0 cr)

Area 2 - Commodity-based Horticulture
Students must complete at least one Area 2 course.
HORT 4062 - Turfgrass Weed and Disease Science (3.0 cr)
or HORT 4063 - Turfgrass Science (3.0 cr)
or HORT 5011 - Common Medicinal Plants: Classification, Identification, and Application (3.0 cr)
or HORT 5012 - Common Medicinal Plants: Growing and Processing (3.0 cr)
or HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
or HORT 5032 - Organic Vegetable Production (3.0 cr)
or HORT 5061 - Advanced Turfgrass Science (2.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)

Area 3 - Related Fields
Students must complete at least one Area 3 course. Courses other than those listed below can be substituted with agreement of the advisor, advisory committee, and director of graduate studies.
AGRO 5021 - Plant Breeding Principles (3.0 cr)
or AGRO 8023 - Evolution of Crop Plants (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or BIOL 5407 - Ecology (3.0 cr)
or EEB 4068 - Plant Physiological Ecology (3.0 cr)
or EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
or EEB 5609 - Ecosystem Ecology (3.0 cr)
or ESPM 5108 - Ecology of Managed Systems (4.0 cr)
or ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)
or HORT 8201 - Advanced Plant Breeding (3.0 cr)
or PMB 5412 - Plant Physiology (3.0 cr)
or PMB 5516 - Plant Cell Biology (3.0 cr)
or PMB 5601 - Topics in Plant Biochemistry (3.0 cr)
or PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or SOIL 4111 - Introduction to Precision Agriculture (3.0 cr)
or SOIL 5611 - Soil Biology and Fertility (4.0 cr)

Plant Breeding and Plant Molecular Genetics
This track allows students to select from genetic research projects ranging from applied plant breeding projects emphasizing breeding procedures and methodologies to molecular genetic projects doing biotechnology, genetic engineering, and genomic research in agronomic and horticultural crops. These research projects give students the opportunity to integrate the latest developments in the laboratory with applied applications in the field to reach the overarching goal of developing new germplasm that will improve the sustainability of our food/feed/fiber/fuel systems.

Students pursuing the PhD with a plant breeding and plant molecular genetics track must complete at least one course from the Plant Breeding area and at least two courses from the Genetics & Genomics area. PhD students are required to complete a minimum of 30 course credits including the program-wide required courses.

Plant Breeding
Take at least one course from the following:
AGRO 5021 - Plant Breeding Principles (3.0 cr)
or AGRO 8202 - Breeding for Quantitative Traits in Plants (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)

Genetics and Genomics
Take at least one course from the following:
AGRO 5431 - Applied Plant Genomics and Bioinformatics (3.0 cr)
or AGRO 8023 - Evolution of Crop Plants (3.0 cr)
or AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
or EEB 5042 - Quantitative Genetics (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)

Other Suggested Courses
Courses other than those listed below can be substituted with approval of the advisor, advisory committee, and director of graduate studies.

**Agroecology and Cropping Systems**
Consult with the advisor regarding number of credits to take if AGRO 5999 is selected.
AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
or AGRO 5999 - Special Topics: Workshop in Agronomy (1.0 - 6.0 cr)
or HORT 5011 - Common Medicinal Plants: Classification, Identification, and Application (3.0 cr)
or HORT 5012 - Common Medicinal Plants: Growing and Processing (3.0 cr)
or HORT 5023 - Public Garden Management (2.0 cr)
or HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
or HORT 5032 - Organic Vegetable Production (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)

**Biochemistry**
BIOC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
or BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
or PMB 5601 - Topics in Plant Biochemistry (3.0 cr)

**Biotechnology/Genetics/Genomics**
GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or HORT 4071W - Applications of Biotechnology to Plant Improvement [WI] (4.0 cr)
or HORT 5007 - Advanced Plant Propagation (3.0 cr)
or PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)

**Computational Biology/Bioinformatics**
Consult with the advisor regarding number of credits to take if CSCI 5980 is selected.
BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
or CSCI 4041 - Algorithms and Data Structures (4.0 cr)
or CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
or CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
or CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)

**Evolution**
EEB 5221 - Molecular Evolution (3.0 cr)

**Physiology**
PMB 5412 - Plant Physiology (3.0 cr)
or PMB 5516 - Plant Cell Biology (3.0 cr)

**Plant Pathology**
PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
or PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 8104 - Plant Virology (2.0 cr)
or PLPA 8105 - Plant Bacteriology (2.0 cr)

**Applied Plant Sciences**
Students who choose to pursue the PhD without a specialization track must complete the APS required core curriculum and at least one course from these three areas: genetics and plant breeding; organismal biology; and cropping systems, communities, and commodities.

**Genetics and Plant Breeding**
Take at least one course from the following:
AGRO 5021 - Plant Breeding Principles (3.0 cr)
or APSC 8201 - Advanced Plant Breeding (3.0 cr)
or EEB 5042 - Quantitative Genetics (3.0 cr)
or GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or HORT 5058 - Plant Cytogenetics (2.0 cr)
or HORT 5059 - Plant Cytogenetics Lab (1.0 cr)
or PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)

Organismal Biology
Take at least one course from the following:
HORT 5007 - Advanced Plant Propagation (3.0 cr)
or HORT 8044 - Manipulation of Plant Growth and Reproduction (2.0 cr)
or PMB 5412 - Plant Physiology (3.0 cr)
or PMB 5516 - Plant Cell Biology (3.0 cr)
or PMB 5601 - Topics in Plant Biochemistry (3.0 cr)
or PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
or PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
or PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
or PLPA 5480 - Principles of Plant Pathology (3.0 cr)
or PLPA 5560 - Plant Disease Resistance and Applications (3.0 cr)
or PLPA 8104 - Plant Virology (2.0 cr)
or PLPA 8105 - Plant Bacteriology (2.0 cr)

Cropping Systems, Communities, and Commodities
Take at least one course from the following:
AGRO 4505 - Biology, Ecology, and Management of Invasive Plants (3.0 cr)
or AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
or HORT 4062 - Turfgrass Weed and Disease Science (3.0 cr)
or HORT 4063 - Turfgrass Science (3.0 cr)
or HORT 4141W - Scheduling Crops for Protected Environments [WI] (4.0 cr)
or HORT 5031 - Fruit Production and Viticulture for Local and Organic Markets (3.0 cr)
or HORT 5032 - Organic Vegetable Production (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or HORT 5131 - Student Organic Farm Planning, Growing, and Marketing (3.0 cr)
or PLPA 5202 - Field Plant Pathology (2.0 cr)
or PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
or SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
**Twin Cities Campus**

**Bioproducts and Biosystems Science, Eng and Mgmt M.S.**

**Bioproducts and Biosystems Engineering**

**College of Food, Agricultural and Natural Resource Sciences**

Link to a list of faculty for this program.

**Contact Information:**

Department of Bioproducts and Biosystems Engineering, Biosystems and Agricultural Engineering Building, 1390 Eckles Avenue, St. Paul, MN 55108 (612-625-7733; fax: 612-624-3005)

Email: bbe@umn.edu

Website: [http://www.bbe.umn.edu](http://www.bbe.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science degree in the bioproducts and biosystems science engineering and management (BBSEM) graduate program provides a strong foundation in the basic sciences, engineering, and management in support of the renewable bio-resources utilization, environmental quality, and national security, while improving our global competitiveness. The areas of specialization include bioproducts science and engineering, biosystems science and engineering, and bioproducts marketing and management.

Bioproducts science and engineering specialization focuses on the fundamental science and engineering of the various manufacturing processes used in sustainable conversion of biomass into bio-based industrial and consumer products, and their effective end-use applications. Bioproducts include "green" materials, chemicals and energy derived from bio-resources, including biofuels, bioenergy, biocomposites, bio-based plastics, adhesives, pulp and paper, building materials, and more.

Biosystems science and engineering specialization is designed for students who seek to develop a strong foundation in physical sciences and engineering principles, which are applied to important problems involving biological systems. Potential areas of interest include water and soil management and protection; livestock environment; food engineering and value-added processing; machinery systems design; grain quality; safety, health, and risk management; renewable energy systems; and waste management.

Bioproducts marketing and management specialization is designed for graduate students who seek to build on a strong diverse background encompassing liberal arts, basic sciences, communications and product development, and marketing and management of bioproducts.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:

Students seeking a master's degree should have a bachelor's degree in engineering, mathematics, the physical or biological sciences, or a related field from a recognized U.S. or international university. Applicants should have a performance level of at least a 3.0 GPA (on a 4.0 grading scale) on previous academic work required for a degree.

Applicants must submit their test score(s) from the following:

- GRE

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Students complete a project that involves a total of about 120 hours of work, and write a Plan B paper on their project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

All master's level students must take BBE 8013, Parameter Estimation (3 cr), unless they can demonstrate to the BBE 8013 instructor that they have already mastered the course material or can identify a suitable alternative.

Students and their advisors must include a letter of explanation if submitting a graduate degree plan that includes more than 4 credits of special problems or advanced problems coursework.

Required Courses

BBE 8001 - Seminar I (1.0 cr)
BBE 8002 - Seminar II (1.0 cr)
BBE 8013 - Parameter Estimation in Biosystems and Agricultural Engineering (3.0 cr)

Master's Plan A and Master's Plan B

Master's Plan A
Take at least 15 additional credits, in consultation with advisor and approved by the director of Graduate Studies. Students need to take a total of 10 thesis credits.

BBE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Master's Plan B
Take an additional 25 credits, in consultation with advisor and approved by the director of Graduate Studies.
Twin Cities Campus
Bioproducts and Biosystems Science, Engineering and Management Minor
Bioproducts and Biosystems Engineering
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Bioproducts and Biosystems Engineering, Biosystems and Agricultural Engineering Building, 1390 Eckles Avenue, St. Paul, MN 55108 (612-625-7733; fax: 612-624-3005)
Email: bbe@umn.edu
Website: http://www.bbe.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The bioproducts and biosystems science engineering and management (BBSEM) graduate program provides a strong foundation in the basic sciences, engineering, and management in support of the renewable bio-resources utilization, environmental quality, and national security while improving our global competitiveness. The areas of specialization include bioproducts science and engineering, biosystems science and engineering, and bioproducts marketing and management.

Bioproducts science and engineering specialization focuses on the fundamental science and engineering of the various manufacturing processes used in the sustainable conversion of biomass into bio-based industrial and consumer products and their effective end-use applications. Bioproducts include "green" materials, chemicals and energy derived from bio-resources including biofuels, bioenergy, biocomposites, bio-based plastics, adhesives, pulp and paper, building materials, and more. Biosystems science and engineering specialization is designed for students who seek to develop a strong foundation in physical sciences and engineering principles which are applied to important problems involving biological systems. Potential areas of interest include water and soil management and protection; livestock environment; food engineering and value-added processing; machinery systems design; grain quality; safety, health, and risk management; renewable energy systems; and waste management. Bioproducts marketing and management specialization is designed for graduate students who seek to build on a strong diverse background encompassing liberal arts, basic sciences, communications and product development, and marketing and management of bioproducts.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
The student must be in good standing in their degree program to apply for this minor.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Select at least 6 credits of graduate-level BBE coursework in consultation with an adviser and approved by the director of graduate studies in bioproducts and biosystems science engineering and management.

**Doctoral**
Select at least 12 credits of graduate-level BBE coursework in consultation with an adviser and approved by the director of graduate studies in bioproducts and biosystems science engineering and management.
**Twin Cities Campus**  
Bioproducts and Biosystems Science, Engineering and Management Ph.D.  
*Bioproducts and Biosystems Engineering*  
*College of Food, Agricultural and Natural Resource Sciences*

Link to a list of faculty for this program.

**Contact Information:**  
Department of Bioproducts and Biosystems Engineering, Biosystems and Agricultural Engineering Building, 1390 Eckles Avenue, St. Paul, MN 55108 (612-625-7733; fax: 612-624-3005)  
Email: bbe@umn.edu  
Website: http://www.bbe.umn.edu

- Program Type: Doctorate  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 69  
- This program does not require summer semesters for timely completion.  
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD offered by the bioproducts and biosystems science engineering and management (BBSEM) graduate program provides a strong foundation in the basic sciences, engineering, and management in support of the renewable bio-resources utilization, environmental quality, and national security while improving our global competitiveness. The areas of specialization include bioproducts science and engineering, biosystems science and engineering, and bioproducts marketing and management.

Bioproducts science and engineering specialization focuses on the fundamental science and engineering of the various manufacturing processes used in the sustainable conversion of biomass into bio-based industrial and consumer products and their effective end-use applications. Bioproducts include "green" materials, chemicals and energy derived from bio-resources, including biofuels, bioenergy, biocomposites, bio-based plastics, adhesives, pulp and paper, building materials, and more.

Biosystems science and engineering specialization is designed for students who seek to develop a strong foundation in physical sciences and engineering principles, which are applied to important problems involving biological systems. Potential areas of interest include water and soil management and protection; livestock environment; food engineering and value-added processing; machinery systems design; grain quality; safety, health, and risk management; renewable energy systems; and waste management.

Bioproducts marketing and management specialization is designed for graduate students who seek to build on a strong, diverse background encompassing liberal arts, basic sciences, communications and product development, and marketing and management of bioproducts.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
The preferred undergraduate GPA for admittance to the program is 3.20.

Students seeking the PhD should have a bachelor's degree in engineering, mathematics, the physical or biological sciences, or a related field from a recognized U.S. or international university.

**Special Application Requirements:**  
Students seeking the PhD should also have a master's degree in engineering, mathematics, the physical or biological sciences, or a related field from a recognized U.S. or international university. Applicants should have a performance level on previous academic work required for a degree of at least a 3.2 GPA (on a 4.0 grading scale). Students expecting to pursue a PhD normally complete a master of science Plan A degree before starting their PhD programs. Exceptional students who want to go straight to the PhD from the bachelor's level may be admitted subject to conditions agreed upon by the advisor, the director of graduate studies, and the graduate program coordinator.

Applicants must submit their test score(s) from the following:  
- GRE
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements
36 credits are required in the major.

9 credits are required outside the major.

24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

All doctoral level students must take BBE 8001, Seminar I (1 cr), and BBE 8002, Seminar II (1 cr), and BBE 8013, Parameter Estimation (3 cr), unless they can demonstrate to the BBE 8013 instructor that they have already mastered the course material, or have justified the selection of a suitable alternative.

BBE 8001, BBE 8002, and BBE 8013, if taken at the master's level, count toward the PhD and do not have to be retaken.

The PhD in bioproducts and biosystems science engineering and management requires extended study and intense intellectual effort, conducting cutting-edge research and advancing the forefront of knowledge in the subject matter area. Students develop skills that enable them to define problems or research questions, plan research, conduct independent research and/or lead research efforts, analyze data, and effectively communicate research results to a variety of audiences.

All PhD degree programs must include a minimum of 45 graduate course credits beyond the B.S. degree, and a minimum of 24 doctoral thesis credits (BBE 8888). PhD degree programs should contain a minimum of 9 course credits in a concentrated area of scientific or theoretical development that is related to the student's research, and may contain up to 3 credits of enrichment courses.

### Required Courses

- **BBE 8001** - Seminar I (1.0 cr)
- **BBE 8002** - Seminar II (1.0 cr)
- **BBE 8013** - Parameter Estimation in Biosystems and Agricultural Engineering (3.0 cr)

### 31 Credits in Major Area of Study

31 credits in major area of study selected with advisor, and approved by the director of Graduate Studies. The student is encouraged to take up to 3 credits of enrichment courses, which are included in the 31-credit requirement.

### 9 Credits of Scientific or Mathematical Theoretical Development

9 credits of scientific or mathematical theoretical development that is related to the student's research, selected with advisor and approved by the director of Graduate Studies.

### 24 Thesis Credits

- **BBE 8888** - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Conservation Sciences M.S.
Fisheries, Wildlife, and Conservation Biology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Fisheries, Wildlife, and Conservation Biology, 135 B Skok Hall, 2003 Upper Buford Circle, St. Paul, MN 55108 (612-624-7751)
Email: conssci@umn.edu
Website: http://www.consci.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The conservation sciences (CS) program has two complementary objectives leading to a unique multidisciplinary program. The first is to provide students with sound graduate training in the biological sciences relevant to the global conservation of plants, animals, and ecosystems. The second objective promotes the study of social, political, and economic sciences that relate to recognition and solution of conservation problems. Students may select one of the three tracks, 1) conservation science or 2) fisheries and aquatic biology or 3) wildlife ecology & management. Students may also pursue a joint degree in law and conservation sciences through the joint law degree program. The overall goal of the program is to prepare students to develop solutions or approaches to address problems that are scientifically and environmentally sound and likely to be acted upon or implemented within their social and political context.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A BS/BA degree in biology or a closely related field is preferred. Applicants with a baccalaureate degree in another field are accepted, but may be required to take selected courses in biology.

Special Application Requirements:
A statement of career goals and three letters of recommendation evaluating the applicant's potential for graduate study are required. Scores less than five years old from the General Test of the GRE are required. TOEFL is required for applicants who speak English as a second language. Applicants to the joint law degree program must also apply to the Law School. Application deadline is December 15. Typically, students only are admitted for fall semester.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80
- MN Batt
Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Plan B master's students must demonstrate familiarity with the tools of research or scholarship in their major field, the ability to work independently, and the ability to present the results of their investigation effectively, by completing at least one Plan B project. The Plan B project should involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The advisory committee specifies both the nature and extent of the options available to satisfy this requirement, subject to approval by the director of graduate studies. The Plan B project must be satisfied independent of the courses in the student's program.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Course
Take the following course for 3 credits:
FW 8452 - Conservation Biology (3.0 cr)

Seminar Requirement
Take 2 semesters of CBIO 8001. Students in the fisheries and aquatic biology track may substitute one semester of CBIO 8001 with FW 8200.
Take 2 or more credit(s) from the following:
• CONS 8001 - Conservation Biology Seminar (1.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)

Statistics Requirement
Take at least one 3-credit statistics or systematics course from following list, or select other 5xxx- or 8xxx-level coursework in consultation with the advisory committee.
Take 3 or more credit(s) from the following:
• BIOL 5272 - Applied Biostatistics (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• EEB 5371 - Principles of Systematics (3.0 cr)

Plan Options

Plan A
Take at least 10 master's thesis credits.
CONS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Take an additional 10 elective course credits, chosen in consultation with the advisor. Coursework may be from the electives section of the chosen track, or other 5xxx- or 8xxx-level courses.

Joint- or Dual-degree Coursework: JD/Conservation Sciences-MSStudent may take a total of 12 credits in common among the academic programs.
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Conservation Science
The conservation science track is available for students wishing to emphasize this concentration within the conservation sciences degree. The track provides structure and oversight for students interested in the interface of population, species, and ecosystem biology with disciplines of social sciences, education, economics. The conservation science track name will be posted to the transcript.

Conservation Science - Electives
Take at least 12 (Plan A) or at least 22 (Plan B) elective credits from the following list, or select other 5xxx- or 8xxx-level coursework in consultation with the advisory committee.

Take 12 or more credit(s) from the following:
- APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- EEB 4129 - Mammalogy (4.0 cr)
- EEB 4134 - Introduction to Ornithology (4.0 cr)
- EEB 5042 - Quantitative Genetics (3.0 cr)
- EEB 5327 - Behavioral Ecology (3.0 cr)
- EEB 5409 - Evolution (3.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)
- ENT 5011 - Insect Structure and Function (4.0 cr)
- ENT 5041 - Insect Ecology (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- FNRM 5104 - Forest Ecology (4.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
- FNRM 5204 - Landscape Ecology and Management (3.0 cr)
- FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- FW 5051 - Analysis of Populations (4.0 cr)
- FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
- FW 5625 - Wildlife Handling and Immobilization for Research and Management (2.0 cr)
- GEOG 8280 - Biogeography (3.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)
- LA 5202 - Landscape Analysis Workshop (1.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- PA 5251 - Strategic Planning and Management (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)

Fisheries and Aquatic Biology
Three-quarters of the global ecosystem is water and most is a global commons. Many biologists and economists argue that freshwater is one of the most critical global resources and that the functional integrity and biodiversity within freshwater and marine ecosystems are highly threatened. The fisheries and aquatic biology (FAB) track is available for MS, PhD, and joint degree students wishing to emphasize this concentration. The track name will be posted to the transcript, and may be useful to the graduate for obtaining jobs with many federal and state agencies where such expertise is specified in job announcements or hiring criteria. The track designation clearly indicates that the student has specialized coursework and research or project experience leading to expertise in fisheries or aquatic biology. Combined with a typical undergraduate degree in biology or natural resource science, careful selection of courses in the graduate program will satisfy the educational requirements for professional certification by the American Fisheries Society.

Students in the track must be advised or co-advised by a faculty member affiliated with the track. Requests for admission to the track may be made during the application process or at any time after the student is admitted to conservation sciences. Students in the track must meet all MS degree requirements.

Students who designate this track will be expected to work closely with their Student Advisory Committee (SAC) to develop an appropriate course of study. The track coordinator will review each student’s academic program to examine how track expectations are met and forward it with a recommendation to the director of graduate studies for approval.

Fisheries & Aquatic Biology - Required Courses
Take a minimum of 6 credits from the following list. Other advanced courses or colloquia on fisheries or aquatic biology, not listed...
here, may satisfy track requirements; consult with the track coordinator.
Take 6 or more credit(s) from the following:
• EEB 5601 - Limnology (3.0 cr)
• EEB 5605 - Limnology Laboratory (2.0 cr)
• EEB 8601 - Introduction to Stream Restoration (3.0 cr)
• EEB 8602 - Stream Restoration Practice (2.0 cr)
• ENT 5361 - Aquatic Insects (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FW 4401 - Fish Physiology and Behavior (3.0 cr)
• FW 5136 - Ichthyology (4.0 cr)
• FW 5601 - Fisheries Population Analysis (3.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 8459 - Stream and River Ecology (3.0 cr)
• FW 8465 - Fish Habitats and Restoration (3.0 cr)

Fisheries & Aquatic Biology - Electives
Take at least 6 (Plan A) or 16 (Plan B) course credits from following list, or select 5xxx- or 8xxx-level coursework in consultation with the advisory committee.
Take 6 or more credit(s) from the following:
• APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• EEB 5042 - Quantitative Genetics (3.0 cr)
• EEB 5327 - Behavioral Ecology (3.0 cr)
• EEB 5409 - Evolution (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• ENT 5011 - Insect Structure and Function (4.0 cr)
• ENT 5041 - Insect Ecology (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 5051 - Analysis of Populations (4.0 cr)
• GEOG 8280 - Biogeography (3.0 cr)
• HORT 5071 - Ecological Restoration (4.0 cr)
• LA 5202 - Landscape Analysis Workshop (1.0 cr)
• LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 5511 - Community Economic Development (3.0 cr)
• VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)

Wildlife Ecology and Management
The Wildlife Ecology and Management track is available for students wishing to emphasize this concentration within the conservation sciences degree. The track provides structure and oversight for students interested in the ecology and management of both game and non-game wildlife species. The track name will be posted to the transcript, and may be useful to the graduate for obtaining jobs with many federal and state agencies where such expertise is specified in job announcements or hiring criteria. The track designation clearly indicates that the student has specialized coursework and research or project experience leading to expertise in wildlife ecology & management.

Students in the track must be advised or co-advised by a faculty member affiliated with the track. Requests for admission to the track may be made during the application process or at any time after the student is admitted to conservation sciences. Students in the track must meet all MS degree requirements. Students who designate this track will be expected to work closely with their Student Advisory Committee (SAC) to develop an appropriate course of study. The track coordinator will review each student's academic program to examine how track expectations are met and forward it with a recommendation to the director of graduate studies for approval.

Wildlife Ecology and Management - Electives
Take at least 12 (Plan A) or at least 22 (Plan B) elective credits from the following list, or select other 5xxx- or 8xxx-level coursework in consultation with the advisory committee.
Take 12 or more credit(s) from the following:
• APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• EEB 4129 - Mammalogy (4.0 cr)
• EEB 4134 - Introduction to Ornithology (4.0 cr)
• EEB 5042 - Quantitative Genetics (3.0 cr)
• EEB 5327 - Behavioral Ecology (3.0 cr)
• EEB 5409 - Evolution (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• ENT 5011 - Insect Structure and Function (4.0 cr)
• ENT 5041 - Insect Ecology (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 5051 - Analysis of Populations (4.0 cr)
• FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
• FW 5625 - Wildlife Handling and Immobilization for Research and Management (2.0 cr)
• GEOG 8280 - Biogeography (3.0 cr)
• HORT 5071 - Ecological Restoration (4.0 cr)
• LA 5202 - Landscape Analysis Workshop (1.0 cr)
• LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 5501 - Theories and Policies of Development (3.0 cr)
• PA 5511 - Community Economic Development (3.0 cr)
• VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)
Twin Cities Campus
Conservation Sciences Minor
Fisheries, Wildlife, and Conservation Biology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Fisheries, Wildlife, and Conservation Biology, 135 B Skok Hall, 2003 Upper Buford Circle, St. Paul, MN 55108 (612-624-7751)
Email: consbio@umn.edu
Website: http://www.consbio.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The conservation sciences (CS) program has two complementary objectives leading to a unique multidisciplinary program. The first is to provide students with sound graduate training in the biological sciences relevant to the global conservation of plants, animals, and ecosystems. The second objective promotes the study of social, political, and economic sciences that relate to recognition and solution of conservation problems. Students may select a named track, fisheries and aquatic biology, which offers an aquatic specialization. Students may also pursue a joint degree in law and conservation biology through the joint law degree program. The overall goal of the program is to prepare students to develop solutions or approaches to address problems that are scientifically and environmentally sound and likely to be acted upon or implemented within their social and political context.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Core Course
FW 8452 - Conservation Biology (3.0 cr)
Seminar
CONS 8001 - Conservation Biology Seminar (1.0 cr)
Electives
Three credits of electives in consultation with the director of graduate studies.

Doctoral
Core Course
FW 8452 - Conservation Biology (3.0 cr)

Seminar
2 credits required including at least one credit of CBIO 8001.
Take 2 or more credit(s) from the following:
• CONS 8001 - Conservation Biology Seminar (1.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)

Electives
7 credits of electives in consultation with the director of graduate studies.
Twin Cities Campus
Conservation Sciences Ph.D.
Fisheries, Wildlife, and Conservation Biology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Fisheries, Wildlife, and Conservation Biology, 135 B Skok Hall, 2003 Upper Buford Circle, St. Paul, MN 55108 (612-624-7751)
Email: conssci@umn.edu
Website: http://www.conssci.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The conservation sciences (CS) program has two complementary objectives leading to a unique multidisciplinary program. The first is to provide students with sound graduate training in the biological sciences relevant to the global conservation of plants, animals, and ecosystems. The second objective promotes the study of social, political, and economic sciences that relate to recognition and solution of conservation problems. Students may select one of three tracks, conservation science track or fisheries and aquatic biology track or wildlife ecology and management track. Students may also pursue a joint degree in law and conservation sciences through the joint law degree program. The overall goal of the program is to prepare students to develop solutions or approaches to address problems that are scientifically and environmentally sound and likely to be acted upon or implemented within their social and political context.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
A BS/BA degree in biology or a closely related field is preferred. Applicants with a baccalaureate degree in another field are accepted, but these individuals may be required to take selected courses in biology. In general, PhD applicants holding a baccalaureate degree are first expected to complete a master's degree.

Special Application Requirements:
A statement of career goals and three letters of recommendation evaluating the applicant's potential for graduate study are required. Three letters of recommendation are required. Scores less than five years old from the General Test of the GRE are required. TOEFL is required for applicants who speak English as a second language. Applicants to the joint law degree program must also apply to the Law School. Application deadline is January 1. Typically, students are admitted only for fall semester.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80
The preferred English language test is Test of English as Foreign Language Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
12 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

PhD students complete 48 credits, 24 credits in courses and 24 thesis credits. Students are expected to show competency in both the biological and social sciences. With their advisory committee, students develop a program that emphasizes the ecological and social aspects of conservation. Dissertation research may require proficiency in supporting areas (e.g., statistics, computing, communications).

Core Courses
All PhD students are required to take following core courses
FW 8452 - Conservation Biology (3.0 cr)
CONS 8095 - Contemporary Problems in Conservation Biology (1.0 cr)

Seminar Requirement
PhD students are required to take 3 semesters of conservation biology seminar, CBIO 8001. FAB track PhD students may substitute 1-2 semesters of FW 8200 to meet 3 semester conservation biology seminar requirement.
Take 3 or more credit(s) from the following:
• CONS 8001 - Conservation Biology Seminar (1.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)

Statistics Requirement
PhD students should take one statistics course (minimum of 3 semester credits) from the following list, or choose from 5- or 8-xxx level courses in other departments in consultation with the advisor and/or SAC.
Take 3 or more credit(s) from the following:
• BIOL 5272 - Applied Biostatistics (4.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
• PUSH 5810 - Survey Research Methods (3.0 cr)
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)

Thesis
All PhD students are required to take 24 thesis semester credits
CONS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: Joint degree in conservation sciences and lawStudent may take a total of 12 credits in common among the academic programs.
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Conservation Science
Conservation science track is available for MS, PhD, and joint degree students wishing to emphasize this concentration within a conservation sciences. This track name will be indicated on the student's transcript. This track provides structure and oversight for students interested in the interface of population, species, and ecosystem biology with disciplines of social sciences, education, economics.

Conservation Science - Electives
Doctoral students should take a minimum of 14 credits from the following list, or choose 5- or 8-xxx level courses from other departments in consultation with SAC to meet minimum credit requirements.
Take 14 or more credit(s) from the following:
- APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- EEB 4129 - Mammalogy (4.0 cr)
- EEB 4134 - Introduction to Ornithology (4.0 cr)
- EEB 5042 - Quantitative Genetics (3.0 cr)
- EEB 5327 - Terrestrial Ecology (3.0 cr)
- EEB 5409 - Evolution (3.0 cr)
- EEB 5601 - Limnology (3.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)
- ENT 4021 - Honey Bees and Insect Societies (3.0 cr)
- ENT 5011 - Insect Structure and Function (4.0 cr)
- ENT 5041 - Insect Ecology (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- FNRM 5104 - Forest Ecology (4.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
- FNRM 5204 - Landscape Ecology and Management (3.0 cr)
- FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- FW 5051 - Analysis of Populations (4.0 cr)
- FW 5401 - Fish Physiology and Behavior (3.0 cr)
- FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
- FW 5625 - Wildlife Handling and Immobilization for Research and Management (2.0 cr)
- GEOG 8280 - Biogeography (3.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- GRAD 8102 - Practicum for Future Faculty (3.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)
- ISG 5010 - Risk Analysis for Introduced Species and Genotypes (3.0 cr)
- ISG 5020 - Risk Analysis Modeling for Introduced Species and Genotypes (1.0 cr)
- ISG 8001 - Discussions in Introduced Species and Genotypes (1.0 cr)
- ISG 8021 - Problem Solving Practicum in Risk Analysis (3.0 cr)
- ISG 8031 - Cooperative Learning Practicum (1.0 cr)
- LA 5202 - Landscape Analysis Workshop (1.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- PA 5251 - Strategic Planning and Management (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)

Fisheries and Aquatic Biology
Three-quarters of the global ecosystem is water and most is a global commons. Many biologists and economists argue that freshwater is one of the most critical global resources and that the functional integrity and biodiversity within freshwater and marine ecosystems are highly threatened. The fisheries and aquatic biology (FAB) track is available for MS, PhD, and joint degree students wishing to emphasize this concentration within a CS major. The track name will be indicated on the student's transcript and may be useful to the graduate for obtaining jobs with many federal and state agencies where such expertise is specified in job announcements or hiring criteria. The track designation clearly indicates that the student has specialized coursework and research or project experience leading to expertise in fisheries or aquatic biology. Combined with a typical undergraduate degree in biology or natural resource science, careful selection of courses in the graduate program will satisfy the educational requirements for professional certification by the
American Fisheries Society.

Students in the track must be advised or co-advised by a faculty member affiliated with the track. Request for admission to the track may be made during the application process or any time after the student is admitted to the CS graduate program. Students in the track must meet all requirements for the PhD in CS.

Students who designate this track will be expected to work closely with their Student Advisory Committee (SAC) to develop an appropriate course of study. The track coordinator will review each student's academic program to examine how track expectations are met and forward it with a recommendation to the director of graduate studies for approval.

Fisheries and Aquatic Biology - Required Courses
In addition to course requirements for the conservation sciences major, PhD students in fisheries and aquatic biology track are required to take minimum of 8 semester credits from following list. Other advanced courses or colloquia on fisheries or aquatic biology that are not listed here may also satisfy needs of students in the track. Please check with FAB track coordinator to add other courses.

**Take 8 or more credit(s) from the following:**
- EEB 5601 - Limnology (3.0 cr)
- EEB 5605 - Limnology Laboratory (2.0 cr)
- EEB 8601 - Introduction to Stream Restoration (3.0 cr)
- EEB 8602 - Stream Restoration Practice (2.0 cr)
- ENT 5361 - Aquatic Insects (4.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
- FW 4401 - Fish Physiology and Behavior (3.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- FW 5051 - Analysis of Populations (4.0 cr)
- FW 5136 - Ichthyology (4.0 cr)
- FW 5601 - Fisheries Population Analysis (3.0 cr)
- FW 8459 - Stream and River Ecology (3.0 cr)
- FW 8465 - Fish Habitats and Restoration (3.0 cr)

Fisheries and Aquatic Biology - Electives
PhD students should take a minimum of 6 semester credits either from the following list, or choose 5- or 8-xxxx courses from other departments in consultation with the advisor and/or SAC.

**Take 6 or more credit(s) from the following:**
- APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- EEB 5042 - Quantitative Genetics (3.0 cr)
- EEB 5327 - Behavioral Ecology (3.0 cr)
- EEB 5409 - Evolution (3.0 cr)
- EEB 5601 - Limnology (3.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)
- ENT 5011 - Insect Structure and Function (4.0 cr)
- ENT 5041 - Insect Ecology (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
- FNRM 5204 - Landscape Ecology and Management (3.0 cr)
- FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- FW 5051 - Analysis of Populations (4.0 cr)
- FW 5401 - Fish Physiology and Behavior (3.0 cr)
- FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
- FW 5625 - Wildlife Handling and Immobilization for Research and Management (2.0 cr)
- GEOG 8280 - Biogeography (3.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- GRAD 8102 - Practicum for Future Faculty (3.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)
- ISG 5010 - Risk Analysis for Introduced Species and Genotypes (3.0 cr)
- ISG 5020 - Risk Analysis Modeling for Introduced Species and Genotypes (1.0 cr)
- ISG 8001 - Discussions in Introduced Species and Genotypes (1.0 cr)
- ISG 8021 - Problem Solving Practicum in Risk Analysis (3.0 cr)
- LA 5202 - Cooperative Learning Practicum (1.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
Wildlife Ecology and Management

The Wildlife Ecology and Management track is available for students wishing to emphasize this concentration within the conservation sciences degree. The track provides structure and oversight for students interested in the interface of population, species, and ecosystem biology with the disciplines of social sciences, education, and economics. The track name will be posted to the transcript, and may be useful to the graduate for obtaining jobs with many federal and state agencies where such expertise is specified in job announcements or hiring criteria. The track designation clearly indicates that the student has specialized coursework and research or project experience leading to expertise in wildlife ecology and management.

Students in the track must be advised or co-advised by a faculty member affiliated with the track. Requests for admission to the track may be made during the application process or at any time after the student is admitted to conservation sciences. Students in the track must meet all MS degree requirements. Students who designate this track will be expected to work closely with their Student Advisory Committee (SAC) to develop an appropriate course of study. The track coordinator will review each student's academic program to examine how track expectations are met and forward it with a recommendation to the director of graduate studies for approval.

Wildlife Ecology & Management - Electives

Doctoral students should take a minimum of 14 credits from the following list, or choose 5- or 8-xxx level courses from other departments in consultation with SAC to meet minimum credit requirements.

Take 14 or more credit(s) from the following:

- APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- EEB 4129 - Mammalogy (4.0 cr)
- EEB 4134 - Introduction to Ornithology (4.0 cr)
- EEB 5042 - Quantitative Genetics (3.0 cr)
- EEB 5327 - Behavioral Ecology (3.0 cr)
- EEB 5409 - Evolution (3.0 cr)
- EEB 5601 - Limnology (3.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)
- ENT 4021 - Honey Bees and Insect Societies (3.0 cr)
- ENT 5011 - Insect Structure and Function (4.0 cr)
- ENT 5041 - Insect Ecology (3.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- FNRM 5104 - Forest Ecology (4.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
- FNRM 5204 - Landscape Ecology and Management (3.0 cr)
- FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- FW 5051 - Analysis of Populations (4.0 cr)
- FW 5401 - Fish Physiology and Behavior (3.0 cr)
- FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
- FW 5625 - Wildlife Handling and Immobilization for Research and Management (2.0 cr)
- GEOG 8280 - Biogeography (3.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- GRAD 8102 - Practicum for Future Faculty (3.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)
- ISG 5010 - Risk Analysis for Introduced Species and Genotypes (3.0 cr)
- ISG 5020 - Risk Analysis Modeling for Introduced Species and Genotypes (1.0 cr)
- ISG 8001 - Discussions in Introduced Species and Genotypes (1.0 cr)
- ISG 8021 - Problem Solving Practicum in Risk Analysis (3.0 cr)
- ISG 8031 - Cooperative Learning Practicum (1.0 cr)
- LA 5202 - Landscape Analysis Workshop (1.0 cr)
- LA 5204 - Metropolitan Landscape Ecology (3.0 cr)
- PA 5251 - Strategic Planning and Management (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5511 - Community Economic Development (3.0 cr)
- VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)
Twin Cities Campus
Entomology M.S.
Enterology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Entomology, 1980 Folwell Avenue, 219 Hodson Hall, St. Paul, MN 55108 (612-624-3636; fax: 612-625-5299)
Email: entodept@umn.edu
Website: http://www.entomology.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Entomology centers on the study of insects and includes specializations in ecology, behavior, molecular biology, microbiology, neurobiology, physiology, population dynamics, systematics, and taxonomy. Specialized or applied areas include apiculture, biological control, cell culture, insect conservation, insect-vector relations, integrated pest management, and modeling. Research programs are active in aquatic systems, forest systems, crop and animal agriculture, human health, and natural and urban environments.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
A bachelor's degree with a major in a biological science is a prerequisite. Preference is given to students with a broad background in the basic sciences. Admission depends primarily on applicant’s undergraduate record, letters of recommendation, and the statement of interest from the applicant.
GRE scores in Verbal Reasoning, Quantitative Reasoning, Analytical Writing are required.

Special Application Requirements:
Applicants must submit a complete set of official transcripts and a clearly written statement of career interests, goals, and objectives, and a diversity statement. Three letters of recommendation are required from persons well acquainted with the student's academic record, and should be either uploaded or sent directly to the department.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: 1-3 project reports as directed by the advisor and the advisory committee.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students must accumulate 2 written examination points.

Required Coursework

ENT 5011 - Insect Structure and Function (4.0 cr)
ENT 5021 - Insect Biodiversity and Evolution (4.0 cr)
ENT 5041 - Insect Ecology (3.0 cr)

Plan Options

Plan A Requirements

Graduate Seminar
Take at least 1 credit of the following:
ENT 8300 - Graduate Seminar (1.0 - 2.0 cr)

Electives
Take at least 8 credits in consultation with the advisor. Elective courses can be taken from entomology or any University of Minnesota program. Students must work with their advisor(s) when selecting electives outside of the entomology program. Elective courses must be taken at the graduate (4xxx-8xxx) level.

Master's Thesis Credits
Take at least 10 master's thesis credits.
ENT 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B Requirements

Take 1-6 credits of Independent Research (ENT 5910: Special Problems in Entomology)
ENT 5910 - Special Problems in Entomology (1.0 - 6.0 cr)

Electives
Take at least 13-18 credits in consultation with the advisor and the advisory committee. Elective courses can be taken from entomology or any University of Minnesota program. Students must work with their advisor(s) when selecting electives outside of the entomology program. Elective courses must be taken at the graduate (4xxx-8xxx) level.
**Twin Cities Campus**

**Entomology Minor**

**Entomology**

**College of Food, Agricultural and Natural Resource Sciences**

Link to a list of faculty for this program.

**Contact Information:**
Department of Entomology, 1980 Folwell Ave, 219 Hodson Hall, St. Paul, MN 55108 (612-624-3636; fax: 612-625-5299)
Email: entodept@umn.edu
Website: [http://www.entomology.umn.edu](http://www.entomology.umn.edu)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](http://www.entomology.umn.edu) section of the catalog website for requirements that apply to all major fields.

Entomology centers on the study of insects and includes specializations in ecology, behavior, molecular biology, microbiology, neurobiology, physiology, population dynamics, systematics, and taxonomy. Specialized or applied areas include apiculture, biological control, cell culture, insect conservation, insect-vector relations, integrated pest management, and modeling. Research programs are active in aquatic systems, forest systems, crop and animal agriculture, human health, and natural and urban environments.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the [General Information](http://www.entomology.umn.edu) section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Program Sub-plans**
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Masters**
Courses are chosen in consultation with the student's major advisor and the Entomology director of graduate studies.

**Master's Course List**
Take at least six credits from the following:
- ENT 4xxx
- ENT 5xxx
- ENT 8xxx

**Doctoral**
Courses are chosen in consultation with the student's major advisor and the Entomology director of graduate studies.

**Doctoral Course List**
Take at least 12 credits from the following:
Twin Cities Campus
Entomology Ph.D.
Entomology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Entomology, 1980 Folwell Avenue, 219 Hodson Hall, St. Paul, MN 55108 (612-624-3636; fax: 612-625-5299)
Email: entodept@umn.edu
Website: http://www.entomology.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Entomology centers on the study of insects and includes specializations in ecology, behavior, molecular biology, microbiology, neurobiology, physiology, population dynamics, systematics, and taxonomy. Specialized or applied areas include apiculture, biological control, cell culture, insect conservation, insect-vector relations, integrated pest management, and modeling. Research programs are active in aquatic systems, forest systems, crop and animal agriculture, human health, and natural and urban environments.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A GPA of 3.00 (on a 4.00 scale).

A 3.50 GPA (on a 4.00 scale) for prior graduate work is preferred for admission.

Other requirements to be completed before admission:
A bachelor's degree with a major in a biological science is a prerequisite. Preference is given to students with a broad background in the basic sciences. Admission depends primarily on applicant's undergraduate record, letters of recommendation, and the statement of interest from the applicant.
GRE scores for Verbal Reasoning, Quantitative Reasoning and Analytical Writing are required for admission.

Special Application Requirements:
Applicants must submit a complete set of official transcripts and a clearly written statement of career interests, goals, objectives and a diversity statement. Three letters of recommendation are required from persons well acquainted with the student's academic record, and should be either uploaded or sent directly to the department.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.

**Plan A:** Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** 1-3 project reports as directed by the advisor and the advisory committee.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students must accumulate 3 written examination points.

**Core Courses**
11 credits required
- ENT 5021 - Insect Biodiversity and Evolution (4.0 cr)
- ENT 5011 - Insect Structure and Function (4.0 cr)
- ENT 5041 - Insect Ecology (3.0 cr)

**Seminar Requirement**
2 credits required
- ENT 8300 - Graduate Seminar (1.0 - 2.0 cr)

**Electives**
11 or more credits required.

Elective courses can be taken from entomology or any University of Minnesota program. Students must work with their advisor(s) when selecting electives outside of the entomology program. Elective courses must be taken at the graduate (4xxx-8xxx) level, but only a maximum of 9 credits from the 4xxx level may be used.

**Thesis Credits**
24 credits required
- ENT 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Food Science M.S.
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fscn.cfans.umn.edu/graduate_programs/foodsciencegraduate/index.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Food science applies scientific principles to the manufacture, distribution, marketing, and consumer aspects of food. Food scientists apply the basic principles and techniques of many disciplines, including chemistry, physics, microbiology, and nutrition, to food processing and preservation, new product development, and food marketing. Food scientists are concerned with the theoretical and practical aspects of the food chain, from the production of raw materials to the use of food products by consumers. Students may emphasize the chemistry, engineering, microbiology, nutrition, or technology of food products.

Students may spend a maximum of five (5) years in this degree program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants to the program need a bachelor's degree, or its international equivalent, in any field.

Other requirements to be completed before admission:
The minimum requirements are general chemistry with laboratory, organic chemistry with laboratory, physics with laboratory, biology with laboratory, and calculus. If preparation appears inadequate, certain additional courses may be required after admission.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is equivalent to 120 hours of work or three full weeks of research and writing. It should consist of one of the following options, which are intended to familiarize the candidate with the tools of research or scholarship in the field and serve to demonstrate the ability to work independently: 1) The candidate may prepare one paper equivalent to 120 hours of work in one advanced course, over and above the normal course requirement as approved by the instructor in consultation with the advisor. This course must be from the major field of interest. 2) The candidate may prepare one paper equivalent to the requirement of 120 hours in some related field or course as approved in consultation with the instructor and the adviser. 3) The student may do an equivalent amount of library or laboratory research and write a research report to satisfy the requirement as approved by the adviser. This may take the form of a research proposal.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

All students are expected to participate as teaching assistants during their graduate careers. Up to 9 credits of 4xxx-level courses are allowed.

Required Courses

All students take the following required courses for 11 credits:
- FSCN 4112 - Food Chemistry and Functional Foods (3.0 cr)
- FSCN 4121 - Food Microbiology (3.0 cr)
- FSCN 4332 - Food Processing Operations (3.0 cr)
- FSCN 8318 - Current Issues in Food Science (2.0 cr)

Take one of the following courses for a total of 2 to 4 credits:
- FSCN 5131 - Food Quality for Graduate Credit (3.0 cr)
- or FSCN 5312 - Food Analysis (4.0 cr)
- or If FSCN 5122 is taken, FSCN 5123 must also be taken
  - FSCN 5122 - Food Fermentations and Biotechnology (2.0 cr)
  - FSCN 5123 - Molecular Biology for Applied Scientists (1.0 cr)

Food Science Elective

Take at least 3 additional FSCN credits, in consultation with the adviser.
- FSCN 5xxx
- or FSCN 8xxx

General Elective

Choose remaining credits in consultation with the adviser to meet minimum credit requirements.

Plan Options

Plan A

Take 10 master's thesis credits.
- FSCN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
- OR-

Plan B

Plan B students do not have additional requirements.
Twin Cities Campus

Food Science Minor
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fsnc.cfans.umn.edu/education/foodsciencegraduate/index.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 10
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Food science applies scientific principles to the manufacture, distribution, marketing, and consumer aspects of food. Food scientists apply the basic principles and techniques of many disciplines, including chemistry, physics, microbiology, and nutrition, to food processing and preservation, new product development, and food marketing. Food scientists are concerned with the theoretical and practical aspects of the food chain, from the production of raw materials to the use of food products by consumers. Students may emphasize the chemistry, engineering, microbiology, nutrition, or technology of food products.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Students wishing to complete the food science minor must consult with the food science director of graduate studies to establish specific requirements and goals for an acceptable minor program of study.

Required Courses
- FSCN 4112 - Food Chemistry and Functional Foods (3.0 cr)
- FSCN 4121 - Food Microbiology (3.0 cr)
- FSCN 4332 - Food Processing Operations (3.0 cr)

Doctoral
Required Courses
Students wishing to complete the food science minor must consult with the food science director of graduate studies to establish specific requirements and goals for an acceptable minor program of study.
In addition to the 3 courses listed below, students pursuing the doctoral minor must take at least 3 5xxx- or 8xxx-level FSCN credits.

- **FSCN 4112** - Food Chemistry and Functional Foods (3.0 cr)
- **FSCN 4121** - Food Microbiology (3.0 cr)
- **FSCN 4332** - Food Processing Operations (3.0 cr)
- FSCN 5xxx
- FSCN 8xxx
Twin Cities Campus
Food Science Ph.D.
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fscn.cfans.umn.edu/graduate_programs/foodsciencegraduate/index.htm

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Food science applies scientific principles to the manufacture, distribution, marketing, and consumer aspects of food. Food scientists apply the basic principles and techniques of many disciplines, including chemistry, physics, microbiology, and nutrition, to food processing and preservation, new product development, and food marketing. Food scientists are concerned with the theoretical and practical aspects of the food chain, from the production of raw materials to the use of food products by consumers. Students may emphasize the chemistry, engineering, microbiology, nutrition, or technology of food products.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants to the program need a bachelor's degree in any field or its international equivalent along with demonstrated research ability such as a MS degree or publications.

Other requirements to be completed before admission:
The minimum requirements are general chemistry with laboratory, organic chemistry with laboratory, physics with laboratory, biology with laboratory, and calculus. If preparation appears inadequate, certain additional courses may be required after admission. Graduate Record Examination (GRE) General Test scores, and the TOEFL (for international students) are also required.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

All students must participate as teaching assistants during their graduate career.

Required Courses
All students must take the following courses
FSCN 4112 - Food Chemistry and Functional Foods (3.0 cr)
FSCN 4121 - Food Microbiology (3.0 cr)
FSCN 4332 - Food Processing Operations (3.0 cr)
FSCN 8318 - Current Issues in Food Science (2.0 cr)
FSCN 5131 - Food Quality for Graduate Credit (3.0 cr)

Course Options
Students must choose one of the following courses.
FSCN 5122 - Food Fermentations and Biotechnology (2.0 cr)
FSCN 5312 - Food Analysis (4.0 cr)

General Elective
Students must take at least three (3) credits at the 5xxx or 8xxx level in addition to the courses listed above.

Elective Courses
Students complete additional 5xxx and 8xxx level FSCN courses, in consultation with their advisor, to total at least 24 credits.
FSCN 5xxx
FSCN 8xxx

Thesis Credits
Food Science PhD students must take 24 thesis credits.
FSCN 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Land and Atmospheric Science M.S.
Soil, Water, & Climate
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Soil, Water, and Climate, 439 Borlaug Hall, 191 Upper Buford Circle, St. Paul, MN 55108 (612-625-5251; fax: 612-625-2208)
Email: kjarcho@umn.edu
Website: http://www.laas.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Land and atmospheric science (LAAS) is a science-based interdisciplinary program focused on the fundamentals of Earth system processes related to land and atmosphere and their coupled interactions. Students have the option to develop a program based on one of the more traditional areas in atmospheric science or soil science or to design their own interdisciplinary course of study bridging the two disciplines. The land and atmospheric science graduate program has no formal tracks or emphasis areas, but instead allows students to design a curriculum that addresses their interests within the scope of the program. This multidisciplinary program encompasses aspects of chemistry, physics, biology, atmospheric sciences, and geology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

BS degree in a related field of science, or a graduate or professional degree.

Required prerequisites

Basic Sciences
Students are expected to have taken a minimum of four of the following courses (or their equivalent).

- MATH 1271 - Calculus I [MATH] (4.0 cr)
  or MATH 1142 - Short Calculus [MATH] (4.0 cr)
- MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
- PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
  or ESPM 3131 - Environmental Physics (3.0 cr)
- PHYS 1102W - Introductory College Physics II [PHYS, WI] (4.0 cr)
  or STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
- CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
  or BIOL 1009 - General Biology [BIOL] (4.0 cr)
- CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
- CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
- STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)

Environmental Sciences
Students are expected to have taken a minimum of two of the following (or similar) courses:

Take 2 - 6 course(s) from the following:
- ESPM 1011 - Issues in the Environment [ENV] (3.0 cr)
- ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
- SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
- ESCI 1001 - Earth and Its Environments [PHYS, ENV] (4.0 cr)
• ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)  
  or MICB 3301 - Biology of Microorganisms (5.0 cr)  
• EEB 3407 - Ecology (3.0 cr)

Other requirements to be completed before admission:
Student course admission prerequisites are as shown below. Students who are admitted with deficiencies would be provided with a list of courses they are required to take before the completion of their degree. This list would be developed by the directors of graduate studies in consultation with the student's faculty advisor.

International applicants must submit score(s) from one of the following tests:
  • TOEFL  
    - Internet Based - Total Score: 79  
    - Internet Based - Writing Score: 21  
    - Internet Based - Reading Score: 19  
    - Paper Based - Total Score: 550  
  • IELTS  
    - Total Score: 6.5  
  • MELAB  
    - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 20 major credits and 10 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project typically consists of a technical paper of a topic and length acceptable to the student's advisory committee.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Courses
All students must complete the 5-credit core curriculum.
Take exactly 3 course(s) totaling exactly 5 credit(s) from the following:
• LAAS 5050 - Integrated Topics in Land & Atmospheric Science (3.0 cr)  
• LAAS 8128 - Land and Atmospheric Science Seminar (1.5 cr)  
• SOIL 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)  

LAAS and Related Courses
Plan A students must select at least 15 credits (9 major credits and 6 related fields) from this list, and Plan B students must select at least 25 credits (15 major credits and 10 related fields). Courses are selected based on relevance to research interests and with the consent of the advisor.

Take 15 or more credit(s) from the following:
• LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)  
• LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)  
• LAAS 5426 - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)  
• LAAS 5480 - Special Topics in Land and Atmospheric Science (1.0 - 4.0 cr)  
• LAAS 5515 - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)  
• LAAS 8195 - Research Problems in Soils (1.0 - 5.0 cr)  
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
• CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
• CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
• CEGE 5180 - Special Topics (1.0 - 4.0 cr)
• CEGE 5511 - Urban Hydrology and Water Quality (4.0 cr)
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
• CEGE 5543 - Introductory Environmental Fluid Mechanics (4.0 cr)
• CEGE 5551 - Environmental Microbiology (3.0 cr)
• CEGE 8501 - Environmental Fluid Mechanics I (4.0 cr)
• CEGE 8502 - Environmental Fluid Mechanics II (4.0 cr)
• CEGE 8503 - Environmental Mass Transport (4.0 cr)
• CEGE 8506 - Stochastic Hydrology (4.0 cr)
• CEGE 8521 - The Atmospheric Boundary Layer (4.0 cr)
• CEGE 8541 - Aquatic Chemistry (3.0 cr)
• CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
• CEGE 8551 - Environmental Microbiology: Molecular Theory and Methods (4.0 cr)
• CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
• CEGE 8562 - Analysis and Modeling of Aquatic Environments II (3.0 cr)
• CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
• EEB 4068 - Plant Physiological Ecology (3.0 cr)
• EEB 4611 - Biogeochemical Processes (3.0 cr)
• EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• EEB 5605 - Limnology Laboratory (2.0 cr)
• ESCL 5102 - Climate Change and Human History (3.0 cr)
• ESCL 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
• ESCL 5351 - Geochemical Modeling of Aquous Systems (3.0 cr)
• ESCL 5402 - Science and Politics of Global Warming (3.0 cr)
• ESCL 8401 - Aqueous Environmental Geochemistry (3.0 cr)
• ESCL 8402 - Biogeochemical Cycles in the Ocean (3.0 cr)
• ESCL 8801 - Geomicrobiology (3.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
• ESPM 5402 - Biometeorology (3.0 cr)
• ESPM 5601 - Principles of Waste Management (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FW 8459 - Stream and River Ecology (3.0 cr)
• GEOG 5401 - Geography of Environmental Systems and Global Change (4.0 cr)
• GEOG 5426 - Climatic Variations (3.0 cr)
• GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
• GEOG 5562 - GIS Development Practicum (3.0 cr)
• GEOG 5839 - Introduction to Dendrochronology (3.0 cr)
• GEOG 8270 - Seminar: Climatology (3.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
• PMB 5412 - Plant Physiology (3.0 cr)
• PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
• PUBH 6100 - Topics: Environmental Health (1.0 - 4.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 6191 - Air Pollution (3.0 cr)
• SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
• SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
• SOIL 5555 - Wetland Soils (3.0 cr)
• SOIL 5611 - Soil Biology and Fertility (4.0 cr)
• SOIL 8252 - Advanced Soil Physics (2.0 cr)
• SOIL 8510 - Advanced Topics in Pedology (2.0 - 4.0 cr)
• SOIL 8541 - Aquatic and Soil Chemistry (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
Plan Options

Plan A
Take 10 or more credit(s) from the following:
- LAAS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Plan B students do not have additional requirements other than those described above.
Twin Cities Campus

Land and Atmospheric Science Minor
Soil, Water, & Climate
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Email: kiarcho@umn.edu
Website: http://www.laas.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Land and atmospheric science (LAAS) is a science-based interdisciplinary program focused on the fundamentals of Earth system processes related to land and atmosphere and their coupled interactions. Students have the option to develop a program based on one of the more traditional areas in atmospheric science or soil science or to design their own interdisciplinary course of study bridging the two disciplines. The Land and atmospheric science graduate program has no formal tracks or emphasis areas, but instead allows students to design a curriculum that addresses their interests within the scope of the program. This multidisciplinary program encompasses aspects of chemistry, physics, biology, atmospheric sciences, and geology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

B.S. degree in a related science field.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

All minor courses must be taken A-F, unless approved by the Graduate Advisory Committee, or if they are offered on the S-N basis only. Courses for use in the minor must be selected with the consultation of the Land and Atmospheric Science graduate faculty member serving as the minor advisor and approved by the director of graduate studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Integrated Topics
All students are required to take the following course.
Take exactly 1 course(s) totaling exactly 3 credit(s) from the following:

- LAAS 5050 - Integrated Topics in Land & Atmospheric Science (3.0 cr)

Other LAAS courses
Take 6 credits for MS minor from the following options, or others approved by the DGS and the LAAS graduate faculty member serving as the minor advisor.

Take 6 or more credit(s) from the following:

- LAAS 5051 - Thesis Proposal Writing for Land & Atmospheric Science (2.0 cr)
- LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
- LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)
- LAAS 5426 - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)
- LAAS 5515 - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)
- LAAS 5621 - Soil and Environmental Genomics (3.0 cr)
- LAAS 8128 - Land and Atmospheric Science Seminar (1.5 cr)

Doctoral

Integrated Topics
All students are required to take the following course.

Take exactly 1 course(s) totaling exactly 3 credit(s) from the following:

- LAAS 5050 - Integrated Topics in Land & Atmospheric Science (3.0 cr)

Other LAAS courses
Take 9 credits for PhD minor from the following options, or others approved by the DGS and the LAAS graduate faculty member serving as the minor advisor.

Take 9 or more credit(s) from the following:

- LAAS 5051 - Thesis Proposal Writing for Land & Atmospheric Science (2.0 cr)
- LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
- LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)
- LAAS 5426 - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)
- LAAS 5515 - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)
- LAAS 5621 - Soil and Environmental Genomics (3.0 cr)
- LAAS 8128 - Land and Atmospheric Science Seminar (1.5 cr)
Twin Cities Campus
Land and Atmospheric Science Ph.D.
Soil, Water, & Climate
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Soil, Water, and Climate, 439 Borlaug Hall, 1919 Upper Buford Circle, St. Paul, MN 55108 (612-625-5251; fax: 612-625-2208)
Email: laas@umn.edu
Website: http://www.laas.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 50
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Land and atmospheric science (LAAS) is a science-based interdisciplinary program focused on the fundamentals of Earth system processes related to land and atmosphere and their coupled interactions. Students have the option to develop a program based on one of the more traditional areas in atmospheric science or soil science or to design their own interdisciplinary course of study bridging the two disciplines. The Land and atmospheric science graduate program has no formal tracks or emphasis areas, but instead allows students to design a curriculum that addresses their interests within the scope of the program. This multidisciplinary program encompasses aspects of chemistry, physics, biology, atmospheric sciences, and geology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

Applicants to the LAAS PhD program are expected to have an MS degree or equivalent in a related field of science.

Required prerequisites
Basic Sciences
Students are expected to have taken a minimum of four of the following courses (or their equivalent):
- MATH 1271 - Calculus I [MATH] (4.0 cr)
- MATH 1142 - Short Calculus [MATH] (4.0 cr)
- MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
- PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
- PHYS 1102W - Introductory College Physics II [PHYS, WI] (4.0 cr)
- or ESPM 3131 - Environmental Physics (3.0 cr)
- or BIOL 1009 - General Biology [BIOL] (4.0 cr)
- or CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
- CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
- CHEM 1062 - Chemical Principles II [PHYS] (3.0 cr)
- CHEM 1066 - Chemical Principles II Laboratory [PHYS] (1.0 cr)
- or STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)

Environmental Sciences
Students are expected to have taken a minimum of two of the following (or similar) courses:
Take 2 - 6 course(s) from the following:
- ESPM 1011 - Issues in the Environment [ENV] (3.0 cr)
- ESPM 1425 - Introduction to Weather and Climate [PHYS, ENV] (4.0 cr)
- SOIL 2125 - Basic Soil Science [PHYS, ENV] (4.0 cr)
- ESCI 1001 - Earth and Its Environments [PHYS, ENV] (4.0 cr)
- ESPM 3612W - Soil and Environmental Biology [WI] (4.0 cr)
  or MICB 3301 - Biology of Microorganisms (5.0 cr)
- EEB 3407 - Ecology (3.0 cr)

Other requirements to be completed before admission:
Students with a BS degree and outstanding scholarship can request direct admission to the LAAS PhD program. Each request will be considered on a case-by-case basis by the Graduate Advisory Committee. Evidence of outstanding scholarship may include: peer-reviewed publications, a pre-doctoral fellowship, a National Science Foundation PhD Fellowship, high GPA/GRE scores, or strong previous research experience. Current MS candidates who exhibit outstanding scholarship may request transfer to a PhD degree program after completion of their first two semesters of coursework.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
16 credits are required in the major.
10 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Courses
All doctoral students must complete the 10-credit core curriculum.
Take exactly 5 course(s) totaling exactly 10 credit(s) from the following:
- LAAS 5050 - Integrated Topics in Land & Atmospheric Science (3.0 cr)
- LAAS 8128 - Land and Atmospheric Science Seminar (1.5 cr)
- SOIL 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- LAAS 5051 - Thesis Proposal Writing for Land & Atmospheric Science (2.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)

LAAS and Related Courses
Choose courses relevant to particular area of research with consent of advisor. Take at least 6 credits from the following list to complete the 16-credit minimum for the major, and at least 10 credits for the supporting program minimum.
Take 16 or more credit(s) from the following:
- LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
- LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)
- LAAS 5426 - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)
- LAAS 5480 - Special Topics in Land and Atmospheric Science (1.0 - 4.0 cr)
- LAAS 5515 - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)
- LAAS 8195 - Research Problems in Soils (1.0 - 5.0 cr)
- AGRO 5121 - Applied Experimental Design (4.0 cr)

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Information current as of August 31, 2018
• AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
• CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
• CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
• CEGE 5180 - Special Topics (1.0 - 4.0 cr)
• CEGE 5511 - Urban Hydrology and Water Quality (4.0 cr)
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
• CEGE 5543 - Introductory Environmental Fluid Mechanics (4.0 cr)
• CEGE 5551 - Environmental Microbiology (3.0 cr)
• CEGE 8501 - Environmental Fluid Mechanics I (4.0 cr)
• CEGE 8502 - Environmental Fluid Mechanics II (4.0 cr)
• CEGE 8503 - Environmental Mass Transport (4.0 cr)
• CEGE 8506 - Stochastic Hydrology (4.0 cr)
• CEGE 8521 - The Atmospheric Boundary Layer (4.0 cr)
• CEGE 8541 - Aquatic Chemistry (3.0 cr)
• CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
• CEGE 8551 - Environmental Microbiology: Molecular Theory and Methods (4.0 cr)
• CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
• CEGE 8562 - Analysis and Modeling of Aquatic Environments II (3.0 cr)
• CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
• EEB 4068 - Plant Physiological Ecology (3.0 cr)
• EEB 4611 - Biogeochemical Processes (3.0 cr)
• EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• EEB 5605 - Limnology Laboratory (2.0 cr)
• ESCI 5102 - Climate Change and Human History (3.0 cr)
• ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
• ESCI 5351 - Geochemical Modeling of Aquatic Systems (3.0 cr)
• ESCI 5402 - Science and Politics of Global Warming (3.0 cr)
• ESCI 8401 - Aquatic Environmental Geochemistry (3.0 cr)
• ESCI 8402 - Biogeochemical Cycles in the Ocean (3.0 cr)
• ESCI 8801 - Geomicrobiology (3.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
• ESPM 5402 - Biometeorology (3.0 cr)
• ESPM 5601 - Principles of Waste Management (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FW 8459 - Stream and River Ecology (3.0 cr)
• GEOG 5401 - Geography of Environmental Systems and Global Change (4.0 cr)
• GEOG 5426 - Climatic Variations (3.0 cr)
• GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
• GEOG 5562 - GIS Development Practicum (3.0 cr)
• GEOG 5839 - Introduction to Dendrochronology (3.0 cr)
• GEOG 8270 - Seminar: Climatology (3.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• PMB 4111 - Microbial Physiology and Diversity (3.0 cr)
• PMB 5412 - Plant Physiology (3.0 cr)
• PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
• PUBH 6100 - Topics: Environmental Health (1.0 - 4.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 6191 - Air Pollution (3.0 cr)
• SAQR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
• SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
• SOIL 5555 - Wetland Soils (3.0 cr)
• SOIL 5611 - Soil Biology and Fertility (4.0 cr)
• SOIL 8252 - Advanced Soil Physics (2.0 cr)
• SOIL 8510 - Advanced Topics in Pedology (2.0 - 4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- WRS 5101 - Water Policy (3.0 cr)

Thesis credits
Take 24 or more credit(s) from the following:
- LAAS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Natural Resources Science and Management M.S.
Bioproducts and Biosystems Engineering, Fisheries, Wildlife, and Conservation Biology, Forest Resources
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Forest Resources, 116d Green Hall, 1530 Cleveland Avenue N, St. Paul MN 55108 (612-624-7683; fax: 612-625-5212)
Email: nrsm@umn.edu
Website: http://www.nrsm.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the natural resources science and management program emphasize one of the following tracks: 1) forests: biology, ecology, conservation, and management; 2) economics, policy, management, and society; 3) assessment, monitoring, and geospatial analysis; 4) recreation resources, tourism, and environmental education; 5) forest hydrology and watershed management; 6) forest products; or 7) paper science and engineering.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Most admitted students have earned degrees in natural resource-related majors. Applicants with exceptional academic records but no related background are eligible; if admitted, they may complete the prerequisites for advanced courses during the early stages of their graduate program. These prerequisites will vary depending upon the student's track and major advisor.

Applicants will not be admitted unless a member of the program faculty agrees to advise them ahead of time. This decision depends on admissibility (the applicant's overall credentials), mutual research interests, and the faculty member's ability to take on a new student. Some faculty members will not advise students unless they have funding for the student. Applicants are encouraged to review faculty profiles on the program website and begin making contacts prior to and during the application process.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language.
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** Plan B project(s) is(are) designed in consultation with the student's advisor and committee. It(They) must develop and demonstrate competence in the student's track.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MS is offered under Plan A (with thesis) and Plan B (without thesis). Plan A requires at least 20 coursework credits and Plan B requires at least 30 coursework credits. Plan A students must also register for 10 thesis credits. Plan A students usually design a program to support their specific thesis project. In consultation with faculty members, Plan B students design a program that develops competence in at least one track. Students present a seminar on the thesis or the Plan B project. Specific requirements vary by track and research project; prospective students should contact the director of graduate studies or a prospective faculty advisor for specific information. Students must also receive training in the ethical conduct of research and present a formal seminar to faculty and peers. This presentation is separate from the final exam seminar.

**Required Seminar**

All students in NRSM must take the Natural Resources Seminar course. Course was listed as FNRM 8107 prior to spring 2017, and NR 8107 in all future semesters.

NR 8107 - Seminar: Natural Resources Science and Management (1.0 cr)

**Joint- or Dual-degree Coursework:** Law, Science & Technology Student may take a total of 12 credits in common among the academic programs.

**Program Sub-plans**

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Assessment, Monitoring, and Geospatial Analysis**

Addresses measurements and related technology applications and resource analysis. Graduate students in this track may choose to specialize in topics such as: geographic information systems (GIS); remote sensing; geospatial analysis; survey design (including forest inventory and monitoring), measurement, modeling; and biometrics. Studies typically focus on landscape, region, or global levels.

**Assessment, Monitoring, and Geospatial Analysis - Suggested Course List**

NRSM students in the assessment, monitoring, and geospatial analysis track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:

- **AGRO 5121** - Applied Experimental Design (4.0 cr)
- **APEC 5031** - Methods of Economic Data Analysis (3.0 cr)
- **APEC 5032** - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
- **APEC 8211** - Econometric Analysis I (4.0 cr)
- **APEC 8212** - Econometric Analysis II (4.0 cr)
- **CI 8149** - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- **CSCI 5302** - Analysis of Numerical Algorithms (3.0 cr)
- **CSCI 5707** - Principles of Database Systems (3.0 cr)
- **DES 8103** - Qualitative and Mixed Methods Research (3.0 cr)
- **ECON 8201** - Econometric Analysis (2.0 cr)
- **ECON 8203** - Econometric Analysis (2.0 cr)

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Information current as of August 31, 2018
• ECON 8204 - Econometric Analysis (2.0 cr)
• EEB 5068 - Plant Physiological Ecology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101 (Inactive) (3.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5261 - Forest Economics and Natural Resources Management (4.0 cr)
• ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5218 - Measuring and Modeling Forests (3.0 cr)
• FNRM 5228 - Advanced Topics in Assessment and Modeling of Forests (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
• FNRM 5471 - Forest Management Planning (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
• GEOG 5562 - GIS Development Practicum (3.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5571 - ArcGIS I (3.0 cr)
• GIS 5572 - ArcGIS II (3.0 cr)
• GIS 5575 - Practical Surveying for GIS (2.0 cr)
• GIS 5577 - Spatial Database Design and Administration (3.0 cr)
• GIS 5578 - GIS Programming (3.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• PUBH 8472 - Spatial Biostatistics (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5555 - Wetland Soils (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5511 - Time Series Analysis (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B
Plan B students do not need to complete additional research credits.

Economics, Policy, Management, and Society
For students interested in focusing on how society values and makes decisions about the use, management, and protection of natural and environmental resources. Graduate students in this track can specialize in areas such as: economics, policy, administration and management, planning, operations research, conflict resolution, human dimensions, and land use planning. Studies might consider choices, impacts, and tradeoffs in protecting, restoring, developing, and allocating natural and environmental resources. The research conducted by students in this track may address a wide range of issues and problems from local to international in scope.

Economics, Policy, Management, and Society - Suggested Course List
NRSM students in the economics, policy, management, and society track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
• APEC 5152 - Applied Macroeconomics: Income and Employment (3.0 cr)
• APEC 5321 - Regional Economic Analysis (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• APEC 5721 - Economics of Science and Technology Policy (3.0 cr)
• APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
• APEC 8202 - Mathematical Optimization in Applied Economics (3.0 cr)
• APEC 8203 - Applied Welfare Economics and Public Policy (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• APEC 8601 - Natural Resource Economics (3.0 cr)
• APEC 8602 - Economics of the Environment (3.0 cr)
• BIOL 5407 - Ecology (3.0 cr)
• CEGE 5570 - Design for Sustainable Development - India (3.0 - 9.0 cr)
• CI 5537 - Principles of Environmental Education (3.0 cr)
• CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• COMM 5250 - Environmental Communication (3.0 cr)
• COMM 5402 - Advanced Interpersonal Communication (3.0 cr)
• COMM 5441 - Communication in Human Organizations (3.0 cr)
• COMM 8452 - Seminar: Methods of Intercultural/Diversity Facilitation (3.0 cr)
• DES 8103 - Quantitative and Mixed Methods Research (3.0 cr)
• ECON 8105 - Macroeconomic Theory (2.0 cr)
• ECON 8106 - Macroeconomic Theory (2.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
• ESY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• ESY 5243 - Principles and Methods of Evaluation (3.0 cr)
• ESY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• ESY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• ESY 5281 - Introductory Statistical Methods (3.0 cr)
• ESY 5282 - Intermediate Statistical Methods (3.0 cr)
• ESY 8286 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5081 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101 [Inactive] (3.0 cr)
• ESPM 5108 - Ecology of Managed Systems (4.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5208 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5241 - Natural Resource and Environmental Policy (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
• ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
• ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
• ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
• ESPM 5602 - Regulations and Corporate Environmental Management (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5604 - Environmental Management Systems and Strategy (3.0 cr)
• ESPM 5811 - Environmental Interpretation (3.0 cr)
• FNRM 5101 - Park and Protected Area Tourism (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5264 - Advanced Forest Management Planning (3.0 cr)
• FNRM 5411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
• FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
• FNRM 5413 - Managing Forest Ecosystems: Silviculture Lab (1.0 cr)
• FNRM 5431 - Timber Harvesting and Road Planning (2.0 cr)
• FNRM 5471 - Forest Management Planning (3.0 cr)
• FNRM 5501 - Urban Forest Management: Managing Greenspaces for People (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry-Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 4001 - Biometry (4.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• FW 8494 - Research in Wildlife (1.0 - 4.0 cr)
• GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
• GEOG 8101 - Proseminar: Nature and Society (3.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5571 - ArcGIS I (3.0 cr)
• GIS 5572 - ArcGIS II (3.0 cr)
• LA 5004 - Regional Environmental Landscape Planning (4.0 cr)
• LAW 6062 - Energy Law (3.0 cr)
- MGMT 6033 - Managing the Strategy Process (2.0 cr)
- MGMT 6050 - Management of Innovation and Change (2.0 cr)
- NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
- NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- OLPD 5611 - Facilitation and Meeting Skills (1.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5011 - Management of Organizations (3.0 cr)
- PA 5021 - Microeconomics for Policy Analysis (3.0 cr)
- PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)
- PA 5031 - Statistics for Public Affairs (4.0 cr)
- PA 5035 - Survey Research and Data Collection (1.5 cr)
- PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
- PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
- PA 5122 - Law and Public Affairs (3.0 cr)
- PA 5242 - Environmental Planning, Policy, and Decision Making (3.0 cr)
- PA 5251 - Strategic Planning and Management (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
- PA 5311 - Program Evaluation (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5503 - Economics of Development (3.0 cr)
- PA 5721 - Energy Systems and Policy (3.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5741 - Risk, Resilience and Decision Making (1.5 cr)
- PA 5790 - Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)
- PA 5890 - Topics in Foreign Policy and International Affairs (1.0 - 5.0 cr)
- PA 5920 - Skills Workshop (0.5 - 4.0 cr)
- PA 5970 - Advanced Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)
- POL 5315 - State Governments: Laboratories of Democracy (4.0 cr)
- POL 8126 - Qualitative Methods (3.0 cr)
- PSY 5202 - Attitudes and Social Behavior (3.0 cr)
- PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
- PUBH 7407 - Analysis of Categorical Data (3.0 cr)
- SCO 8735 - Supply Chain Management (3.0 cr)
- SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
- SOC 8701 - Sociological Theory (4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)
- SOIL 5611 - Soil Biology and Fertility (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)
- STAT 5601 - Nonparametric Methods (3.0 cr)
- STAT 5602 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
- STAT 5603 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
- STAT 5604 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
- WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
- WRS 5101 - Water Policy (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B

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Information current as of August 31, 2018
Plan B students do not need to complete additional research credits.

Forest Hydrology and Watershed Management
Brings together the integrally related areas of earth sciences, soils, and water resources management with an applied focus on wildland ecosystems, which may include the interface of forests with grasslands, wetlands, and agriculture. Graduate students in this track may specialize in areas such as: forest hydrology, water quality, and watershed management. Research would focus on forest, riparian, and wetland ecosystems.

Forest Hydrology and Watershed Management - Suggested Course List
NRSM students in the forest hydrology and watershed management track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5513 - Watershed Engineering (3.0 cr)
• BBE 5523 - Ecological Engineering Design (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• BBE 8013 - Parameter Estimation in Biosystems and Agricultural Engineering (3.0 cr)
• BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
• CEGE 4501 - Hydrologic Design (4.0 cr)
• CEGE 4512 - Open Channel Hydraulics (4.0 cr)
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• CEGE 8506 - Stochastic Hydrology (4.0 cr)
• CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
• CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
• CEGE 8562 - Analysis and Modeling of Aquatic Environments II (3.0 cr)
• CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8601 - Introduction to Stream Restoration (3.0 cr)
• EEB 8602 - Stream Restoration Practice (2.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
• ESCI 4702 - General Hydrogeology (4.0 cr)
• ESCI 4703 - Glacial Geology (4.0 cr)
• ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
• ESPM 4216 - Contaminant Hydrology (3.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5241 - Natural Resource and Environmental Policy (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
• ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
• ESPM 5402 - Biometeorology (3.0 cr)
• ESPM 5555 - Wetland Soils (3.0 cr)
• ESPM 5575 - Wetlands (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
• ESPM 5811 - Environmental Interpretation (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5577 - Spatial Database Design and Administration (3.0 cr)
• LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
• WRIT 5101 - Water Policy (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

- OR -

Plan B
Plan B students do not need to complete additional research credits.

Forest Products
For students who wish to specialize in areas such as: wood and fiber as raw materials; deterioration of wood; wood mechanics and structural design; wood moisture interactions and drying; processing and performance of composites; economics of manufacturing systems; technology and processing of solid wood products; marketing, design and production of housing components; and energy-

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Information current as of August 31, 2018
efficient building construction.

Forest Products - Suggested Course List
NRSM students in the forest products track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:
- AGRO 5121 - Applied Experimental Design (4.0 cr)
- APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
- APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
- BBE 5023 - Process Control and Instrumentation (3.0 cr)
- BBE 5301 - Applied Surface and Colloid Science (3.0 cr)
- BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
- BBE 5303 - Introduction to Bio-based Materials Science (3.0 cr)
- BBE 5401 - Bioproducts Separation and Purification Processes (3.0 cr)
- BBE 5402 - Bio-based Products Engineering Lab II (1.0 cr)
- BBE 5403 - Bio-based Products Engineering Lab I (1.0 cr)
- BBE 5404 - Biopolymers and Biocomposites Engineering (3.0 cr)
- BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
- BBE 5713 - Biological Process Engineering (3.0 cr)
- BBE 5733 - Renewable Energy Technologies (3.0 cr)
- BBE 8001 - Seminar I (1.0 cr)
- BBE 8002 - Seminar II (1.0 cr)
- BBE 8013 - Parameter Estimation in Biosystems and Agricultural Engineering (3.0 cr)
- CHEM 4214 - Polymers (3.0 cr)
- CHEM 4221 - Introduction to Polymer Chemistry (3.0 cr)
- CHEM 5210 - Materials Characterization (4.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- DES 8103 - Quantitative and Mixed Methods Research (3.0 cr)
- ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
- ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
- ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
- FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
- FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
- FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
- FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
- FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
- FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
- FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
- FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
- FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
- FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
- FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
- GIS 5555 - Basic Spatial Analysis (3.0 cr)
- ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
- NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
- NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B
Plan B students do not need to complete additional research credits.

Forests: Biology, Ecology, Conservation, and Management
Focuses on forest resources and allows students to choose from specializations in the following areas: forest biology, ecology, ecophysiology; genetics and tree improvement; tree physiology; reproductive biology and forest regeneration; forest growth and vegetation dynamics; timber harvesting, silviculture, and sustainable forest management; landscape ecology, restoration, and management; conservation of biodiversity and wildlife habitat management; forest health; disturbance (including fire) ecology; urban and community forestry; and agroforestry. Research normally focuses on forest and related ecosystems.

Forests: Biology, Ecology, Conservation, and Management - Suggested Course List
NRSM students in the forests: biology, ecology, conservation, and management track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
• BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
• EEB 5068 - Plant Physiological Ecology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
• ENT 4251 - Forest and Shade Tree Entomology (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101 (inactive) (3.0 cr)
• ESPM 5108 - Ecology of Managed Systems (4.0 cr)
• ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
• ESPM 5555 - Wetland Soils (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5205 - Productivity and Ecology of Forest Soils (3.0 cr)
• FNRM 5218 - Measuring and Modeling Forests (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FNRM 5264 - Advanced Forest Management Planning (3.0 cr)
• FNRM 5411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
• FNRM 5413 - Managing Forest Ecosystems: Silviculture Lab (1.0 cr)
• FNRM 5501 - Urban Forest Management: Managing Greenspaces for People (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• FW 8452 - Conservation Biology (3.0 cr)
• GEOG 5426 - Climatic Variations (3.0 cr)
• GEOG 5839 - Introduction to Dendrochronology (3.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• HORT 5071 - Ecological Restoration (4.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• PA 8201 - Environment and Infrastructure Planning (4.0 cr)
• PLPA 5003 - Diseases of Forest and Shade Trees (3.0 cr)
• PLPA 5480 - Principles of Plant Pathology (3.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)

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• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5611 - Soil Biology and Fertility (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B
Plan B students do not need to complete additional research credits.

Paper Science and Engineering
Specializes in areas such as: the chemistry and biotechnology of lignocellulosic materials; material science of paper and fiber products; paper recycling; energy and manufacturing efficiency in the pulp and paper-making process; novel and environmentally friendly pulping and bleaching, transport processes through porous media, surface and colloid science of papermaking; chemical engineering applications in pulp and paper processes; and statistical process control.

Paper Science and Engineering - Suggested Course List
NRSM students in the paper science and engineering track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:

• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
• BBE 5023 - Process Control and Instrumentation (3.0 cr)
• BBE 5301 - Applied Surface and Colloid Science (3.0 cr)
• BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
• BBE 5303 - Introduction to Bio-based Materials Science (3.0 cr)
• BBE 5305 - Pulp and Paper Technology (3.0 cr)
• BBE 5401 - Bioproducts Separation and Purification Processes (3.0 cr)
• BBE 5402 - Bio-based Products Engineering Lab II (1.0 cr)
• BBE 5403 - Bio-based Products Engineering Lab I (1.0 cr)
• BBE 5404 - Biopolymers and Biocomposites Engineering (3.0 cr)
• BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
• BBE 5713 - Biological Process Engineering (3.0 cr)
• BBE 5733 - Renewable Energy Technologies (3.0 cr)
• BBE 8001 - Seminar I (1.0 cr)
• BBE 8002 - Seminar II (1.0 cr)
• BBE 8013 - Parameter Estimation in Biosystems and Agricultural Engineering (3.0 cr)
• BBE 8300 - Research Problems (1.0 - 10.0 cr)
• CHEM 5210 - Materials Characterization (4.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 5266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Urban Forestry - Biology and Management (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B
Plan B students do not need to complete additional research credits.

Recreation Resources, Tourism, and Environmental Education
Focuses on the use and management of natural resources for recreation and tourism. Graduate students in this track may specialize in
areas such recreational land management, resource-based tourism, planning for recreation and tourism, and the human dimensions of natural resource uses. Additionally, students may focus on environmental education and leadership for effective communication with diverse publics about natural resources.

Recreation Resources, Tourism, and Environmental Education - Suggested Course List

NRSM students in the recreation resources, tourism, and environmental education track should refer to this list when enrolling in courses that are appropriate for their area of study. Plan A students must enroll in 19 coursework credits in addition to their seminar requirement and thesis credits, and Plan B students must enroll in 29 credits in addition to their seminar requirement. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:

- AGRO 5121 - Applied Experimental Design (4.0 cr)
- APEC 4311 - Tourism Development: Principles, Processes, Policies (3.0 cr)
- APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
- APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- CI 5537 - Principles of Environmental Education (3.0 cr)
- CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
- EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
- ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
- ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
- ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
- ESPM 5811 - Environmental Interpretation (3.0 cr)
- FNRM 5101 - Park and Protected Area Tourism (3.0 cr)
- FNRM 5104 - Forest Ecology (4.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5201 - Introduction to Travel and Tourism (3.0 cr)
- FNRM 5232 - Managing Recreational Lands (4.0 cr)
- FNRM 5259 - Visitor Behavior Analysis (3.0 cr)
- FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
- FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
- FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
- FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
- FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
- FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
- FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
- FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
- FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
- FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
- FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
- FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
- FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
- FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
- GIS 5555 - Basic Spatial Analysis (3.0 cr)
- LS 5950 - Special Topics (1.0 - 4.0 cr)
- NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
- NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5502 - Theory and Models of Evaluation (3.0 cr)
- OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
- OLPD 5611 - Facilitation and Meeting Skills (1.0 cr)
- PA 4101 - Nonprofit Management and Governance (3.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5011 - Management of Organizations (3.0 cr)
- PA 5031 - Statistics for Public Affairs (4.0 cr)
- PA 5035 - Survey Research and Data Collection (1.5 cr)
- PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
- PA 5111 - Financing Public and Nonprofit Organizations (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5920 - Skills Workshop (0.5 - 4.0 cr)
- POL 8126 - Qualitative Methods (3.0 cr)
- PSY 5202 - Attitudes and Social Behavior (3.0 cr)
- PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
- PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
- PUBH 7407 - Analysis of Categorical Data (3.0 cr)
- SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
- SOC 8701 - Sociological Theory (4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)
- STAT 5601 - Nonparametric Methods (3.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling (3.0 cr)
- STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
- STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
- WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Degree Plan Options

Plan A
Plan A students are required to complete 10 thesis credits of NR 8777.

-OR-

Plan B
Plan B students do not need to complete additional research credits.
Twin Cities Campus
Natural Resources Science and Management Minor
Bioproducts and Biosystems Engineering, Fisheries, Wildlife, and Conservation Biology, Forest Resources
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Forest Resources, 116d Green Hall, 1530 Cleveland Avenue N., St. Paul MN 55108 (612-624-7683; fax 612-625-5212)
Email: nrsm@umn.edu
Website: http://www.nrsm.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 8
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.


Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Students majoring in other programs who wish to declare a minor in Natural Resources Science and Management must file a proposal with the NRSM program office.

The NRSM program does not require specific courses for completion of the minor. Rather, the student should work in consultation with their major advisor(s) and with the NRSM faculty member who will serve on the student's examination committee as the representative of the program minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Minor Requirements
The NRSM program does not require specific courses for completion of this minor. The minor requires at least 8 credits of graduate-level courses to be chosen in consultation with the student's major advisor and the NRSM faculty member who will serve on the student's examination committee as the minor program representative.

The proposed coursework will be reviewed by NRSM's Director of Graduate Studies, and must be approved before the student can submit their Graduate Degree Plan.
Doctoral Requirements

The NRSM program does not require specific courses for completion of this minor. The minor requires at least 12 credits of graduate-level courses to be chosen in consultation with the student's major advisor and the NRSM faculty member who will serve on the student's examination committee as the minor program representative.

The proposed coursework will be reviewed by NRSM's Director of Graduate Studies, and must be approved before the student can submit their Graduate Degree Plan.
Twin Cities Campus
Natural Resources Science and Management Ph.D.
Forest Resources
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Forest Resources, 116d Green Hall, 1530 Cleveland Avenue N, St. Paul MN 55108 (612-624-7683; fax: 612-625-5212)
Email: nrsm@umn.edu
Website: http://www.nrsm.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 59 to 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the natural resources science and management (NRSM) PhD program emphasize one of the following tracks: 1) forests: biology, ecology, conservation, and management; 2) economics, policy, management, and society; 3) assessment, monitoring, and geospatial analysis; 4) recreation resources, tourism, and environmental education; 5) forest hydrology and watershed management; 6) forest products; or 7) paper science and engineering.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Most admitted students have earned degrees in natural resource-related majors. Applicants with exceptional academic records but no related background are eligible; if admitted, they may complete the prerequisites for advanced courses during the early stages of their graduate program. These prerequisites will vary depending upon the student's chosen track and major advisor.

Applicants will not be admitted unless a member of the program faculty agrees to advise the student ahead of time. This decision depends on admissibility (the applicant's overall credentials), mutual research interests, and the faculty member's ability to take on a new student. Some faculty members will not advise students unless they have funding for the student. Applicants are encouraged to review faculty profiles on the program website and begin making contacts prior to and during the application process.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
35 to 48 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The University of Minnesota requires at least 48 credits for a doctoral degree, 24 of which must be thesis credits [NR 8888]. The NRSM graduate program will typically expect to see 40 to 48 course credits. If a student enters the program with a relevant master’s degree, relevant credits from the prior degree can be transferred in to apply toward the doctoral degree pending advisor, committee, graduate program, and college approval. Normally, a student who enters the doctoral program with a master's degree will complete 30-40 additional credits in the major program. There are no minor courses required, but students have the option of formally declaring a minor.

Course selection and thesis proposals are developed by each student in consultation with the faculty advisor and are approved by the Natural Resources Science and Management Graduate Studies Committee. Students must also receive training in the ethical conduct of research and present a formal seminar to faculty and peers. This presentation is separate from the final exam seminar.

Required Seminar
All students in NRSM must take the Natural Resources Seminar course. Course was listed as FNRM 8107 prior to spring 2017, and NR 8107 in all future semesters.
NR 8107 - Seminar: Natural Resources Science and Management (1.0 cr)

Joint- or Dual-degree Coursework: Law, Science & Technology Student may take a total of 12 credits in common among the academic programs.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Assessment, Monitoring, and Geospatial Analysis
Addresses measurements and related technology applications and resource analysis. Graduate students in this track may choose to specialize in topics such as: geographic information systems (GIS); remote sensing; geospatial analysis; survey design (including forest inventory and monitoring), measurement, modeling; and biometrics. Studies typically focus on landscape, region, or global levels.

Assessment, Monitoring, and Geospatial Analysis - Suggested Course List
NRSM students in the assessment, monitoring, and geospatial analysis track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.
Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• ECON 8201 - Econometric Analysis (2.0 cr)
• ECON 8203 - Econometric Analysis (2.0 cr)
• ECON 8204 - Econometric Analysis (2.0 cr)
• EEB 5068 - Plant Physiological Ecology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101 (Inactive) (3.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
• ESPM 5289 - GIS in Environmental Science and Management (4.0 cr)
• ESPM 5503 - Environmental Life Cycle Analysis (3.0 cr)
• FMRM 5111 - Hydrology and Watershed Management (3.0 cr)
• FMRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FMRM 5218 - Measuring and Modeling Forests (3.0 cr)
• FMRM 5228 - Advanced Topics in Assessment and Modeling of Forests (3.0 cr)
• FMRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FMRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
• FMRM 5471 - Forest Management Planning (3.0 cr)
• FMRM 8101 - Research Problems: Ecological Restoration (1.0 - 5.0 cr)
• FMRM 8102 - Research Problems: Hydrology and Watershed Management (1.0 - 5.0 cr)
• FMRM 8106 - Research Problems: Urban Forestry-Biology and Management (1.0 - 5.0 cr)
• FMRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FMRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FMRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FMRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FMRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FMRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FMRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FMRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• GEOG 5531 - Numerical Spatial Analysis (4.0 cr)
• GEOG 5562 - GIS Development Practicum (3.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5571 - ArcGIS I (3.0 cr)
• GIS 5572 - ArcGIS II (3.0 cr)
• GIS 5575 - Practical Surveying for GIS (2.0 cr)
• GIS 5577 - Spatial Database Design and Administration (3.0 cr)
• GIS 5578 - GIS Programming (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• PUBH 8472 - Spatial Biostatistics (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5555 - Wetland Soils (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5511 - Time Series Analysis (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Economics, Policy, Management, and Society
For students interested in focusing on how society values and makes decisions about the use, management, and protection of natural and environmental resources. Graduate students in this track can specialize in areas such as: economics, policy, administration and management, planning, operations research, conflict resolution, human dimensions, and land use planning. Studies might consider choices, impacts, and tradeoffs in protecting, restoring, developing, and allocating natural and environmental resources. The research conducted by students in this track may address a wide range of issues and problems from local to international in scope.

Economics, Policy, Management, and Society - Suggested Course List
NRSM students in the economics, policy, management, and society track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)
• APEC 5152 - Applied Macroeconomics: Income and Employment (3.0 cr)
• APEC 5321 - Regional Economic Analysis (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• APEC 5721 - Economics of Science and Technology Policy (3.0 cr)
• APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
• APEC 8202 - Mathematical Optimization in Applied Economics (3.0 cr)
• APEC 8203 - Applied Welfare Economics and Public Policy (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• APEC 8601 - Natural Resource Economics (3.0 cr)
• APEC 8602 - Economics of the Environment (3.0 cr)
• BIOL 5407 - Ecology (3.0 cr)
• CEGE 5570 - Design for Sustainable Development - India (3.0 - 9.0 cr)
• CI 5537 - Principles of Environmental Education (3.0 cr)
• CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• COMM 5402 - Advanced Interpersonal Communication (3.0 cr)
• COMM 5441 - Communication in Human Organizations (3.0 cr)
• COMM 8452 - Seminar: Methods of Intercultural/Diversity Facilitation (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• ECON 8105 - Macroeconomic Theory (2.0 cr)
• ECON 8106 - Macroeconomic Theory (2.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101  [Inactive] (3.0 cr)
• ESPM 5108 - Ecology of Managed Systems (4.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5241 - Natural Resource and Environmental Policy (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
• ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
• ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
• ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
• ESPM 5602 - Regulations and Corporate Environmental Management (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5604 - Environmental Management Systems and Strategy (3.0 cr)
• ESPM 5811 - Environmental Interpretation (3.0 cr)
• FNRM 5101 - Park and Protected Area Tourism (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5264 - Advanced Forest Management Planning (3.0 cr)
• FNRM 5411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
• FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
• FNRM 5431 - Timber Harvesting and Road Planning (2.0 cr)
• FNRM 5471 - Forest Management Planning (3.0 cr)
• FNRM 5501 - Urban Forest Management: Managing Greenspaces for People (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry–Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 4001 - Biometry (4.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• FW 8494 - Research in Wildlife (1.0 - 4.0 cr)
• GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
• GEOG 8101 - Proseminar: Nature and Society (3.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5571 - ArcGIS I (3.0 cr)
• GIS 5572 - ArcGIS II (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• LA 5004 - Regional Environmental Landscape Planning (4.0 cr)
• LAW 6062 - Energy Law (3.0 cr)
• MGMT 6033 - Managing the Strategy Process (2.0 cr)
• MGMT 6050 - Management of Innovation and Change (2.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
• OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 5611 - Facilitation and Meeting Skills (1.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5011 - Management of Organizations (3.0 cr)
• PA 5021 - Microeconomics for Policy Analysis (3.0 cr)
• PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
• PA 5122 - Law and Public Affairs (3.0 cr)
• PA 5242 - Environmental Planning, Policy, and Decision Making (3.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• PA 5271 - Geographic Information Systems: Applications in Planning and Policy Analysis (3.0 cr)
• PA 5311 - Program Evaluation (3.0 cr)
• PA 5501 - Theories and Policies of Development (3.0 cr)
• PA 5503 - Economics of Development (3.0 cr)
• PA 5721 - Energy Systems and Policy (3.0 cr)
• PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• PA 5741 - Risk, Resilience and Decision Making (1.5 cr)
• PA 5790 - Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)
• PA 5890 - Topics in Foreign Policy and International Affairs (1.0 - 5.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• PA 8790 - Advanced Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)
• POL 5315 - State Governments: Laboratories of Democracy (4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SCO 8735 - Supply Chain Management (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8701 - Sociological Theory (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5611 - Soil Biology and Fertility (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5021 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
• WRS 5101 - Water Policy (3.0 cr)

Forest Hydrology and Watershed Management
Brings together the integrally related areas of earth sciences, soils, and water resources management with an applied focus on wildland ecosystems, which may include the interface of forests with grasslands, wetlands, and agriculture. Graduate students in this track may specialize in areas such as: forest hydrology, water quality, and watershed management. Research would focus on forest, riparian, and wetland ecosystems.

Forest Hydrology and Watershed Management - Suggested Course List
NRSM students in the forest hydrology and watershed management track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee. Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5513 - Watershed Engineering (3.0 cr)
• BBE 5523 - Ecological Engineering Design (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
• CEGE 4501 - Hydrologic Design (4.0 cr)
• CEGE 4512 - Open Channel Hydraulics (4.0 cr)
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• CEGE 8506 - Stochastic Hydrology (4.0 cr)
• CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
• CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
• CEGE 8562 - Analysis and Modeling of Aquatic Environments II (3.0 cr)
• CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8601 - Introduction to Stream Restoration (3.0 cr)
• EEB 8602 - Stream Restoration Practice (2.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 5266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
• ESCI 4702 - General Hydrogeology (4.0 cr)
• ESCI 4703 - Glacial Geology (4.0 cr)
• ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
• ESPM 4216 - Contaminant Hydrology (3.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5241 - Natural Resource and Environmental Policy (3.0 cr)
• ESPM 5252 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
• ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
• ESPM 5402 - Biometeorology (3.0 cr)
• ESPM 5555 - Wetland Soils (3.0 cr)
• ESPM 5575 - Wetlands (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
• ESPM 5811 - Environmental Interpretation (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GIS 5577 - Spatial Database Design and Administration (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5402 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
• WRS 5101 - Water Policy (3.0 cr)

Forest Products
For students who wish to specialize in areas such as: wood and fiber as raw materials; deterioration of wood; wood mechanics and structural design; wood moisture interactions and drying; processing and performance of composites; economics of manufacturing systems; technology and processing of solid wood products; marketing, design and production of housing components; and energy-efficient building construction.

Forest Products - Suggested Course List
NRSM students in the forest products track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements.

Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
• BBE 5023 - Process Control and Instrumentation (3.0 cr)
• BBE 5301 - Applied Surface and Colloid Science (3.0 cr)
• BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
• BBE 5303 - Introduction to Bio-based Materials Science (3.0 cr)
• BBE 5401 - Bioproducts Separation and Purification Processes (3.0 cr)
• BBE 5402 - Bio-based Products Engineering Lab II (1.0 cr)
• BBE 5403 - Bio-based Products Engineering Lab I (1.0 cr)
• BBE 5404 - Biopolymers and Biocomposites Engineering (3.0 cr)
• BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
• BBE 5713 - Biological Process Engineering (3.0 cr)
• BBE 5733 - Renewable Energy Technologies (3.0 cr)
• BBE 8001 - Seminar I (1.0 cr)
• BBE 8002 - Seminar II (1.0 cr)

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<td>Graduate Research Writing for International Students (3.0 cr)</td>
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</table>
Forests: Biology, Ecology, Conservation, and Management

Focuses on forest resources and allows students to choose from specializations in the following areas: forest biology, ecology, ecophysiology; genetics and tree improvement; tree physiology; reproductive biology and forest regeneration; forest growth and vegetation dynamics; timber harvesting, silviculture, and sustainable forest management; landscape ecology, restoration, and management; conservation of biodiversity and wildlife habitat management; forest health; disturbance (including fire) ecology; urban and community forestry; and agroforestry. Research normally focuses on forest and related ecosystems.

Forests: Biology, Ecology, Conservation, and Management - Suggested Course List

NRSM students in the forests: biology, ecology, conservation, and management track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:

• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
• APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
• BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
• BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
• CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
• DES 8103 - Qualitative and Mixed Methods Research (3.0 cr)
• EEB 4609W - Ecosystem Ecology [ENV, WI] (3.0 cr)
• EEB 5068 - Plant Physiological Ecology (3.0 cr)
• EEB 5609 - Ecosystem Ecology (3.0 cr)
• EEB 8200 - Sustainability Science Distributed Graduate Seminar (3.0 cr)
• ENT 4251 - Forest and Shade Tree Entomology (3.0 cr)
• EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
• EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
• EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
• EPSY 5261 - Introductory Statistical Methods (3.0 cr)
• EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• ESPM 5071 - Ecological Restoration (4.0 cr)
• ESPM 5101 - Ecology of Managed Systems (4.0 cr)
• ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
• ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
• ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
• ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
• ESPM 5555 - Wetland Soils (3.0 cr)
• ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
• ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
• FNRM 5104 - Forest Ecology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• FNRM 5203 - Forest Fire and Disturbance Ecology (3.0 cr)
• FNRM 5204 - Landscape Ecology and Management (3.0 cr)
• FNRM 5205 - Productivity and Ecology of Forest Soils (3.0 cr)
• FNRM 5218 - Measuring and Modeling Forests (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FNRM 5264 - Advanced Forest Management Planning (3.0 cr)
• FNRM 5411 - Managing Forest Ecosystems: Silviculture (3.0 cr)
• FNRM 5413 - Managing Forest Ecosystems: Silviculture Lab (1.0 cr)
• FNRM 5501 - Urban Forest Management: Managing Greenspaces for People (3.0 cr)
• FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
• FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
• FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
• FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
• FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
• FNRM 8106 - Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)

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Information current as of August 31, 2018
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• FW 5603W - Habitats and Regulation of Wildlife [WI] (3.0 cr)
• FW 8051 - Statistical Modeling of Ecological Data using R and WinBugs/JAGS (4.0 cr)
• FW 8200 - Seminar (1.0 - 4.0 cr)
• FW 8452 - Conservation Biology (3.0 cr)
• GEOG 5426 - Climatic Variations (3.0 cr)
• GEOG 5839 - Introduction to Dendrochronology (3.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• HORT 5071 - Ecological Restoration (4.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• PA 8201 - Environment and Infrastructure Planning (4.0 cr)
• PLPA 5003 - Diseases of Forest and Shade Trees (3.0 cr)
• PLPA 5480 - Principles of Plant Pathology (3.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• SOIL 5611 - Soil Biology and Fertility (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)

Paper Science and Engineering
Specializes in areas such as: the chemistry and biotechnology of lignocellulosic materials; material science of paper and fiber products; paper recycling; energy and manufacturing efficiency in the pulp and paper-making process; novel and environmentally friendly pulping and bleaching, transport processes through porous media, surface and colloid science of papermaking; chemical engineering applications in pulp and paper processes; and statistical process control.

Paper Science and Engineering - Suggested Course List
NRSM students in the paper science and engineering track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee. Take 0 or more course(s) from the following:
• AGRO 5121 - Applied Experimental Design (4.0 cr)
• APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
• APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
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<td>DES 8103</td>
<td>Qualitative and Mixed Methods Research (3.0 cr)</td>
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<tr>
<td>EPSY 5221</td>
<td>Principles of Educational and Psychological Measurement (3.0 cr)</td>
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<tr>
<td>EPSY 5244</td>
<td>Survey Design, Sampling, and Implementation (3.0 cr)</td>
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<tr>
<td>EPSY 5247</td>
<td>Qualitative Methods in Educational Psychology (3.0 cr)</td>
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<td>EPSY 5261</td>
<td>Introductory Statistical Methods (3.0 cr)</td>
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<tr>
<td>EPSY 5262</td>
<td>Intermediate Statistical Methods (3.0 cr)</td>
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<tr>
<td>EPSY 8266</td>
<td>Statistical Analysis Using Structural Equation Methods (3.0 cr)</td>
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<tr>
<td>ESPM 5211</td>
<td>Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)</td>
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<td>ESPM 5242</td>
<td>Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)</td>
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<tr>
<td>ESPM 5603</td>
<td>Environmental Life Cycle Analysis (3.0 cr)</td>
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<tr>
<td>FNRM 5104</td>
<td>Forest Ecology (4.0 cr)</td>
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<td>FNRM 5131</td>
<td>Geographical Information Systems (GIS) for Natural Resources (4.0 cr)</td>
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<tr>
<td>FNRM 8101</td>
<td>Research Problems: Physiological Ecology (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8102</td>
<td>Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8103</td>
<td>Research Problems: Forest Hydrology (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8104</td>
<td>Research Problems: Forest Ecology (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8105</td>
<td>Research Problems: Silviculture (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8106</td>
<td>Research Problems: Urban Forestry--Biology and Management (1.0 - 5.0 cr)</td>
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<td>FNRM 8201</td>
<td>Research Problems: Forest Economics (1.0 - 5.0 cr)</td>
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<td>FNRM 8202</td>
<td>Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8203</td>
<td>Research Problems: Forest Recreation (1.0 - 5.0 cr)</td>
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<td>FNRM 8204</td>
<td>Research Problems: Forest Policy (1.0 - 5.0 cr)</td>
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<td>FNRM 8205</td>
<td>Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8206</td>
<td>Research Problems: Forest Management (1.0 - 5.0 cr)</td>
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<tr>
<td>FNRM 8207</td>
<td>Economic Analysis of Natural Resource Projects (2.0 cr)</td>
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<td>FNRM 8208</td>
<td>Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)</td>
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<tr>
<td>GIS 5555</td>
<td>Basic Spatial Analysis (3.0 cr)</td>
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<tr>
<td>GRAD 8101</td>
<td>Teaching in Higher Education (3.0 cr)</td>
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<tr>
<td>GRAD 8200</td>
<td>Teaching and Learning Topics in Higher Education (1.0 cr)</td>
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<tr>
<td>ME 5228</td>
<td>Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)</td>
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<tr>
<td>NR 5021</td>
<td>Statistics for Agricultural and Natural Resource Professionals (3.0 cr)</td>
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<tr>
<td>NR 8100</td>
<td>Topics in Natural Resources Science and Management (1.0 - 2.0 cr)</td>
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<tr>
<td>OLPD 5061</td>
<td>Ethnographic Research Methods (3.0 cr)</td>
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<tr>
<td>OLPD 5528</td>
<td>Focus Group Interviewing Research Methods (1.0 - 3.0 cr)</td>
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<tr>
<td>PA 5002</td>
<td>Introduction to Policy Analysis (1.5 cr)</td>
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<tr>
<td>PA 5021</td>
<td>Statistics for Public Affairs (4.0 cr)</td>
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<tr>
<td>PA 5035</td>
<td>Survey Research and Data Collection (1.5 cr)</td>
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<tr>
<td>PA 5041</td>
<td>Qualitative Methods for Policy Analysts (4.0 cr)</td>
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<tr>
<td>PA 5920</td>
<td>Skills Workshop (0.5 - 4.0 cr)</td>
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<tr>
<td>POL 8126</td>
<td>Qualitative Methods (3.0 cr)</td>
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<tr>
<td>PUBH 7250</td>
<td>Designing and Conducting Focus Group Interviews (1.0 cr)</td>
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<tr>
<td>PUBH 7407</td>
<td>Analysis of Categorical Data (3.0 cr)</td>
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<tr>
<td>SOC 5811</td>
<td>Social Statistics for Graduate Students [MATH] (4.0 cr)</td>
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<tr>
<td>SOC 8801</td>
<td>Sociological Research Methods (4.0 cr)</td>
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</table>
Recreation Resources, Tourism, and Environmental Education
Focuses on the use and management of natural resources for recreation and tourism. Graduate students in this track may specialize in areas such as recreational land management, resource-based tourism, planning for recreation and tourism, and the human dimensions of natural resource uses. Additionally, students may focus on environmental education and leadership for effective communication with diverse publics about natural resources.

Recreation Resources, Tourism, and Environmental Education - Suggested Course List
NRSM students in the recreation resources, tourism, and environmental education track should refer to this list when enrolling in courses that are appropriate for their area of study. Students must enroll in at least 34 credits in addition to their seminar and thesis credit (24 credits of NR 8888) requirements. Students may elect to take courses outside of this list if advised to do so by their advisor or committee.

Take 0 or more course(s) from the following:

- AGRO 5121 - Applied Experimental Design (4.0 cr)
- APEC 4311 - Tourism Development: Principles, Processes, Policies (3.0 cr)
- APEC 5031 - Methods of Economic Data Analysis (3.0 cr)
- APEC 5032 - Economic Data Analysis for Managerial and Policy Decisions (3.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- CI 5537 - Principles of Environmental Education (3.0 cr)
- CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)
- CI 8149 - Qualitative Research: Coding, Analysis, Interpretation, and Writing (3.0 cr)
- DES 8103 - Quantitative and Mixed Methods Research (3.0 cr)
- EEB 5053 - Ecology: Theory and Concepts (4.0 cr)
- EPSY 5241 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
- EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8256 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
- ESPM 5211 - Survey, Measurement, and Modeling for Environmental Analysis (3.0 cr)
- ESPM 5242 - Methods for Environmental and Natural Resource Policy Analysis (3.0 cr)
- ESPM 5245 - Sustainable Land Use Planning and Policy (3.0 cr)
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
- ESPM 5603 - Environmental Life Cycle Analysis (3.0 cr)
- ESPM 5811 - Environmental Interpretation (3.0 cr)
- FNRM 5101 - Park and Protected Area Tourism (3.0 cr)
- FNRM 5104 - Forest Ecology (4.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
- FNRM 5201 - Introduction to Travel and Tourism (3.0 cr)
- FNRM 5232 - Managing Recreational Lands (4.0 cr)
- FNRM 5259 - Visitor Behavior Analysis (3.0 cr)
- FNRM 8101 - Research Problems: Physiological Ecology (1.0 - 5.0 cr)
- FNRM 8102 - Research Problems: Forest-Tree Genetics (1.0 - 5.0 cr)
- FNRM 8103 - Research Problems: Forest Hydrology (1.0 - 5.0 cr)
- FNRM 8104 - Research Problems: Forest Ecology (1.0 - 5.0 cr)
- FNRM 8105 - Research Problems: Silviculture (1.0 - 5.0 cr)
- FNRM 8106 - Research Problems: Urban Forestry–Biology and Management (1.0 - 5.0 cr)
• FNRM 8201 - Research Problems: Forest Economics (1.0 - 5.0 cr)
• FNRM 8202 - Research Problems: Forest Biometry and Measurements (1.0 - 5.0 cr)
• FNRM 8203 - Research Problems: Forest Recreation (1.0 - 5.0 cr)
• FNRM 8204 - Research Problems: Forest Policy (1.0 - 5.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• FNRM 8206 - Research Problems: Forest Management (1.0 - 5.0 cr)
• FNRM 8207 - Economic Analysis of Natural Resource Projects (2.0 cr)
• FNRM 8208 - Research Problems: Environmental Learning and Leadership (1.0 - 5.0 cr)
• FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
• GIS 5555 - Basic Spatial Analysis (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• LS 5950 - Special Topics (1.0 - 4.0 cr)
• NR 5021 - Statistics for Agricultural and Natural Resource Professionals (3.0 cr)
• NR 8100 - Topics in Natural Resources Science and Management (1.0 - 2.0 cr)
• OLPD 5061 - Ethnographic Research Methods (3.0 cr)
• OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
• OLPD 5502 - Theory and Models of Evaluation (3.0 cr)
• OLPD 5528 - Focus Group Interviewing Research Methods (1.0 - 3.0 cr)
• OLPD 5611 - Facilitation and Meeting Skills (1.0 cr)
• PA 4101 - Nonprofit Management and Governance (3.0 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5011 - Management of Organizations (3.0 cr)
• PA 5031 - Statistics for Public Affairs (4.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)
• PA 5111 - Financing Public and Nonprofit Organizations (3.0 cr)
• PA 5501 - Theories and Policies of Development (3.0 cr)
• PA 5920 - Skills Workshop (0.5 - 4.0 cr)
• POL 8126 - Qualitative Methods (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (3.0 cr)
• PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• SOC 8701 - Sociological Theory (4.0 cr)
• SOC 8801 - Sociological Research Methods (4.0 cr)
• SOC 8811 - Advanced Social Statistics (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
Twin Cities Campus
Nutrition M.S.
Food Science & Nutrition
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fscn.cfans.umn.edu/graduate-programs/nutrition

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Nutrition is the study of how nutrients, both essential and nonessential, affect health and all life processes. Consequently, nutrition is an extremely broad field that encompasses physiology, biochemistry, education, public health, and public policy. The nutrition graduate program is interdisciplinary. Advisors and financial support may come from any of the departments or schools in which nutrition graduate faculty reside, including the Department of Food Science and Nutrition (College of Food, Agricultural and Natural Resource Sciences); Division of Epidemiology (School of Public Health); Departments of Medicine, Surgery, Psychiatry, Lab Medicine and Pathology, and Family Medicine and Community Health (Medical School); Department of Kinesiology and Leisure Studies (College of Education and Human Development); Department of Biochemistry and Molecular Biology (University of Minnesota Duluth); University of Minnesota Extension; Hormel Institute (Austin, MN); and V.A. Medical Center and Park Nicollet Institute (Minneapolis, MN).

Three subspecialty areas are offered in the program: human nutrition, nutritional biochemistry, and public health nutrition. Thesis work can be conducted locally or internationally in the laboratory, clinic, or field.

Students are allowed a maximum of 5 years in the program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants to the program need a bachelor's degree in any field or its international equivalent.

Other requirements to be completed before admission:
A strong foundation in the biological and physical sciences is required. This background includes college mathematics, the equivalent of one semester of general chemistry, organic chemistry, general biology, biochemistry, physiology, and statistics. For the doctoral program, additional prerequisite courses include calculus and physics. If there is evidence that the applicant has a good background in the sciences, some of the prerequisites can be met after admission. The M.S. program also requires the following nutrition courses, or equivalent, which may be completed after the student's admission to the program: Principles of Nutrition (FSCN 1112), Life Cycle Nutrition (FSCN 3612), and Human Nutrition (FSCN 4612).

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
  • IELTS
  - Total Score: 6.5
  • MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The graduate faculty, including the student’s advisor and director of Graduate Studies, specify both the nature and extent of the course and project work necessary to satisfy this requirement.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

All students are expected to obtain teaching experience, subject to the policies of the advisor’s department or division.

Required Coursework

All students must take the following courses for at least 20 credits:

Orientation Course
NUTR 8621 - Presentation Skills (1.0 cr)

Core Coursework
NUTR 5625 - Nutritional Biochemistry (3.0 cr)
NUTR 5626 - Nutritional Physiology (3.0 cr)
NUTR 5622 - Vitamin and Mineral Biochemistry (3.0 cr)
NUTR 5624 - Nutrition and Genetics (2.0 cr)

Advanced Topics Course
Take at least one course from the following list after completing two semesters in the program:
NUTR 8620 - Advances in Nutrition (2.0 cr)

Outside Coursework
All students must complete at least 6 credits outside the major, including at least one statistics course and at least one methods course.

Statistics Course
Take at least one statistics course from the following list. A different statistics course can be substituted with advisor approval.

PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 6414 - Biostatistical Literacy (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)

Research Methods Course
Take one or more courses for at least 2 credits of research methods coursework from this list, or graduate-level methods coursework from another field with advisor approval.

ANSC 5091 - Research Proposals: From Ideas to Strategic Plans [WI] (3.0 cr)
or NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
or PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
or PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
or PUBH 6806 - Principles of Public Health Research (2.0 cr)

Additional Outside Coursework
Other courses may be from any field, but must be at the 5000 or 8000 level. Exceptions: 6000 level courses from Public Health (PUBH) are allowed.

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Information current as of August 31, 2018
Plan Options

Plan A: Master's Thesis Credits
Plan A students take at least 10 credits of the following:
NUTR 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B: Additional Coursework
Plan B students must take at least 10 credits from the following, or other graduate-level coursework with advisor approval:
NUTR 8695 - Independent Study: Nutrition (1.0 - 10.0 cr)
NUTR 8xxx
NUTR 5xxx

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated BS/MS-Nutrition
This sub-plan is limited to students completing the program under Plan B.

The Department of Food Science and Nutrition offers and integrated bachelor of science (BS) and master of science (MS) in nutrition. The integrated BS/MS program offers students the opportunity to earn both degrees in five years by working toward a master's degree while simultaneously working toward their undergraduate degree. Nutrition undergraduate students in the DPD or nutrition studies sub-plans are welcome to apply to this program during their 3rd year of undergraduate study. During the 4th year, students take undergraduate and graduate courses concurrently and are advised by an undergraduate and graduate program advisor.

Students in this program will complete the 120 undergraduate credits required for a BS degree in nutrition by the end of the 4th year and must be awarded an undergraduate degree at the 4th year mark. During the 4th and 5th years, students will complete 30 graduate credits and a Plan B research project with a final oral defense as required for the nutrition MS degree. Students who satisfy the Didactic Program in Dietetics (DPD) verification requirements can begin the Emily Program Dietetic Internship in August following their 5th year. Students cannot double-count credits to meet credit requirements for both the undergraduate and graduate degrees.
Twin Cities Campus
Nutrition Minor
Food Science & Nutrition
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fscn.cfans.umn.edu/graduate-programs/nutrition

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 13
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Nutrition is the study of how nutrients, both essential and nonessential, affect health and all life processes. Consequently, nutrition is an extremely broad field that encompasses physiology, biochemistry, education, public health, and public policy. The nutrition graduate program is interdisciplinary. Advisors and financial support may come from any of the departments or schools in which nutrition graduate faculty reside, including the Department of Food Science and Nutrition (College of Food, Agricultural and Natural Resource Sciences); Division of Epidemiology (School of Public Health); Departments of Medicine, Surgery, Psychiatry, Lab Medicine and Pathology, and Family Medicine and Community Health (Medical School); Department of Kinesiology and Leisure Studies (College of Education and Human Development); Department of Biochemistry and Molecular Biology (University of Minnesota Duluth); University of Minnesota Extension; Hormel Institute (Austin, Minn.); V.A. Medical Center and Park Nicollet Institute (Minneapolis, Minn.).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Coursework
Take the following two courses for the master's minor in Nutrition.
NUTR 5625 - Nutritional Biochemistry (3.0 cr)
NUTR 5626 - Nutritional Physiology (3.0 cr)

Doctoral
Coursework
Take at least 13 credits from the following list of courses. NUTR 8620 and 8611 are available to students after completing two semesters in the minor. Consult with the nutrition director of graduate studies.
NUTR 5624 - Nutrition and Genetics (2.0 cr)
NUTR 5625 - Nutritional Biochemistry (3.0 cr)
NUTR 5626 - Nutritional Physiology (3.0 cr)
NUTR 5622 - Vitamin and Mineral Biochemistry (3.0 cr)
NUTR 8620 - Advances in Nutrition (2.0 cr)
Twin Cities Campus
Nutrition Ph.D.
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Food Science and Nutrition, 225 Food Science and Nutrition Building, 1334 Eckles Avenue, Saint Paul, MN 55108 (612-624-6753; fax: 612-625-5272)
Email: fsgrad@umn.edu
Website: http://fscn.cfans.umn.edu/graduate-programs/nutrition/phd

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 50
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Nutrition is the study of how nutrients, both essential and nonessential, affect health and all life processes. Consequently, nutrition is an extremely broad field that encompasses physiology, biochemistry, education, public health, and public policy. The nutrition graduate program is interdisciplinary. Advisers and financial support may come from any of the departments or schools in which nutrition graduate faculty reside, including the Department of Food Science and Nutrition (College of Food, Agricultural and Natural Resource Sciences); Division of Epidemiology (School of Public Health); Departments of Medicine, Surgery, Psychiatry, Lab Medicine and Pathology, and Family Medicine and Community Health (Medical School); Department of Kinesiology and Leisure Studies (College of Education and Human Development); Department of Biochemistry and Molecular Biology (University of Minnesota Duluth); University of Minnesota Extension; Hormel Institute (Austin, MN.); V.A. Medical Center and Park Nicollet Institute (Minneapolis, MN.).

Three subspecialty areas are offered in the doctoral degree program: human nutrition, nutritional biochemistry, and public health nutrition. Thesis work may be conducted locally or internationally in the laboratory, clinic, or field.

Students may spend a maximum of 8 years in the program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants to the program need a bachelor's degree in any field or its international equivalent, along with demonstrated research ability such as a MS degree or publications.

Other requirements to be completed before admission:
A strong foundation in the biological and physical sciences is required. This background includes college mathematics, the equivalent of one semester of general chemistry, organic chemistry, general biology, biochemistry, physiology, and statistics. For the doctoral program, additional prerequisite courses include calculus and physics. If there is evidence that the applicant has a good background in the sciences, some of the prerequisites can be met after admission. The PhD program also requires the following nutrition courses, or equivalents, which may be completed after admission to the program: Principles of Nutrition (FSCN 1112), Life Cycle Nutrition (FSCN 3612), and Human Nutrition (FSCN 4612).

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21

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Information current as of August 31, 2018
Program Requirements
14 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

PhD students are expected to obtain teaching experience through assisting with course instruction three times. Teaching experience is subject to the policies of the advisor's department or division.

Thesis work may be conducted in the laboratory, clinic, or field, either locally or internationally.

Required Coursework
Orientation Course
NUTR 8621 - Presentation Skills (1.0 cr)

Core Courses
NUTR 5625 - Nutritional Biochemistry (3.0 cr)
NUTR 5626 - Nutritional Physiology (3.0 cr)
NUTR 5622 - Vitamin and Mineral Biochemistry (3.0 cr)
NUTR 5624 - Nutrition and Genetics (2.0 cr)

Advanced Topics Courses
All students must take Nutr 8620.
NUTR 8620 - Advances in Nutrition (2.0 cr)

Outside Coursework
All doctoral students must complete a minimum of 12 credits of outside coursework. Students must take one graduate level statistics course, one graduate level research methods course, and any other graduate level course to meet the 12 credit minimum.

Statistics Course
Take at least one statistics course from the following list. A different graduate level statistics course can be substituted with advisor approval.
PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 6414 - Biostatistical Literacy (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)

Research Methods Course
Take one or more courses totaling at least two credits of research methods coursework from this list, or graduate-level methods coursework from another field with advisor approval.
ANSC 5091 - Research Proposals: From Ideas to Strategic Plans [WI] (3.0 cr)
or NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
or PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
or PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
or PUBH 6806 - Principles of Public Health Research (2.0 cr)

**Additional Outside Coursework**
Other courses may be from any field, but must be at the 5000 or 8000 level. Exceptions: 6000 level courses from Public Health are allowed.

**Doctoral Thesis Credits**
Take at least 24 credits of the following:
NUTR 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
**Twin Cities Campus**  
**Plant Pathology M.S.**  
**Plant Pathology**  
**College of Food, Agricultural and Natural Resource Sciences**

Link to a [list of faculty](#) for this program.

**Contact Information:**  
Department of Plant Pathology, 495 Borlaug Hall, 1991 Buford Circle, Saint Paul, MN 55108 (612-625-8200)  
Email: [plpath@umn.edu](mailto:plpath@umn.edu)  
Website: [http://plpa.cfans.umn.edu](http://plpa.cfans.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30  
- This program requires summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

Plant pathology focuses on the biology of plant-microbe interactions, and incorporates research involving biochemical, molecular, genetic, physiological, whole organism, population, and community levels of biological organization. Plant pathology interfaces with all plant science disciplines, and with many other fields including food sciences, veterinary medicine, biobased products, and ecology. Areas of concentration include molecular plant pathology (offered as a special emphasis), plant disease management, biological control of plant disease, forest pathology and microbial degradation of wood, microbial ecology, population biology, plant-microbe interactions, disease resistance, host-parasite coevolution, plant microbe mutualisms, and virology. Students have opportunities for laboratory and field research locally, as well as nationally and internationally. The course of study varies with the requirements for the area of concentration and interests of the student. Students who choose the emphasis in molecular plant pathology enhance their ability to design and use molecular approaches to investigate plant disease, increase basic knowledge, and develop new strategies for disease control.

**Program Delivery**  
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
The preferred undergraduate GPA for admittance to the program is 3.50.

Master's degree applicants must have a sound college background in the basic biological and physical sciences and mathematics.

Other requirements to be completed before admission:
Applicants must have completed 35 semester credits in biology with at least one course in each of the following areas: botany, zoology, genetics, plant physiology, and microbiology. Applicants must also have completed at least one course each in inorganic chemistry, organic chemistry, biochemistry, and physics. If deficiencies exist in the prerequisites, students must correct them during the first year of the graduate program. These courses cannot be counted as part of the degree program. All students accepted into the department with a BS degree are admitted into the MS program. After a minimum of two semesters, students who qualify may elect to change their degree status to the PhD program. Criteria for the change include scholastic standing, potential for success in completing a PhD, and writing competency.

**Special Application Requirements:**
GRE scores are required for all students and TOEFL or IELTS scores are required for international students. A clearly written statement of career interests as well as three letters of recommendation are required of all students. Students may apply at any time; however, submission of all application materials by December 10 will ensure priority consideration for fellowships and research assistantships for the next academic year. Students can be admitted any semester.

Applicants must submit their test score(s) from the following:
- GRE  
  - General Test - Verbal Reasoning: 153  
  - General Test - Quantitative Reasoning: 148  
  - General Test - Analytical Writing: 4.5

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The University of Minnesota is an equal opportunity educator and employer.  
Information current as of August 31, 2018
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language (TOEFL).

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** The Plan B option requires one to three projects, determined and approved by the advisor and director of graduate studies, totaling approximately 120 hours of work.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

All students:

- Students must enroll in a credit or non-credit teaching methods seminar or workshop, chosen in consultation with the advisor and director of graduate studies.
- Regular attendance at weekly plant pathology seminars is expected.
- Internships are encouraged as part of the graduate experience. Financial support for international or domestic internships is available on a competitive basis.
- Take PLPA 5480 (3 credits), if an introductory plant pathology course has not previously been taken.

**Required Coursework**

Take all of the following courses. Take PLPA 8005 (S-N grade basis) for 2 credits for completing a one-semester teaching experience. Consult with the advisor and director of graduate studies regarding the additional teaching methods seminar/workshop requirement. These credits count toward the major credit requirement.

- **PLPA 5480** - Principles of Plant Pathology (3.0 cr)
- **PLPA 8123** - Research Ethics in Plant and Environmental Sciences (0.5 cr)
- **PLPA 8200** - Seminar (1.0 cr)
- **PLPA 8005** - Supervised Classroom or Extension Teaching Experience (1.0 - 2.0 cr)
- **PLPA 8104** - Plant Virology (2.0 cr)
- **PLPA 8105** - Plant Bacteriology (2.0 cr)

**Plant Pathology Electives**

Select at least 5 credits from the following course list in consultation with the director of graduate studies, advisor, and graduate advisory committee.

Take 5 or more credit(s) from the following:

- **PLPA 5003** - Diseases of Forest and Shade Trees (3.0 cr)
- **PLPA 5202** - Field Plant Pathology (2.0 cr)
- **PLPA 5203** - Introduction to Fungal Biology (3.0 cr)
- **PLPA 5300** - Current Topics in Molecular Plant Pathology (1.0 cr)
- **PLPA 5301** - Large Scale Omic Data in Plant Biology (3.0 cr)
- **PLPA 5444** - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
- **PLPA 5660** - Plant Disease Resistance and Applications (3.0 cr)
- **PLPA 8103** - Plant-Microbe Interactions (3.0 cr)
Outside Coursework
Take at least 6 credits outside the major. Select courses in consultation with the advisor, director of graduate studies, and advisory committee. Suggested courses include the following:
AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
EEB 5221 - Molecular Evolution (3.0 cr)
GCD 5036 - Molecular Cell Biology (3.0 cr)
BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)

Thesis Credits or Capstone Project Credits
Plan A students must take 10 credits of PLPA 8777. Plan B students must take 10 credits of PLPA 8300.

Thesis Credits
Plan A students take 10 credits of PLPA 8777. 
Take 10 or more credit(s) from the following:
• PLPA 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or Plan B students take 10 credits of PLPA 8300.
Take 10 or more credit(s) from the following:
• PLPA 8300 - Plant Pathology Project (1.0 - 6.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Molecular Plant Pathology
This sub-plan is limited to students completing the program under Plan A.

Students in the molecular plant pathology track complete specialized coursework that emphasizes molecular approaches to investigating plant diseases, increase their knowledge of basic science, and explore emerging strategies for disease control. Students in the molecular plant pathology track will learn about topics such as pathogen effectomics, plant phenomics, molecular plant/microbe interactions, and an ever-evolving array of molecular research techniques, strategies, and analytical approaches. At the same time, students will garner a comprehensive understanding of plant interactions with pathogenic and non-pathogenic microbes from a systems level, building a firm knowledge base of classical and contemporary plant pathology concepts. Students completing the molecular plant pathology track will be well positioned for research careers in molecular plant pathology in academia, industry, and government.

Take all of the following courses. Take PLPA 8005 (S-N grade basis) for 2 credits for completing a one-semester teaching experience. Consult with the advisor and director of graduate studies regarding the additional teaching methods seminar/workshop requirement. These credits count toward the major credit requirement.

Molecular Plant Pathology
Take 14 - 20 credit(s) from the following:

Required Coursework
Minimum of 14 credits in plant pathology required.
• PLPA 5480 - Principles of Plant Pathology (3.0 cr)
• PLPA 5300 - Current Topics in Molecular Plant Pathology (1.0 cr)
• PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
• PLPA 8200 - Seminar (1.0 cr)
• PLPA 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
• PLPA 8005 - Supervised Classroom or Extension Teaching Experience (1.0 - 2.0 cr)

Outside Coursework
Take at least 6 course credits outside the major. Select courses in consultation with advisor, director of graduate studies, and advisory committee. Suggested courses include the following:
• AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
• BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• EEB 5221 - Molecular Evolution (3.0 cr)
• GCD 5036 - Molecular Cell Biology (3.0 cr)

Plant Pathology Electives
Take elective credits from the following list, chosen in consultation with your advisor, director of graduate studies, and advisory committee to meet the 14-credit (Plan A) minimum major requirement.
Take at most 8 credit(s) from the following:
• PLPA 5003 - Diseases of Forest and Shade Trees (3.0 cr)
• PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
• PLPA 5660 - Plant Disease Resistance and Applications (3.0 cr)
• PLPA 5202 - Field Plant Pathology (2.0 cr)
• PLPA 5203 - Introduction to Fungal Biology (3.0 cr)
- PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)
- PLPA 8104 - Plant Virology (2.0 cr)
- PLPA 8105 - Plant Bacteriology (2.0 cr)
Twin Cities Campus

Plant Pathology Minor

Plant Pathology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Plant Pathology Graduate Program, 495 Borlaug Hall, 1991 Buford Circle, Saint Paul, MN 55108 (612-625-8200)
Email: pipath@umn.edu
Website: http://plpa.cfans.umn.edu

Program Type: Graduate minor related to major
Requirements for this program are current for Fall 2018
Length of program in credits (Masters): 6
Length of program in credits (Doctorate): 12
This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Plant pathology focuses on the biology of plant-microbe interactions, and incorporates research involving biochemical, molecular, genetic, physiological, whole organism, population, and community levels of biological organization. Plant pathology interfaces with all plant science disciplines, and with many other fields including food sciences, veterinary medicine, biobased products, and ecology. Areas of concentration include molecular plant pathology, plant disease management, biological control of plant disease, forest pathology and microbial degradation of wood, microbial ecology, population biology, plant-microbe interactions, disease resistance, host-parasite coevolution, plant microbe mutualisms, and virology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral

Doctoral
Take 12 or more credit(s) from the following:
- PLPA 8103 - Plant-Microbe Interactions (3.0 cr)
- PLPA 5300 - Current Topics in Molecular Plant Pathology (1.0 cr)
- PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)
- PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
- PLPA 5480 - Principles of Plant Pathology (3.0 cr)
- PLPA 8104 - Plant Virology (2.0 cr)
- PLPA 8105 - Plant Bacteriology (2.0 cr)
- PLPA 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)

Masters

Master's Minor
Take 6 or more credit(s) from the following:
• PLPA 5103 - Plant-Microbe Interactions (3.0 cr)
• PLPA 5300 - Current Topics in Molecular Plant Pathology (1.0 cr)
• PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)
• PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
• PLPA 5480 - Principles of Plant Pathology (3.0 cr)
• PLPA 8104 - Plant Virology (2.0 cr)
• PLPA 8105 - Plant Bacteriology (2.0 cr)
• PLPA 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
Twin Cities Campus

Plant Pathology Ph.D.

Plant Pathology
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Plant Pathology Graduate Program, 495 Borlaug Hall, 1991 Buford Circle, Saint Paul, MN 55108 (612-625-8200)
Email: plpath@umn.edu
Website: http://plpa.cfans.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 56
• This program requires summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Plant pathology focuses on the biology of plant-microbe interactions, and incorporates research involving biochemical, molecular, genetic, physiological, whole organism, population, and community levels of biological organization. Plant pathology interfaces with all plant science disciplines, and with food sciences, veterinary medicine, biobased products, and ecology. Areas of concentration include molecular plant pathology (offered as a special emphasis), plant disease management, biological control of plant disease, forest pathology and microbial degradation of wood, microbial ecology, population biology, plant-microbe interactions, disease resistance, host-parasite coevolution, plant microbe mutualisms, and virology. Students have opportunities for laboratory and field research locally as well as nationally and internationally. The course of study varies with the requirements of the area of concentration and interests of the student. Students who choose the emphasis in molecular plant pathology enhance their ability to design and use molecular approaches to investigate plant disease, increase basic knowledge, and develop new strategies for disease control.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Applicants must have a sound college background in the basic biological and physical sciences and mathematics.

PhD applicants must satisfy all the prerequisites for the master's degree program in plant pathology or have a master's degree in plant pathology or in a field of natural science.

Other requirements to be completed before admission:
Applicants must have completed 35 semester credits in biology with at least one course in each of the following areas: botany, zoology, genetics, plant physiology, and microbiology. Applicants must also have completed at least one course each in inorganic chemistry, organic chemistry, biochemistry, and physics. If deficiencies exist in the prerequisites, they must be corrected during the first year of the graduate program. Applicants should note that these courses cannot be counted as part of the degree program. All students accepted into the department with only a BS degree are admitted into the MS degree program. After a minimum of two semesters, students who qualify may elect to change their degree status to the PhD program. Criteria for the change include scholastic standing, potential for success in completing a PhD, and writing competency.

Special Application Requirements:
GRE scores are required for all students and TOEFL or IELTS scores are required for international students. A clearly written statement of career interests as well as three letters of recommendation are required of all students. Students may apply at any time; however, submission of all application materials by December 10 will ensure priority consideration for fellowships and research assistantships for the next academic year. Students can be admitted any semester.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 153
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

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**Program Requirements**

20 credits are required in the major.

12 credits are required outside the major.

24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must enroll in a supervised teaching or extension teaching experience, chosen in consultation with the advisor and director of graduate studies.

Degree plans are determined by the advisory committee, with approval of the director of graduate studies.

Regular attendance at weekly plant pathology seminars is expected.

Internships are encouraged as part of the graduate experience. Financial support for international or domestic internships is available on a competitive basis.

**Required Coursework (13 credits)**

All students take the following courses, if not completed previously. Take PLPA 8200 twice for a total of 2 credits. Take PLPA 8005 for 2 credits to fulfill the one-semester teaching experience requirement. Take GRAD 8101 concurrently with or after completing PLPA 8005.

- **PLPA 5480 - Principles of Plant Pathology** (3.0 cr)
- **PLPA 8103 - Plant-Microbe Interactions** (3.0 cr)
- **PLPA 8123 - Research Ethics in Plant and Environmental Sciences** (0.5 cr)
- **PLPA 8200 - Seminar** (1.0 cr)
- **PLPA 8005 - Supervised Classroom or Extension Teaching Experience** (1.0 - 2.0 cr)
- **GRAD 8101 - Teaching in Higher Education** (3.0 cr)

**Electives (12 credits)**

Take at least 12 credits, in consultation with the advisor, to complete the outside credit requirement.

- **AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement** (3.0 cr)
- **ANSC 5200 - Statistical Genetics and Genomics** (4.0 cr)
- **BIOC 5361 - Microbial Genomics and Bioinformatics** (3.0 cr)
- **CSCI 5481 - Computational Techniques for Genomics** (3.0 cr)
- **EEB 5221 - Molecular Evolution** (3.0 cr)
- **AGRO 5021 - Plant Breeding Principles** (3.0 cr)
- **GCD 5036 - Molecular Cell Biology** (3.0 cr)
- **GCD 8131 - Advanced Molecular Genetics and Genomics** (3.0 cr)
- **MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses** (4.0 cr)
- **AGRO 5431 - Applied Plant Genomics and Bioinformatics** (3.0 cr)
BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
PMB 5412 - Plant Physiology (3.0 cr)
CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
PLPA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Standard Program

Standard Program Courses (7 credits)
Take the following courses:
- PLPA 8104 - Plant Virology (2.0 cr)
- PLPA 8105 - Plant Bacteriology (2.0 cr)
- PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Molecular Plant Pathology
Students in the molecular plant pathology track complete specialized coursework that emphasizes molecular approaches to investigating plant diseases, increase their knowledge of basic science, and explore emerging strategies for disease control. Students in the Molecular Plant Pathology track will learn about topics such as pathogen effectomics, plant phenomics, molecular plant/microbe interactions, and an ever-evolving array of molecular research techniques, strategies, and analytical approaches. At the same time, students will garner a comprehensive understanding of plant interactions with pathogenic and non-pathogenic microbes from a systems level, building a firm knowledge base of classical and contemporary plant pathology concepts. Students completing the molecular plant pathology track will be well positioned for research careers in molecular plant pathology in academia, industry, and government.

Molecular Plant Pathology Courses (7 credits)
Take the following courses. Take PLPA 5300 twice for a total of 2 credits.
- PLPA 5301 - Large Scale Omic Data in Plant Biology (3.0 cr)
- PLPA 5300 - Current Topics in Molecular Plant Pathology (1.0 cr)

Virology OR Bacteriology
Take one of the following courses:
- PLPA 8104 - Plant Virology (2.0 cr)
- or PLPA 8105 - Plant Bacteriology (2.0 cr)
Twin Cities Campus

Risk Analysis for Introduced Species and Genotypes Minor

Fisheries, Wildlife, and Conservation Biology

College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Department of Entomology, Room 219 Hodson Hall, 6125B, 1980 Folwell Ave., St. Paul, MN 55108
Email: isgigert@umn.edu
Website: http://isg-igert.umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 13
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in risk analysis for introduced species and genotypes is available to master's (M.A. and M.S.) and doctoral students. The minor provides an interdisciplinary curriculum that addresses all phases of risk analysis pertaining to the introduction of exotic species and novel genotypes. The curriculum is based on collaborative learning and includes a survey course, discussions, a problem solving practicum, and a cooperative learning practicum. The minor complements major programs in applied economics; applied plant sciences; conservation biology; ecology, evolution, and behavior; entomology; natural resources science and management; plant biological sciences; and water resources science.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
ISG Core Courses
The master's minor requires 6 graduate credits from the core curriculum; ISG 8001 must be taken two times for 1 credit each time.
ISG 5010 - Risk Analysis for Introduced Species and Genotypes (3.0 cr)
ISG 5020 - Risk Analysis Modeling for Introduced Species and Genotypes (1.0 cr)
ISG 8001 - Discussions in Introduced Species and Genotypes (1.0 cr)

Doctoral
ISG Doctoral Minor
In addition to the 10-credit core listed, a 3-credit decision analysis or quantitative modeling course from another program is required. ISG 8001 must be taken twice for one credit.
ISG 5010 - Risk Analysis for Introduced Species and Genotypes (3.0 cr)

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Information current as of August 31, 2018
ISG 5020 - Risk Analysis Modeling for Introduced Species and Genotypes (1.0 cr)
ISG 8001 - Discussions in Introduced Species and Genotypes (1.0 cr)
ISG 8021 - Problem Solving Practicum in Risk Analysis (3.0 cr)
ISG 8031 - Cooperative Learning Practicum (1.0 cr)
Twin Cities Campus
Sustainable Agriculture Systems Minor
Agronomy & Plant Genetics
College of Food, Agricultural and Natural Resource Sciences

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Sustainable Agriculture Systems Minor, 411 Borlaug Hall, 1991 Buford Circle, St. Paul, MN 55108 (612-625-3754; fax:612-625-1268)
Email: sheaf001@umn.edu
Website: http://www.misa.umn.edu/StudentPrograms/GraduateMinor/index.htm

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in sustainable agriculture systems offers master's (MA and MS) and doctoral students an interdisciplinary curriculum that considers the biological, sociological, and economic aspects of agriculture. The minor emphasizes a holistic perspective to designing farming and food systems and solving problems in agriculture. The importance of yield and profitability are balanced by considerations of the environment and the health and social well-being of producers, consumers, and communities. A unique component of the minor is an on-site internship with growers, grassroots organizations, or public agencies working in sustainable agriculture. The minor complements major programs in ecology, conservation biology, forestry, sociology, geography, political science, and public affairs, as well as majors in the College of Food, Agricultural and Natural Resource Sciences.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission is contingent upon prior admission to a master's or doctoral degree-granting program.

Special Application Requirements:
Contact the director of graduate studies in sustainable agriculture systems for an Intent to Enroll Form. Students are admitted each semester.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Required Coursework (6 Credits)
All students pursuing the Sustainable Agriculture Systems minor must complete the following courses for a total of 6 credits. Take SAGR 8020 for 1 credit.
SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
SAGR 8020 - Field Experience in Sustainable Agriculture (1.0 - 4.0 cr)
AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
**Master’s-level Minor**
The master's-level Sustainable Agriculture minor comprises the 6 required course credits noted above.

Doctoral
**Doctoral-level Minor Electives (6 Credits)**
In addition to the 6 required credits, select at least 6 credits in consultation with the Sustainable Agriculture Systems director of graduate studies to complete the 12-credit minimum.
Twin Cities Campus
Advanced Dental Therapy Postbaccalaureate Certificate
Dentistry Primary Care Administration
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
University of MN, School of Dentistry
515 Delaware St SE
9-436 Moos Health Sci
Minneapolis, MN  55455
612-626-5138
Email: heit0058@umn.edu
Website: http://dentistry.umn.edu/programs-admissions/dental-therapy/index.htm

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Advanced Dental Therapy PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Advanced Dental Therapy certificate is designed for dental therapists who have completed a baccalaureate or master degree in dental therapy from the University of Minnesota, School of Dentistry between the years 2011 and 2014. It focuses on acquiring the knowledge and skills mandated by the Minnesota Board of Dentistry to become eligible for advanced dental therapy certification.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
Bachelor Degree of Dental Therapy from the University of Minnesota.

Master Degree of Dental Therapy from the University of Minnesota.

Other requirements to be completed before admission:
Completion of a Bachelor of Science in Dental Therapy degree or Master of Dental Therapy degree at the University of Minnesota, School of Dentistry between 2011 thru 2014. Holds current credentials of Licensed Dental Therapist in the state of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students are required to maintain a minimum GPA of 3.00 and to achieve no less than a C grade in each course. Students must enroll in the Advance Dental Therapy Post-baccalaureate Certificate within five years following the completion of their dental therapy degree and must complete the course and clinic requirements within five years of enrollment.

Required Didactic Coursework (5 Credits)
Take the following courses for a total of 5 credits:
DT 5162 - Principles of Exodontia and Minor Oral Surgery (1.0 cr)
DT 6321 - Treatment Planning (2.0 cr)
DT 6341 - Advanced Dental Therapy Prep Lecture (2.0 cr)

Required Clinical Coursework (10 Credits)
Take the following for at least 10 credits:
DT 6340 - Advanced Dental Therapy Prep Clinic (10.0 cr)
Twin Cities Campus
Dental Hygiene M.S.D.H.
Denistry Primary Care Administration
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
Division of Dental Hygiene, 9-372 Moos Tower, 515 Delaware Street SE, Minneapolis, MN 55455 (612-625-9121; fax: 612-625-1605)
Email: jaliv003@umn.edu
Website: http://www.dentistry.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 33 to 40
- This program requires summer semesters for timely completion.
- Degree: Master of Science Dental Hygiene

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science in dental hygiene program prepares leaders in the profession for practice, research, the healthcare industry, and academia.

The curriculum provides meaningful academic experiences for each graduate student based on their career goals and interest. Courses in the management track will provide students with knowledge and skills necessary for careers in the healthcare industry such as sales, marketing and professional relations management, management of large dental clinics, practice management consulting, and entrepreneurship.

Courses in the education track will provide students with the knowledge and skills to teach didactic, clinic, and laboratory courses in dental hygiene programs; conduct research; and assume administrative positions.

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Graduate of an accredited US institution or foreign equivalent dental hygiene program.

Other requirements to be completed before admission:
Baccalaureate degree; dental hygiene license; CPR certification; undergraduate statistics course.

Special Application Requirements:
Applicants must submit directly to the Admissions Committee a typed essay including short and long term goals and an explanation of why an advanced degree is of interest, a current resume including evidence of leadership and dental hygiene clinic experience, and three letters of reference. Deadline May 1.

Applicants pursuing the managment track must submit their GMAT score.

Applicants must submit their test score(s) from the following:
- GMAT
  - Total score: 500

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 94
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
IELTS
- Total Score: 6.5
MELAB
- Final score: 80
- Speaking test score: 0

Key to test abbreviations (GMAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 23 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan C: Plan C requires 40 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: Plan C students complete a capstone project based on internship experiences.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Curriculum (11 Credits)

All MSDH students take the following courses for a total of 11 credits:

- DH 5401 - Research Methods in Health Sciences (3.0 cr)
- DH 5407 - Instructional Strategies for Effective Teaching (2.0 cr)
- DH 5411 - Administrative Leadership and Professional Development (2.0 cr)
- DH 5421 - Grant Writing for Health Professionals (1.0 cr)

Statistics

- EPSY 5261 - Introductory Statistical Methods (3.0 cr)

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Dental Hygiene Education

This sub-plan is limited to students completing the program under Plan A.

Courses in the dental hygiene education track provide students with the knowledge and skills to teach didactic, clinic, and laboratory courses in dental hygiene programs; conduct research; and assume administrative positions.

Education Track Curriculum (12 Credits)

In addition to the 11 MSDH core credits, take the following 12 credits to complete the 23 course credits required:

- DH 5403 - The Discipline of Dental Hygiene (2.0 cr)
- DH 5405 - Curriculum and Course Development (2.0 cr)
- DH 5409 - Dental Hygiene Clinic Administration (2.0 cr)
- DH 5413 - Dental Hygiene Supervised Clinic Student Teaching (4.0 cr)
- DH 5415 - Dental Hygiene Supervised Didactic Course Student Teaching (2.0 cr)

Thesis Credits

Take 10 masters thesis credits.

- DH 8777 - Thesis Credits: Master’s (1.0 - 18.0 cr)
This sub-plan is limited to students completing the program under Plan A or Plan C.

The Management Track coursework can be taken on-line or on campus. Courses in the management track provide students with the knowledge and skills necessary for healthcare industry careers such as sales, marketing and professional relations management, management of large dental clinics, practice management consulting, and entrepreneurship.

**Management Track Curriculum (27 to 29 Credits)**
In addition to the 11 MSDH core credits, Plan A students take 27 credits (17 course credits and 10 thesis credits) to complete the 38-credit minimum, and Plan C students take 29 credits to complete the 40-credit minimum.

**Management Track Core Courses (9 Credits)**
All Management track students take the following courses for a total of 9 credits:
- MBA 6030 - Financial Accounting (3.0 cr)
- MBA 6210 - Marketing Management (3.0 cr)
- MBA 6220 - Supply Chain & Operations (3.0 cr)

**MBA Electives (8 to 12 Credits)**
Plan A students select at least 8 credits, and Plan C students select at least 12 credits, from the following list in consultation with the advisor. Alternative courses may be taken with advisor approval.
- ENTR 6020 - Business Formation (4.0 cr)
- HRIR 6301 - Staffing, Training, and Development (4.0 cr)
- MBA 6300 - Strategic Management (3.0 cr)
- MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
- MILI 6562 - Information Technology in Health Care (2.0 cr)
- MKTG 6051 - Marketing Research (4.0 cr)

**Plan A Option (10 Credits)**
Plan A students must take 10 masters thesis credits.
- DH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan C Option (8 Credits)**
Plan C students must take the following courses for a total of 8 credits:
- DH 5201 - Management Internship (5.0 cr)
- DH 5203 - Capstone Project (3.0 cr)
Twin Cities Campus

Dental Therapy M.D.T.
Dentistry Primary Care Administration
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
Division of Dental Therapy, 9-436 Moos Tower, 515 Delaware Street, S.E., Minneapolis, MN 55455
(612-625-4310; fax: 612-626-6096)
Email: atki0094@umn.edu
Website: http://www.dentistry.umn.edu/programs_admissions/DentalTherapyPrograms/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 91
- This program requires summer semesters for timely completion.
- Degree: Master of Dental Therapy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The M.D.T. program blends a strong dental therapy education with the study of the biological, behavioral, and social sciences. It provides the didactic, laboratory, and clinical experiences required for the assessment and treatment of specified dental procedures. Dental therapy students learn alongside the dental and dental hygiene students with whom they will work with after graduation.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have a bachelor of science or bachelor of arts degree.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 92
  - Internet Based - Writing Score: 20
  - Internet Based - Reading Score: 20

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 91 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Required courses
DT 5210 (inactive) (1.0 - 3.0 cr)
DT 5330 (inactive) (3.0 cr)
DT 5429 - Introduction to Psychomotor Skill Development (1.0 cr)
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>DT 5430</td>
<td>Oral Anatomy</td>
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<tr>
<td>DT 5431</td>
<td>Oral Anatomy Laboratory</td>
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<tr>
<td>DT 5521</td>
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<td>DT 5410</td>
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<tr>
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<td>Operative Dentistry I Pre-Clinic Laboratory</td>
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<td>DT 5140</td>
<td>Preventive Pediatric Dental Clinic</td>
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<td>DT 5320</td>
<td>Comprehensive Care Clinic</td>
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<td>DT 5361</td>
<td>Outreach Experiences II</td>
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<td>DT 5443</td>
<td>Operative Clinic III</td>
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<tr>
<td>DT 5435</td>
<td>Operative Dentistry II for the Dental Therapist, Lab</td>
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Information current as of August 31, 2018
Twin Cities Campus
Dentistry M.S.
School of Dentistry - Adm
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
M.S.-Dentistry Program, 15-136 Moos Tower, 515 Delaware Street, S.E., Minneapolis, MN 55455 (612-624-9900; fax: 612-624-0027)
Email: schwe008@umn.edu
Website: http://www.dentistry.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MS program in dentistry prepares dentists with clinical expertise for positions of leadership in education, research, and program administration in the oral health field. A multidisciplinary faculty of dental educators, researchers, and clinicians teach the program, which is housed in the School of Dentistry. All students complete core coursework in teaching and evaluation of dentistry, research methods, and health care administration. Additional advanced coursework is offered in these same focus areas, as well as in selected clinical and oral science topics with multidisciplinary impact, including conscious sedation, craniofacial pain, geriatrics, oral biology, oral medicine and radiology, oral pathology, practice administration, and psychology. Students have flexibility in planning individualized programs to accommodate their specific areas of interest, and courses from other disciplines may be included for credit in the major area.

Students enrolled in an advanced clinical dental training program may be admitted to the dentistry graduate program for concurrent study, but must carefully plan their curriculum with their faculty adviser and the director of graduate studies so that their residency and M.S. programs are appropriately integrated and satisfy University registration requirements. Programs in the School of Dentistry that may enroll students for the MS degree include: General Practice Residency, Endodontics, Geriatrics, Orthodontics, Pediatric dentistry, Periodontics, Prosthodontics and Orofacial Pain

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

DDS/DMD or equivalent from accredited US institution or recognized foreign school. Clinical residency enrollment and 3.0 GPA or rank in top quarter of graduating professional school class preferred.

Other requirements to be completed before admission:
Applicants must submit three letters of recommendation from individuals familiar with their academic capabilities. Also required is a brief essay (under 500 words) which relates the applicant's career goals to the goals of the program. Applications are received and reviewed throughout the year. Students may enter the program in any semester at the discretion of program faculty.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 80
  - Paper Based - Total Score: 600

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must complete training in the responsible conduct of research.

Core Coursework (8-9 Credits)

All students must select at least 8 credits, in consultation with the advisor, from the following list:

Required Courses
Three core courses are required.
- GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
- OBIO 5001 - Methods in Research and Writing (2.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)

Health Care Administration Course
At least one course is required.
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
  or PUBH 6724 - The Health Care System and Public Health (3.0 cr)

Plan A Thesis Credits
Plan A students must take at least 10 master's thesis credits.
- DENT 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Topics Areas
Students must complete one topic area.

Periodontology (12 to 22 Credits)
Plan A students pursuing the Periodontology topic area must select at least 12 credits, and Plan B students must take at least 22 credits from the following list, in consultation with the advisor:
- ANAT 7999 - Head and Neck Anatomy (3.0 cr)
- OSUR 5277 - Physical Diagnosis for Oral Surgery Residents (2.0 cr)
- DENT 7102 - Conscious Sedation (2.0 cr)
- DENT 8100 - Topics in Advanced Periodontology: Literature Review (2.0 cr)
- DENT 7051 - Advanced Study in the Theory and Principles of Oral Medicine (2.0 cr)
- OBIO 8012 - Basic Concepts in Skeletal Biology (2.0 cr)
- DENT 7061 - Special Oral Pathology I (1.0 cr)
- DENT 7062 - Special Oral Pathology II (1.0 cr)
- DENT 7052 - Oral and Maxillofacial Radiologic Interpretation (2.0 cr)
- DENT 7101 - Management Philosophy for Dental Practices (1.0 cr)
- DENT 8101 - Dental Implantology: A Multidisciplinary Approach (2.0 cr)

-OR-

General Practice Residency (12 to 22 Credits)
Plan A students pursuing the General Practice Residency topic area must select at least 12 credits from the following, in consultation with the advisor. Plan B students must select at least 22 credits from the following and in consultation with the advisor:
- DENT 7051 - Advanced Study in the Theory and Principles of Oral Medicine (2.0 cr)
- DENT 7102 - Conscious Sedation (2.0 cr)
- DENT 7123 - Temporomandibular Disorders and Orofacial Pain (1.0 cr)
- DENT 7052 - Oral and Maxillofacial Radiologic Interpretation (2.0 cr)
- DENT 7061 - Special Oral Pathology I (1.0 cr)
- DENT 7062 - Special Oral Pathology II (1.0 cr)
DENT 7101 - Management Philosophy for Dental Practices (1.0 cr)
DENT 8121 - Current Literature in TMD and Orofacial Pain (1.0 cr)

-OR-

TMD, Orofacial Pain & Dental Sleep Medicine (12 to 22 Credits)
Plan A students pursuing the TMD, Orofacial Pain & Dental Sleep Medicine topic area must select at least 12 credits, and Plan B students must take at least 22 credits from the following list, in consultation with the advisor:
OSUR 5277 - Physical Diagnosis for Oral Surgery Residents (2.0 cr)
ANAT 7999 - Head and Neck Anatomy (3.0 cr)
DENT 8121 - Current Literature in TMD and Orofacial Pain (1.0 cr)
DENT 7121 - Psychological Issues in Medical and Dental Patient Management (1.0 cr)
DENT 7052 - Oral and Maxillofacial Radiologic Interpretation (2.0 cr)
DENT 8120 - Advanced Principles and Techniques of Orofacial Pain Disorders (2.0 cr)
DENT 7051 - Advanced Study in the Theory and Principles of Oral Medicine (2.0 cr)
DENT 8123 - Advanced Topics in Orofacial Pain (2.0 cr)

-OR-

Endodontics (12 to 22 Credits)
Plan A students pursuing the Endodontics topic area must select at least 12 credits from the following, in consultation with the advisor.
Plan B students must select at least 22 credits from the following and in consultation with the advisor:
DENT 7102 - Conscious Sedation (2.0 cr)
DENT 7051 - Advanced Study in the Theory and Principles of Oral Medicine (2.0 cr)
DENT 7052 - Oral and Maxillofacial Radiologic Interpretation (2.0 cr)
DENT 7021 - Contemporary Diagnosis and Management of Orofacial Pain (1.0 cr)
DENT 7062 - Special Oral Pathology II (1.0 cr)
DENT 7061 - Special Oral Pathology I (1.0 cr)
ANAT 7999 - Head and Neck Anatomy (3.0 cr)
DENT 7101 - Management Philosophy for Dental Practices (1.0 cr)

-OR-

Prosthodontics (12 to 22 Credits)
Plan A students pursuing the Prosthodontics topic area must select at least 12 credits, and Plan B students must take at least 22 credits from the following list, in consultation with the advisor:
ANAT 7999 - Head and Neck Anatomy (3.0 cr)
DENT 7220 - Prosthetically-Driven Implant Surgery and Treatment Planning (1.0 cr)
DENT 7102 - Conscious Sedation (2.0 cr)
DENT 7112 - Treatment Planning Seminar (2.0 cr)
DENT 7111 - Current Literature Review in Dentistry (2.0 cr)
DENT 7052 - Oral and Maxillofacial Radiologic Interpretation (2.0 cr)
DENT 8101 - Dental Implantology: A Multidisciplinary Approach (2.0 cr)
DENT 7411 - Dental Biomaterials in Prosthodontics (1.0 cr)
DENT 7123 - Temporomandibular Disorders and Orofacial Pain (1.0 cr)
DENT 7061 - Special Oral Pathology I (1.0 cr)
DENT 7062 - Special Oral Pathology II (1.0 cr)
PERO 7321 - Periodontics/Orthodontics Seminar (1.0 cr)
PERO 7322 - Multidisciplinary Treatment Seminar in Dentistry Related to Periodontics (1.0 cr)
DENT 7051 - Advanced Study in the Theory and Principles of Oral Medicine (2.0 cr)
DENT 7101 - Management Philosophy for Dental Practices (1.0 cr)

-OR-

Orthodontics (12 to 22 Credits)
Plan A students pursuing the Orthodontics topic area must select at least 12 credits from the following, in consultation with the advisor.
Plan B students must select at least 22 credits from the following and in consultation with the advisor:
ANAT 7999 - Head and Neck Anatomy (3.0 cr)
DENT 8091 - Interdisciplinary Care of the Cleft Palate Patient (1.0 cr)
DENT 7061 - Special Oral Pathology I (1.0 cr)
PERO 7321 - Periodontics/Orthodontics Seminar (1.0 cr)
DENT 7062 - Special Oral Pathology II (1.0 cr)
DENT 8081 - Clinical Topics in TMD (2.0 cr)
OBIO 8012 - Basic Concepts in Skeletal Biology (2.0 cr)
Twin Cities Campus
Oral Biology M.S.
School of Dentistry - Adm
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
School of Dentistry, 17-164 Moos Tower, 515 Delaware Street, S.E., Minneapolis, MN 55455 (612-625-5984; fax: 612-626-2651)
Email: oralbio@umn.edu
Website: http://www.oralbiology.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The interdisciplinary Oral Biology Program is offered by the School of Dentistry with cooperating faculty in the Medical School, College of Pharmacy, and Veterinary Medicine. It gives students research skills and a broad understanding of the development, structure, function, and pathology of the orofacial region. Students are encouraged to focus in one of five areas of emphasis: biomaterials and biomechanics; epithelial biology and carcinogenesis; microbiology and immunology; sensory neuroscience; and bone biology, craniofacial development, and tissue engineering. An exceptional student can create his/her own area of emphasis or specialize in topics not listed here; students should discuss their interests with the director of graduate studies before applying. Curricula are designed to allow considerable flexibility in planning individual programs to accommodate specific areas of interest; courses from other disciplines may be included as part of the major.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must submit 1) scores from the General Test of the GRE, 2) three letters of recommendation from persons who can comment authoritatively about the applicant's potential for a research and academic career, 3) a clearly written personal statement (one to two pages) describing career goals, 4) an essay describing research aspirations (one to two pages), and 5) a résumé highlighting research experience and accomplishments.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 148
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 90
  - Internet Based - Writing Score: 25
  - Internet Based - Reading Score: 25

IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MS in oral biology is intended for individuals who are currently involved in a research laboratory or program and are seeking to increase their scientific perspectives. This program generally requires a minimum of two years to complete. Courses in the major may be taken from other disciplines with the approval of the advisor and the director of graduate studies. Students must also complete a minor in an associated non-clinical discipline (minimum 6 credits).

Program Requirements

Required Coursework (4 Credits)

Select at least 4 credits from the following list, in consultation with the advisor:

- OBIO 8012 - Basic Concepts in Skeletal Biology (2.0 cr)
- OBIO 8018 - Topics in Oral Pathobiology (2.0 cr)
- OBIO 8021 - Oral Microbiology (2.0 cr)
- OBIO 8022 - Oral Neuroscience (2.0 cr)
- OBIO 8023 - Physical Biology of the Oral Cavity (2.0 cr)
- OBIO 8024 - Genetics and Human Disease (1.0 cr)
- OBIO 8025 - Topics in Cariology (2.0 cr)
- OBIO 8026 - Salivary Glands and Secretions (2.0 cr)
- OBIO 8027 - Biomaterials in Regenerative Dentistry (2.0 cr)
- OBIO 8028 - Molecular Basis of Cellular and Microbial Adhesion (2.0 cr)
- OBIO 8371 - Mucosal Immunobiology (3.0 cr)

Oral Biology Seminar (4 Credits)

Registration and participation in the oral biology student seminar series each semester is required. Take OBIO 8030 four times for a total of 4 credits.

- OBIO 8030 - Oral Biology Seminar (1.0 cr)

Electives (6 Credits)

Select at least 6 credits, in consultation with director of graduate studies.

Required Minor (6 Credits)

Students must complete a graduate minor in a complementary, non-clinical discipline. At least 6 minor field credits are required. Confer with the director of graduate studies for the minor field to determine additional requirements.

Thesis Credits (10 Credits)

Take at least 10 master's thesis credits.

- OBIO 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus
Oral Biology Minor
School of Dentistry - Adm
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
School of Dentistry, 17-164 Moos Tower, 515 Delaware Street, S.E., Minneapolis, MN 55455 (612-625-5984; fax 612-626-2651)
Email: oralbio@umn.edu
Website: http://www.oralbiology.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The interdisciplinary oral biology program is offered by the School of Dentistry with cooperating faculty in the Medical School, College of Pharmacy, and Veterinary Medicine. It gives students research skills and a broad understanding of the development, structure, function, and pathology of the orofacial region. Students are encouraged to focus in one of five areas of emphasis: biomaterials and biomechanics; epithelial biology and carcinogenesis; microbiology and immunology; sensory neuroscience; and bone biology, craniofacial development, and tissue engineering. An exceptional student can create their own area of emphasis or specialize in topics not listed here; students should discuss their interests with the director of graduate studies before applying. Curricula are designed to allow considerable flexibility in planning individual programs to accommodate specific areas of interest.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Coursework (4-8 Credits)
Master's students must select at least 4 credits, and doctoral students must select at least 8 credits, from the following list in consultation with the oral biology director of graduate studies.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBIO 8012</td>
<td>Basic Concepts in Skeletal Biology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8018</td>
<td>Topics in Oral Pathobiology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8021</td>
<td>Oral Microbiology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8022</td>
<td>Oral Neuroscience</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8023</td>
<td>Physical Biology of the Oral Cavity</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8024</td>
<td>Genetics and Human Disease</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>OBIO 8025</td>
<td>Topics in Cariology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8026</td>
<td>Salivary Glands and Secretions</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8027</td>
<td>Biomaterials in Regenerative Dentistry</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8028</td>
<td>Molecular Basis of Cellular and Microbial Adhesion</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8371</td>
<td>Mucosal Immunobiology</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Masters**

**Electives (2 credits)**
Select at least 2 credits, in consultation with the oral biology director of graduate studies, to meet the 6-credit minimum for the master's minor.

**Doctoral**

**Electives (4 credits)**
Select at least 4 credits, in consultation with the oral biology director of graduate studies, to meet the 12-credit minimum for the doctoral minor.
Twin Cities Campus
Oral Biology Ph.D.
School of Dentistry - Adm
School of Dentistry

Link to a list of faculty for this program.

Contact Information:
School of Dentistry, 17-164 Moos Tower, 515 Delaware Street, S.E., Minneapolis, MN 55455 (612-625-5984; fax:612-626-2651)
Email: oralbio@umn.edu
Website: http://www.oralbiology.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 55 to 61
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The interdisciplinary graduate program in oral biology is offered by the School of Dentistry with cooperating faculty in the Medical School, College of Pharmacy, and Veterinary Medicine. It gives students research skills and a broad understanding of the development, structure, function, and pathology of the orofacial region. Students are encouraged to focus in one of five areas of emphasis: biomaterials and biomechanics; epithelial biology and carcinogenesis; microbiology and immunology; sensory neuroscience; and bone biology, craniofacial development, and tissue engineering. An exceptional student can create his/her own area of emphasis or specialize in topics not listed here; students should discuss their interests with the director of graduate studies before applying.

Curricula are designed to allow considerable flexibility in planning individual programs to accommodate specific areas of interest; courses from other disciplines may be included as part of the major.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must submit 1) scores from the General Test of the GRE, 2) three letters of recommendation from persons who can comment authoritatively about the applicant’s potential for a research and academic career, 3) a clearly written personal statement (one to two pages) describing career goals, 4) an essay describing research aspirations (one to two pages), and 5) a résumé highlighting research experience and accomplishments. For D.D.S./Ph.D. applicants who are U.S. citizens, resident aliens, or Canadian citizens, U.S. or Canadian Dental Admission Test (DAT) scores at or above the national average will be accepted in lieu of the GRE. Applicants who have graduated from U.S. or Canadian dental or medical schools within three years of their application to the Ph.D. program may request that previous U.S. or Canadian DAT or MCAT scores be considered in lieu of the GRE.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 148
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 90
  - Internet Based - Writing Score: 25
  - Internet Based - Reading Score: 25
- IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language.
Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
19 to 25 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Completion of a minor in a complementary, non-clinical discipline is required.

Program Requirements
Courses may be selected from departments and programs outside oral biology with approval of the advisor and director of graduate studies.

Oral Biology Topics Courses (8 Credits)
Select at least 8 credits from the following list:

- OBIO 8012 - Basic Concepts in Skeletal Biology (2.0 cr)
- OBIO 8018 - Topics in Oral Pathobiology (2.0 cr)
- OBIO 8021 - Oral Microbiology (2.0 cr)
- OBIO 8022 - Oral Neuroscience (2.0 cr)
- OBIO 8023 - Physical Biology of the Oral Cavity (2.0 cr)
- OBIO 8024 - Genetics and Human Disease (1.0 cr)
- OBIO 8025 - Topics in Cariology (2.0 cr)
- OBIO 8026 - Salivary Glands and Secretions (2.0 cr)
- OBIO 8027 - Biomaterials in Regenerative Dentistry (2.0 cr)
- OBIO 8028 - Molecular Basis of Cellular and Microbial Adhesion (2.0 cr)
- OBIO 8371 - Mucosal Immunobiology (3.0 cr)

Oral Biology Seminar (8 Credits)
Take the following seminar eight times for a total of 8 credits:

- OBIO 8030 - Oral Biology Seminar (1.0 cr)

Statistics Course (3 Credits)
Take at least one course from the following list:

- STAT 5021 - Statistical Analysis (4.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)

Required Minor (12 Credits)
Students must complete a non-clinical minor in the basic sciences or public health. At least 12 minor field credits are required. Confer with the director of graduate studies for the minor field to determine additional requirements.

Thesis Credits (24 Credits)
Take at least 24 doctoral thesis credits.

- OBIO 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: Doctor of Dental Surgery DDS/Oral Biology PhD
Biochemistry, Molecular Biology and Biophysics M.S.

Twin Cities Campus

Contact Information:
Department of Biochemistry, Molecular Biology and Biophysics
6-155 Jackson Hall
321 Church St. SE
Minneapolis, MN 55455
612-625-6100
Email: bmbbgp@umn.edu
Website: http://cbs.umn.edu/academics/departments/bmbb/graduate-program/about-graduate-program

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The biochemistry, molecular biology and biophysics (BMBB) graduate program is an interdisciplinary program that is supported by the College of Biological Sciences (CBS) and the Medical School of the University of Minnesota. The program provides a broad research-based education involving faculty from BMBB, as well as many faculty members from several other departments in CBS, the Medical School, the College of Science and Engineering (CSE), the College of Food, Agricultural and Natural Resources Sciences (CFANS), and the College of Veterinary Medicine.

BMBB focuses on determining the molecular mechanisms that underlie basic biological functions using an integrated approach that encompasses biochemistry, chemistry, biophysics, genomics, molecular biology, proteomics, and structural biology. Special emphasis is placed on revealing how biological processes go awry in diseases including cancer, diabetes, heart disease, and AIDS. The program has four areas of emphasis: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, and chemical and structural biology. All students are expected to demonstrate a minimum level of competence in these areas, but will emphasize the area most related to their thesis project.

While graduate training in a BMBB laboratory involves first-year coursework and associated preliminary examinations, the focal point for graduate education is thesis research. Laboratory-based exploration coupled with journal clubs, seminars, scientific meetings and retreats, career counseling, and scientific ethics constitutes the major components of the program. Support for graduate education comes from a variety of sources but is augmented by several NIH and NSF-based training grants. Most graduate students from the University of Minnesota obtain full-time employment immediately after graduation or pursue advanced training in academic or corporate positions.

Students pursuing a degree in BMBB are only admitted to the PhD program (see note below) under the auspices of Molecular, Cellular and Structural Biology (MCSB), a first-year program administered by BMBB and the Molecular, Cellular, Developmental Biology and Genetics (MCDB&G) graduate programs. After the first year, students select either BMBB or MCDB&G to complete their degree.

Note: One cannot apply for admission to the master's degree in BMBB. Students are only admitted to the BMBB PhD program. Alternative, related master's degree programs that admit students are the master's of biological Sciences (MBS) (http://cce.umn.edu/master-of-biological-sciences) and the master's in microbial engineering (http://bti.umn.edu/MicE/).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The program can accommodate for a variety of educational backgrounds. However, applications from students with an undergraduate degree in the biological, chemical, or physical sciences are encouraged.

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Information current as of August 31, 2018
The program can accommodate for a variety of educational backgrounds. However, applications from students with an advanced degree in the biological, chemical, or physical sciences are encouraged.

Other requirements to be completed before admission:
Recommended academic preparation includes one year each of calculus, organic chemistry, and basic biology, including biochemistry and genetics. For students of demonstrated ability, background deficiencies can be made up during the first year of graduate study.

Successful applicants must have previous research experience in an academic or industrial setting, in addition to any course-related laboratory experiences. It is important to demonstrate familiarity, with an aptitude for basic science research prior to embarking on a graduate career in this program.

***Note: Students are admitted only to the PhD program for BMBB (see additional note below).

**Special Application Requirements:**
Additionally, applicants must submit three letters of recommendation from persons familiar with their academic and research capabilities. A statement of interests and goals, a complete set of transcripts, and official scores from the General Test of the GRE are required. The GRE Subject Test in biochemistry, cell and molecular biology, biology, or chemistry is strongly recommended, but not required.

The deadline to submit a completed application is December 1. Completed files are reviewed between January and February. Graduate studies begin fall semester only.

Note: One cannot apply for admission to the master's degree in BMBB. Students are only admitted to the BMBB PhD program. Alternative, related master's degree programs that admit students are the Master of Biological Sciences (MBS) (http://cce.umn.edu/master-of-biological-sciences) and the Master in Microbial Engineering (http://bti.umn.edu/MicE/).

Applicants must submit their test score(s) from the following:
- GRE

Key to test abbreviations (GRE).

For an online application or for more information about graduate education admissions, see the **General Information** section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

All students are expected to participate in seminars involving student reports on current literature and research.

**Biochemistry Core (1 Credit)**
- Take the following core course for 1 credit:
  - **BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)**

**Laboratory and Field Course (1 Credit)**
- Take **MCDG 8920** for at least 1 credit. In August of the first year, BMBB students must register for this hands-on, intensive lab course that takes place at the Itasca Biological Station and Laboratories, which provides first-year students with exposure to a range of modern methods and model systems.
  - **MCDG 8920 - Special Topics (1.0 - 4.0 cr)**

**Module Options (6 Credits)**
- Complete 6 credits in consultation with the director of graduate studies.
  - **BIOC 5535 - Introduction to Modern Structural Biology -- Diffraction (2.0 cr)**
  - **BIOC 5536 - Introduction to Modern Structural Biology - Nuclear Magnetic Resonance (2.0 cr)**
  - **BIOC 8005 - Biochemistry: Structure and Catalysis (2.0 cr)**
  - **BIOC 8006 - Biochemistry: Metabolism and Control (2.0 cr)**
  - **BIOC 8007 - Molecular Biology of DNA (2.0 cr)**
  - **BIOC 8008 - Molecular Biology of RNA (2.0 cr)**

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Information current as of August 31, 2018
**Electives (12 Credits)**

Take 12 credits of coursework in one of the four BMBB emphases: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, or chemical and structural biology. Courses from disciplines other than BMBB, in consultation with the advisor, may be used to build an emphasis.

Take 12 or more credit(s) from the following:

- **BIOC 5352** - Biotechnology and Bioengineering for Biochemists (3.0 cr)
- **BIOC 5361** - Microbial Genomics and Bioinformatics (3.0 cr)
- **MICA 8002** - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- **GCD 8151** - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- **MICA 8003** - Immunity and Immunopathology (4.0 cr)
- **MICA 8004** - Cellular and Cancer Biology (4.0 cr)
- **GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
- **GCD 8008** - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- **PUBH 6450** - Biostatistics I (4.0 cr)
- **SCB 8181** - Stem Cell Biology (3.0 cr)
- **STAT 5021** - Statistical Analysis (4.0 cr)
- **MICA 8010** - Microbial Pathogenesis (3.0 cr)
- **BIOC 5216** - Current Topics in Signal Transduction (3.0 cr)
- **BIOC 5527** - Introduction to Modern Structural Biology (4.0 cr)
- **BIOC 5528** - Spectroscopy and Kinetics (4.0 cr)
- **CHEN 8754** - Systems Analysis of Biological Processes (3.0 cr)
- **BIOC 5213** - Selected Topics in Molecular Biology (3.0 cr)
- **BIOC 5444** - Muscle (3.0 cr)
- **CHEM 8011** - Mechanisms of Chemical Reactions (4.0 cr)
- **CHEM 8021** - Computational Chemistry (4.0 cr)
- **CHEM 8411** - Introduction to Chemical Biology (4.0 cr)
- **CHEM 8412** - Chemical Biology of Enzymes (4.0 cr)
- **CHEM 8735** - Bioinorganic Chemistry (4.0 cr)
- **PHCL 5111** - Pharmacogenomics (3.0 cr)
- **PUBH 7445** - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- **MICA 8013** - Translational Cancer Research (2.0 cr)
- **GRAD 8101** - Teaching in Higher Education (3.0 cr)
- **GRAD 8200** - Teaching and Learning Topics in Higher Education (1.0 cr)
- **BIOC 5309** - Biocatalysis and Biodegradation (3.0 cr)
- **BIOC 5351** - Protein Engineering (3.0 cr)
- **CSCI 5461** - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
- **GRAD 5102** - Preparation for University Teaching for Nonnative English Speakers (2.0 cr)
- **BIOC 8184** - Graduate Seminar (1.0 cr)
- **BIOC 8084** - Research and Literature Reports (1.0 cr)
- **BIOL 8100** - Improvisation for Scientists (1.0 cr)
- **GCD 5005** - Computer Programming for Biology (3.0 cr)

**Thesis Credits**

Take at least 10 master's thesis credits.

**BIOC 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)
Biochemistry, Molecular Biology and Biophysics Minor

Link to a list of faculty for this program.

Contact Information:
Department of Biochemistry, Molecular Biology and Biophysics
6-155 Jackson Hall
321 Church St. SE
Minneapolis, MN 55455
612-625-6100
Email: bmbbgp@umn.edu
Website: http://cbs.umn.edu/academics/departments/bmbb/graduate-program/about-graduate-program

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The biochemistry, molecular biology and biophysics (BMBB) program is an interdisciplinary program that is supported by the College of Biological Sciences (CBS) and the Medical School of the University of Minnesota. The program provides a broad research-based education involving faculty from BMBB as well as many faculty members from several other departments in CBS, the Medical School, the College of Science and Engineering (CSE), the College of Food, Agricultural and Natural Resources Sciences (CFANS), and the College of Veterinary Medicine.

BMBB focuses on determining the molecular mechanisms that underlie basic biological functions using an integrated approach that encompasses biochemistry, chemistry, biophysics, genomics, molecular biology, proteomics, and structural biology. Special emphasis is placed on revealing how biological processes go awry in diseases including cancer, diabetes, heart disease, and AIDS. The program has four areas of emphasis: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, and chemical and structural biology. All students are expected to demonstrate a minimum level of competence in these areas, but will emphasize the area most related to their thesis project.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses (6 Credits)
Select at least six credits of BMBB coursework, chosen in consultation with the BMBB director of graduate studies. In extenuating cases, an alternative course may be substituted with the approval of the director of graduate studies.
Doctoral

Module Options (6 Credits)
Take at least 6 credits from the following, in consultation with the BMBB director of graduate studies.
- BIOC 5535 - Introduction to Modern Structural Biology - Diffraction (2.0 cr)
- BIOC 5536 - Introduction to Modern Structural Biology - Nuclear Magnetic Resonance (2.0 cr)
- BIOC 8005 - Biochemistry: Structure and Catalysis (2.0 cr)
- BIOC 8006 - Biochemistry: Metabolism and Control (2.0 cr)
- BIOC 8007 - Molecular Biology of DNA (2.0 cr)
- BIOC 8008 - Molecular Biology of RNA (2.0 cr)

Biochemistry Electives (6 Credits)
Take at least six credits, chosen in consultation with the BMBB director of graduate studies, to complete the 12-credit requirement. In extenuating cases, an alternative course may be substituted with the approval of the director of graduate studies.
- BIOC 5xxx
- BIOC 6xxx
- BIOC 7xxx
- BIOC 8xxx
- GCD 5036 - Molecular Cell Biology (3.0 cr)
Twin Cities Campus
Biochemistry, Molecular Biology and Biophysics Ph.D.
Biochemistry, Molecular Biology, & Biophysics TCBS
Graduate School

Link to a list of faculty for this program.

Contact Information:
Department of Biochemistry, Molecular Biology and Biophysics
6-155 Jackson Hall
321 Church St. SE
Minneapolis, MN 55455
612-625-6100
Email: bmbbgp@umn.edu
Website: http://cbs.umn.edu/academics/departments/bmbb/graduate-program/about-graduate-program

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 48
• This program requires summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Biochemistry, Molecular Biology and Biophysics (BMBB) graduate program is an interdisciplinary program that is supported by the College of Biological Sciences (CBS) and the Medical School of the University of Minnesota. The program provides a broad research-based education involving faculty from BMBB as well as many faculty members from several other departments in CBS, the Medical School, the College of Science and Engineering (CSE), the College of Food, Agricultural and Natural Resources Sciences (CFANS), and the College of Veterinary Medicine.

BMBB focuses on determining the molecular mechanisms that underlie basic biological functions using an integrated approach that encompasses biochemistry, chemistry, biophysics, genomics, molecular biology, proteomics, and structural biology. Special emphasis is placed on revealing how biological processes go awry in diseases including cancer, diabetes, heart disease, and AIDS. The program has four areas of emphasis: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, and chemical and structural biology. All students are expected to demonstrate a minimum level of competence in these areas but will emphasize the area most related to their thesis project.

While graduate training in a BMBB laboratory involves first-year coursework and associated preliminary examinations, the focal point for graduate education is thesis research. Laboratory-based exploration coupled with journal clubs, seminars, scientific meetings and retreats, career counseling and scientific ethics constitutes the major components of the program. Support for graduate education comes from a variety of sources but is augmented by several NIH and NSF-based training grants. PhD graduates from the University of Minnesota obtain full-time employment immediately after graduation or pursue advanced training in academic or corporate postdoctoral positions.

Students pursuing the PhD are admitted to BMBB under the auspices of Molecular, Cellular and Structural Biology (MCSB), a first year program administered by BMBB and the Molecular, Cellular, Developmental Biology and Genetics (MCDB&G) graduate programs. After the first year, students select either BMBB or MCDB&G to complete their degree.

Related PhD and MS programs in BMBB:

As a part of the BMBB program, graduate studies leading to a PhD degree may be pursued on the Duluth campus. A PhD in BMBB may also be obtained through the Combined MD-PhD program. Please visit the program website for more information (http://www.med.umn.edu/mdphd/index.htm).

Note: One cannot apply for admission to the master's degree in BMBB. Students are only admitted to the BMBB PhD program. Alternative, related master's degree programs that admit students are the master's of biological sciences (MBS) (http://ce.umn.edu/master-of-biological-sciences) and the master's in microbial engineering (http://bti.umn.edu/MicE/).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
Prerequisites for Admission
The program can accommodate for a variety of educational backgrounds. However, applications from students with an undergraduate
degree in the biological, chemical, or physical sciences are encouraged.

The program can accommodate for a variety of educational backgrounds. However, applications from students with an advanced
degree in the biological, chemical, or physical sciences are encouraged.

Other requirements to be completed before admission:
Recommended academic preparation includes one year each of calculus, organic chemistry, and basic biology, including biochemistry
and genetics. For students of demonstrated ability, background deficiencies can be made up during the first year of graduate study.

Successful applicants must have previous research experience in an academic or industrial setting in addition to any course-related
laboratory experiences. It is important to demonstrate an aptitude for basic science research prior to embarking on a graduate career in
this program.

Special Application Requirements:
Additionally, applicants must submit three letters of recommendation from persons familiar with their academic and research
capabilities. A statement of interests and goals, and a complete set of transcripts are required.

The deadline to submit a completed application is December 1. Completed files are reviewed between January and February. Graduate
studies begin fall semester only.

Related Ph.D. and M.S. Programs in BMBB:
As a part of the BMBB program, graduate studies leading to a PhD degree may be pursued on the Duluth Campus. A PhD in BMBB
may also be obtained through the Combined MD-PhD Program. Please visit the program website for more information
(http://www.med.umn.edu/mdphd/index.htm).

Note: One cannot apply for admission to the master's degree in BMBB. Students are only admitted to the BMBB PhD program.
Alternative, related master's degree programs that admit students are the Master of Biological Sciences (MBS)
(http://cse.umn.edu/master-of-biological-sciences) and the Master in Microbial Engineering (http://bti.umn.edu/MicE/).

For an online application or for more information about graduate education admissions, see the General Information section of the
catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Requirements include core coursework, thesis credits, and laboratory experiences, as well as coursework in one of the four BMBB
emphases listed below.

Additional requirements for the PhD degree include seminar presentations, examinations, and teaching assignments. BIOC 8084 is a
weekly student seminar on current literature and research, and students must register for 1 credit of BIOC 8084 each term until they
have reached advanced doctoral status. BIOC 8184 is a departmental seminar involving prominent national and international scientists.
Students must attend at least 50% of weekly meetings for BIOC 8084 and BIOC 8184. Students are also required to complete two
semesters of teaching, typically between years 2 to 4.

Biochemistry Core Coursework (3 Credits)
Complete the following core courses. MCDBG 8920 must be taken for two credits.

BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
MCDG 8920 - Special Topics (1.0 - 4.0 cr)

Complete six credits, in consultation with the director of graduate studies, from the following list:
BIOC 5535 - Introduction to Modern Structural Biology -- Diffraction (2.0 cr)
BIOC 5536 - Introduction to Modern Structural Biology - Nuclear Magnetic Resonance (2.0 cr)
BIOC 8005 - Biochemistry: Structure and Catalysis (2.0 cr)
BIOC 8006 - Biochemistry: Metabolism and Control (2.0 cr)
BIOC 8007 - Molecular Biology of DNA (2.0 cr)
BIOC 8008 - Molecular Biology of RNA (2.0 cr)

Emphasis Electives (15 Credits)
Complete 15 credits of coursework in one of the four BMBB emphases: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, or chemical and structural biology. Courses from disciplines other than BMBB may be used to build an emphasis in consultation with the advisor.

Take 15 or more credit(s) from the following:
- BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
- BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
- MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (3.0 cr)
- MICA 8003 - Immunity and Immunopathology (4.0 cr)
- MICA 8004 - Cellular and Cancer Biology (4.0 cr)
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- SCB 8181 - Stem Cell Biology (3.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- MICA 8010 - Microbial Pathogenesis (3.0 cr)
- BIOC 5216 - Current Topics in Signal Transduction (3.0 cr)
- BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
- BIOC 5526 - Spectroscopy and Kinetics (4.0 cr)
- CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
- BIOC 5213 - Selected Topics in Molecular Biology (3.0 cr)
- BIOC 5444 - Muscle (3.0 cr)
- CHEM 8011 - Mechanisms of Chemical Reactions (4.0 cr)
- CHEM 8021 - Computational Chemistry (4.0 cr)
- CHEM 8411 - Introduction to Chemical Biology (4.0 cr)
- CHEM 8412 - Chemical Biology of Enzymes (4.0 cr)
- CHEM 8735 - Bioinorganic Chemistry (4.0 cr)
- PHCL 5111 - Pharmacogenomics (3.0 cr)
- PUBH 67445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- MICA 8013 - Translational Cancer Research (2.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
- BIOC 5309 - Biocatalysis and Biodegradation (3.0 cr)
- BIOC 5351 - Protein Engineering (3.0 cr)
- CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
- GRAD 5102 - Preparation for University Teaching for Nonnative English Speakers (2.0 cr)
- BIOC 8084 - Research and Literature Reports (1.0 cr)
- BIOC 8184 - Graduate Seminar (1.0 cr)
- BIOL 8100 - Improvisation for Scientists (1.0 cr)
- GCD 5005 - Computer Programming for Biology (3.0 cr)

Thesis Credits
Take 24 doctoral thesis credits.
BIOC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: MD/PhD-Biochemistry, Molecular Biology and Biophysics Student may take a total of 18 credits in common among the academic programs.
Twin Cities Campus
Bioethics M.A.
Bioethics, Center for
Graduate School

Contact Information:
Center for Bioethics, University of Minnesota, Suite N504 Boynton, 410 Church Street SE, Minneapolis, MN 55455 (612-624-9440; fax: 612-624-9108)
Email: bthxed@umn.edu
Website: http://www.bioethics.umn.edu/education/master-arts-bioethics

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Admissions for the Bioethics MA Program are currently on hold. Please contact bthxed@umn.edu for updates.

The Center for Bioethics offers two kinds of MA degrees: Plan A and Plan B with a major in bioethics. The curriculum for both Plan A and Plan B degrees includes a set of required core courses, bioethics electives, and a requirement for coursework in fields related to bioethics. The Plan A culminates in a substantial, 10-credit master's thesis. In lieu of a thesis, the Plan B culminates in a 4-credit practicum, a 3-credit capstone project and final exam. Electives comprise the additional 3 credits in the Plan B degree.

Graduates of the MA in bioethics greatly enhance their professional opportunities in the field when they combine their bioethics degree with a terminal graduate or professional degree in another field. Examples of degree combinations can include an MA degree in bioethics with a JD, PhD, MD, nursing, or others. This model of pairing the MA in bioethics with another degree prompts students to acquire a firm disciplinary grounding as well as interdisciplinary bioethics expertise, a practice which best prepares students for the interdisciplinary career options related to bioethics. Some examples of careers include work in the fields of genetics, social work, public health, veterinary science, religious studies, psychology, biology and philosophy.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree is required for admission.

Special Application Requirements:
Transcripts of all postsecondary academic work, a personal statement, a writing sample (preferably on a topic in bioethics), a description of research or relevant work experience, a C.V. or résumé, and at least three letters of reference are required. Applicants may also submit a statement on "Extenuating Circumstances" and "Diversity." See program website for more details.

Students are admitted to the Bioethics M.A. program for fall semester only. Applications are accepted as early as the first day of fall semester prior to the proposed start of the student's M.A. program. Our primary deadline is March 1 with an extended deadline of May 1 if space in our program remains available.

Students are encouraged to link their degree in bioethics to a degree in a related field (either before entering the bioethics M.A. program or at the same time). Given the fundamentally interdisciplinary nature of bioethics, prospective students are advised against viewing the bioethics M.A. as a stand-alone degree that prepares them for career placement. This model prompts students to acquire a firm disciplinary grounding as well as interdisciplinary bioethics expertise—a practice that best prepares students for bioethics-related career placement. Thus, the admissions process will give preference to students who have already earned or are in the process of earning an advanced degree in a related field, although this will not strictly be required for admission.
Because our program recommends pairing the Bioethics degree with another graduate or professional degree, we recognize applicants may need to answer to another program prior to our deadline. If this is the case, please email bthxed@umn.edu with your concern.

Applicants must submit their test score(s) from the following:
- GRE
- MCAT
- LSAT

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600

Key to test abbreviations (GRE, MCAT, LSAT, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 21 major credits and 9 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** Students will design and undertake a project and its corollary product relevant to their interests, experience, and intended use of the MA in bioethics. The experiential component is designed to be flexible, allowing the student to undertake an internship, shadow physicians or other health care personnel, or use their own work experience when relevant to cater a project to their intended goals. Rigor is maintained through committee oversight, nature of the experience, and number of hours undertaken.

Products are also designed to be flexible while retaining rigor, innovation, and written analysis. Original research is not required (as with a thesis), but a thorough literature review and accompanying overview or synthesis of the arena of which the project is a part is necessary, as is a thorough explanation of the final product. Full committee approval of the final product before the project is undertaken is required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Joint- or Dual-degree Coursework:** Joint Degree Program in Law, Health, and the Life Sciences

Student may take a total of 11 credits in common among the academic programs.
Twin Cities Campus
Bioethics Minor
Bioethics, Center for
Graduate School

Link to a list of faculty for this program.

Contact Information:
Center for Bioethics, University of Minnesota, N504 Boynton, 410 Church Street SE, Minneapolis, MN 55455 (612-624-9440; fax: 612-624-9108)
Email: bthxed@umn.edu
Website: http://www.bioethics.umn.edu/education/graduate-minor-bioethics

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 14
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor is administered by the Center for Bioethics and is designed for University of Minnesota students interested in deepening their knowledge of the ethical issues surrounding health and the life sciences. Explore your interests in bioethics while also earning a degree in your home discipline.

The minor is open to students in many of the Universitys masters or doctoral degree programs. Some professional degree-seeking students also may elect a minor, including MEd, MPH, MHA, MN, DNP, MOT, MPSE, MDH, MDT, and MPS students. To be eligible, the degree program must offer the option to pursue a minor; please consult with your director of graduate studies in your major field to determine if this option is open for you. At this time, students in first-professional programs (JD, MD, PharmD, DVM, DDS, and LLM) are not eligible for minors.

Enrollment is contingent upon approval by the director of graduate studies in bioethics. Students work with the director of graduate studies to tailor their minor program to their individual needs and interests.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
For an online application or for more information about graduate education admissions, see the General Information section of this website.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Courses must be chosen in consultation with the bioethics director of graduate studies.

Philosophy students are expected to have successfully completed at least one course in ethical theory at the 5xxx or 8xxx level prior to undertaking coursework in the minor.

Students must complete the minor with a 3.00 GPA.

Bioethics Minor Required Courses
Complete either BTHX 5010 or BTHX 5325, not both.

**BTHX 5010 - Bioethics Proseminar (2.0 cr)**

or **BTHX 5325 - Biomedical Ethics (3.0 cr)**

Select one course.

- **BTHX 5300 - Foundations of Bioethics (3.0 cr)**
- **PHIL 5320 - Intensive Study of a Historical Moral Theory (3.0 cr)**
- **PHIL 8310 - Seminar: Moral Philosophy (3.0 cr)**

**Electives**

Doctoral students must also take additional ethics courses to total 14 credits of required plus elective courses; at least 3 credits of the electives must be BTHX courses. Masters students must also take additional credits of ethics courses for a total of 8 credits of required plus elective courses. Any of the following BTHX courses may be taken as electives. The student may take courses offered through other designators only if they have the permission of the bioethics DGS.

- **BTHX 5000 - Topics in Bioethics (1.0 - 4.0 cr)**
- **BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)**
- **BTHX 5120 - Dying in Contemporary Medical Culture (2.0 cr)**
- **BTHX 5210 - Ethics of Human Subjects Research (3.0 cr)**
- **BTHX 5400 - Intro Ethics in Hlth Policy (3.0 cr)**
- **BTHX 5411 - Health Law and Policy (3.0 cr)**
- **BTHX 5433 - Law, Biomedicine, and Bioethics (3.0 cr)**
- **BTHX 5510 - Gender and the Politics of Health (3.0 cr)**
- **BTHX 5520 - Social Justice and Bioethics (3.0 cr)**
- **BTHX 5540 - Bioethics, Psychiatry & Psychology (3.0 cr)**
- **BTHX 5610 - Research & Publication Seminar (1.0 cr)**
- **BTHX 5620 - Social Context of Health and Illness (3.0 cr)**
- **BTHX 5630 - Bioethics Colloquium (1.0 cr)**
- **BTHX 5650 - Disability Ethics (3.0 cr)**
- **BTHX 5900 - Independent Study in Bioethics (1.0 - 4.0 cr)**
- **BTHX 8000 - Advanced Topics in Bioethics (1.0 - 4.0 cr)**
- **BTHX 8120 - Dying in Contemporary Medical Culture (2.0 cr)**
- **BTHX 8500 - Practicum in Bioethics (1.0 - 4.0 cr)**
- **BTHX 8510 - Gender and the Politics of Health (3.0 cr)**
- **BTHX 8520 - Social Justice and Bioethics (3.0 cr)**
- **BTHX 8610 - Medical Consumerism (3.0 cr)**

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Masters**

**Doctoral**
Twin Cities Campus

Biomedical Informatics and Computational Biology M.S.
R Bioscience/Biotechnology

Graduate School

Link to a list of faculty for this program.

Contact Information:
Biomedical Informatics and Computational Biology, 300 University Square, 111 South Broadway, Rochester, MN 55904 (507-258-8006; fax: 507-258-8066)
Email: biobgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- The Biomedical Informatics and Computational Biology Program is an all-University program delivered on the Rochester and Twin Cities campuses. The University of Minnesota Twin Cities is the degree-granting authority for delivery of the Biomedical Informatics and Computational Biology Program in Rochester.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in biomedical informatics and computational biology (BICB) offers course work in five core areas: 1) biochemistry, molecular and cell biology; 2) database, data mining, and computing; 3) informatics, analysis, and machine learning; 4) mathematics, biostatistics, and statistics; and 5) computational and systems biology. In addition, students select courses from a diverse set of fields, including chemistry, chemical engineering, physics, biophysics, structural biology, imaging, signal processing, and clinical and translational sciences. The curriculum is individualized to fit the student's interest and research direction. Prior coursework may be used to fill the requirements if appropriate. Students may pursue a minor in a different program.

All students receive training in ethics, leadership, and management, including legal and intellectual property issues and entrepreneurship. Those interested in academic careers have the opportunity to participate in development programs that focus on aspects of teaching and learning.

The M.S. is offered under two plans: Plan A (with thesis), and Plan B (with project). Plan A is considered suitable for students planning to pursue careers that require a limited research experience or those planning to continue their education in a Ph.D. program. It is also suitable for students with full-time employment whose thesis can be related to their work assignments. Plan B is suitable for students planning to work in settings where technical knowledge is more germane than research experience.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
The program expects incoming graduate students to have a strong background in the quantitative sciences and varied backgrounds in the life/health sciences. The expected competencies of incoming students may be demonstrated by coursework completed at the undergraduate level or by informal competency examinations.

In addition to completing the online application form, applicants must submit a personal statement, which describes past experiences and career aspirations, and reasons for pursuing graduate studies in biomedical informatics and computational biology. Applicants should also indicate the names of the BICB graduate faculty whose interests overlap their own. Although there is no page limit for the personal statement, 2-3 pages are recommended.

Special Application Requirements:
Applications for the M.S. program are accepted throughout the year for either fall or spring.

GRE scores may be waived for students with significant work or academic experience.
Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 14 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 24 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** Plan B students complete a project under the direction of a faculty member and present the work to their faculty committee in an oral exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The M.S. is offered under two plans: Plan A (with thesis), and Plan B (with project).

Plan A is considered suitable for students planning to pursue careers that require a limited research experience or those planning to continue their education in a Ph.D. program. Plan A students defend their thesis in public and must pass an oral examination. Plan A is suitable for students with full-time employment whose thesis can be related to their work assignments.

Plan B is suitable for students planning to work in settings where technical knowledge is more germane than research experience.

The requirements include 20 course credits for Plan A and 30 course credits for Plan B.

Up to 6 credits outside the major may be taken but are not required.

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Rochester
Biomedical Informatics and Computational Biology Minor

Graduate School

Contact Information:
Biomedical Informatics and Computational Biology, 300 University Square, 111 South Broadway, Rochester, MN 55904 (507-258-8006; fax: 507-258-8066)
Email: bibbgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

Program Type: Graduate minor related to major
Requirements for this program are current for Fall 2018
Length of program in credits (Masters): 9
Length of program in credits (Doctorate): 12
This program does not require summer semesters for timely completion.
The Biomedical Informatics and Computational Biology Program is an all-University program delivered on the Rochester and Twin Cities campuses. The University of Minnesota Twin Cities is the degree-granting authority for delivery of the Biomedical Informatics and Computational Biology Program in Rochester.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in biomedical informatics and computational biology (BICB) offers course work in five core areas: 1) biochemistry, molecular and cell biology; 2) database, data mining, and computing; 3) informatics, analysis, and machine learning; 4) mathematics, biostatistics, and statistics; and 5) computational and systems biology. In addition, students select courses from a diverse set of fields, including chemistry, chemical engineering, physics, biophysics, structural biology, imaging, signal processing, and clinical and translational sciences. The curriculum is individualized to fit the student's interest and research direction. Prior coursework may be used to fill the requirements if appropriate. Students may pursue a minor in a different program.

All students receive training in ethics, leadership, and management, including legal and intellectual property issues and entrepreneurship. Students interested in academic careers have the opportunity to participate in development programs that focus on aspects of teaching and learning.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Minor programs are arranged on an individual basis.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Master's Minor: A minimum of 9 credits must be completed in Core Area 1 and one of Core Areas 2-5.

Doctoral Minor: A minimum of 12 credits must be completed in Core Area 1 and two of Core Areas 2-5.

Graduate students choose from a list of courses that satisfy requirements in core areas and electives.

There are five core areas:
1. Biochemistry, molecular and cell biology
2. Database, data mining, and computing
3. Informatics, analysis, and machine learning
4. Mathematics, biostatistics, and statistics
5. Computational and systems biology

Students choose elective courses from the following eight areas:
1. Biochemistry, molecular and cell biology
2. Informatics, database, data mining, and computing
3. Mathematics, biostatistics, and statistics
4. Chemistry, chemical engineering, and physics
5. Biophysics and structural biology
6. Imaging, information theory, and signal processing
7. Computational chemistry, medicinal chemistry, and drug design
8. Clinical and translational sciences

Core/elective courses are listed on the courses page of the BICB Student Handbook (http://r.umn.edu/academics-research/bicb/graduate-program/student-handbook/courses). The adviser(s), together with the DGS, will ensure that the student selects appropriate courses.
Twin Cities Campus
Biomedical Informatics and Computational Biology Ph.D.
Department of Biomedical Informatics and Computational Biology
Graduate School
Link to a list of faculty for this program.

Contact Information:
Biomedical Informatics and Computational Biology, 300 University Square, 111 South Broadway, Rochester, MN 55904 (507-258-8006; fax: 507-258-8066)
Email: biecgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program requires summer semesters for timely completion.
- The Biomedical Informatics and Computational Biology Program is an all-University program delivered on the Rochester and Twin Cities campuses. The University of Minnesota Twin Cities is the degree-granting authority for delivery of the Biomedical Informatics and Computational Biology Program in Rochester.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in biomedical informatics and computational biology (BICB) offers course work in five core areas: 1) biochemistry, molecular and cell biology; 2) database, data mining, and computing; 3) informatics, analysis, and machine learning; 4) mathematics, biostatistics, and statistics; and 5) computational and systems biology. In addition, students select courses from a diverse set of fields, including chemistry, chemical engineering, physics, biophysics, structural biology, imaging, signal processing, and clinical and translational sciences. The curriculum is individualized to fit the student's interest and research direction. Prior coursework may be used to fill the requirements if appropriate. Students may pursue a minor in a different program.

All students receive training in ethics, leadership, and management, including legal and intellectual property issues and entrepreneurship. The Ph.D. program includes an industrial or clinical internship. Students interested in academic careers have the opportunity to participate in development programs that focus on aspects of teaching and learning.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
The program expects incoming graduate students to have a strong background in the quantitative sciences and varied backgrounds in the life/health sciences. The expected competencies of incoming students may be demonstrated by coursework completed at the undergraduate level or by informal competency examinations.

In addition to completing the online application form, applicants must submit a personal statement, which describes past experiences and career aspirations, and reasons for pursuing graduate studies in biomedical informatics and computational biology. Prospective students should also indicate the names of the BICB graduate faculty whose interests overlap with their own. The department strongly encourages applicants to contact these faculty members before applying. Although there is no page limit for the personal statement, 2-3 pages are recommended.

Special Application Requirements:
Three letters of recommendation and scores from the General Test of the GRE are required. Applicants are admitted only for the fall semester.

GRE scores may be waived for students with significant work or academic experience.

Applicants must submit their test score(s) from the following:
- GRE
International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

30 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Ph.D. students take preliminary written exams at the end of the second year of study, which focuses on the development of a research proposal. An oral preliminary exam focuses on the plan for thesis research and the student's coursework and is taken by the fall of the third year of full-time registration or its equivalent. At least 24 course credits are required to gain competency in both biology and quantitative areas related to biomedical informatics and computational biology. An internship is required, which may be waived for students with equivalent experience. Additionally, 24 thesis credits are required. Ph.D. students defend their thesis in public and must pass an oral examination.

An internship is required, which may be waived for students with equivalent experience.

Up to 9 credits outside the major may be taken but are not required.

Program Sub-plans

A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.
Twin Cities Campus
Biophysical Sciences and Medical Physics M.S.

Graduate School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota School of Medicine, Department of Radiology, Box 292 UMHC, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-0131; fax: 612-626-1951)
Email: riten001@tc.umn.edu
Website: http://www.med.umn.edu/radiology/research/physics/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This interdisciplinary program includes faculty members who have primary appointments in fields such as radiobiology, physics, engineering, computer science, physiology, dentistry, genetics, and biochemistry. Students concentrate in research areas such as molecular biophysics, medical imaging, magnetic resonance imaging and spectroscopy, radiobiology, radiation therapy physics, and mathematical biophysics and computation. A limited number of students prepare for employment as hospital-based medical physicists through a program that includes opportunities for coursework, laboratory work, and directed study to provide experience in areas such as purchase specification, acceptance testing, quality assurance, and radiation safety.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements:
Three letters of recommendation and scores from the General Test of the GRE are required. Applicants are considered for admission in both semesters.

Applicants must submit their test score(s) from the following:
- GRE

Key to test abbreviations (GRE).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

The M.S. is offered under two plans: Plan A, (with thesis), and Plan B, (with project). Plan A is considered suitable for students with full-time employment whose thesis can be related to their work assignments. Plan B is more suitable for students planning to work in government or hospital settings where technical knowledge is more germane than research experience. Plan B students complete a project under the direction of a faculty member and present the work to their faculty committee in an oral exam. A total of 30 credits is required, including 14 in the major and 6 in a related field or minor.
Twin Cities Campus
Biophysical Sciences and Medical Physics Minor
Radiology
Graduate School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota School of Medicine, Department of Radiology, Box 292 UMHC, 420 Delaware Street S.E., Minneapolis, Minnesota 55455 (612-626-0131; fax: 612-626-1951)
Email: riten001@tc.umn.edu
Website: http://www.med.umn.edu/radiology/research/physics/home.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This interdisciplinary program includes faculty members who have primary appointments in fields such as radiobiology, physics, engineering, computer science, physiology, dentistry, genetics, and biochemistry. Students concentrate in research areas such as molecular biophysics, medical imaging, magnetic resonance imaging and spectroscopy, radiobiology, radiation therapy physics, and mathematical biophysics and computation. A limited number of students prepare for employment as hospital-based medical physicists through a program that includes opportunities for coursework, laboratory work, and directed study to provide experience in areas such as purchase specification, acceptance testing, quality assurance, and radiation safety.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Programs are arranged on an individual basis and must consist of courses that represent a subfield of the discipline, e.g., radiobiology or medical physics.
Twin Cities Campus
Biophysical Sciences and Medical Physics Ph.D.
Radiology
Graduate School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota School of Medicine, Department of Radiology, Box 292 UMHC, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-0131; fax: 612-626-1951)
Email: riten001@tc.umn.edu
Website: http://www.med.umn.edu/radiology/research/physics/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This interdisciplinary program includes faculty members who have primary appointments in fields such as radiobiology, physics, engineering, computer science, physiology, dentistry, genetics, and biochemistry. Students concentrate in research areas such as molecular biophysics, medical imaging, magnetic resonance imaging and spectroscopy, radiobiology, radiation therapy physics, and mathematical biophysics and computation. A limited number of students prepare for employment as hospital-based medical physicists through a program that includes opportunities for coursework, laboratory work, and directed study to provide experience in areas such as purchase specification, acceptance testing, quality assurance, and radiation safety.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements:
Three letters of recommendation and scores from the General Test of the GRE are required. Applicants are considered for admission in both semesters.

Applicants must submit their test score(s) from the following:
- GRE

Key to test abbreviations (GRE).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
12 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
Ph.D. students take preliminary written exams at the end of the first year of study or as soon as possible after completing the core course sequence in topics in physics for medicine and biology. An oral preliminary exam focuses on the plan for thesis research and the student's grasp of related information and is taken by the fall of the third year of full-time registration or its equivalent. At least 12 credits are required in a minor or supporting program. Additionally, 24 thesis credits are required.
Clinical Ethics Postbaccalaureate Certificate
Bioethics, Center for Graduate School

Contact Information:
Center for Bioethics
N504 Boynton
410 Church St SE
Minneapolis, MN 55455
Email: bthxed@umn.edu
Website: http://www.bioethics.umn.edu/education/clinical-ethics-certificate-program

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 13
- This program does not require summer semesters for timely completion.
- Degree: Clinical Ethics PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Admissions to the clinical ethics post-baccalaureate certificate are currently on hold. Please contact bthxed@umn.edu for updates.

The clinical ethics post-baccalaureate certificate will offer a graduate level educational opportunity for practicing professionals including physicians, nurses, social workers, chaplains, and others. Students will engage in classwork and practical experience geared toward mastery of the knowledge and skills needed for work in clinical ethics, including participation on ethics committees, clinical ethics consultation services, institutional and regional clinical ethics policy bodies such as organ allocation committees or brain death committees, support for institutional staff development programs in their professional fields, or simply being better prepared to meet the ethical challenges that arise in their work. The curriculum will fulfill the health care ethics core competencies promulgated by the American Society for Bioethics and Humanities.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A graduate or professional degree in a field related to clinical ethics is required for admission.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Courses
NB: BTHX 8500 will be taken twice, 2 cr each time, once fall once spring.

- **BTHX 5100** - Introduction to Clinical Ethics (3.0 cr)
- **BTHX 5110** Ethical Issues in Pediatrics (2.0 cr)
- **BTHX 5120** Dying in Contemporary Medical Culture (2.0 cr)
- **BTHX 8100** Advanced Theory and Practice of Clinical Ethics (2.0 cr)
- **BTHX 8500** - Practicum in Bioethics (1.0 - 4.0 cr)
Twin Cities Campus
Health Care Design and Innovation Postbaccalaureate Certificate
School of Nursing
Graduate School

Link to a list of faculty for this program.

Contact Information:
Densford International Center for Nursing Leadership, University of Minnesota School of Nursing, 4-185 Weaver-Densford Hall, 308 Harvard St SE, Minneapolis, MN 55455 (612-625-1187; fax: 612-624-0908)
Email: nursecerts@umn.edu
Website: http://www.hcdi.umn.edu

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2018
• Length of program in credits: 12
• This program does not require summer semesters for timely completion.
• Degree: Health Care Design & Innovation PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postbaccalaureate certificate in health care design and innovation prepares health care and design practitioners to create optimal healing environments. Students learn how to apply design thinking in creating new processes, systems, and care environments. The certificate emphasizes principles that promote healing and safe patient care while maximizing clinical and financial outcomes.

Program Delivery
This program is available:
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Admittance to the certificate program requires a baccalaureate degree from an accredited institution in a health-related field, interior design, architecture, or other design-related area.

Other requirements to be completed before admission:
Applicants are required to submit transcripts from all institutions where postsecondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, one essay, a current curriculum vitae/resume, and English language proficiency scores (if applicable). This certificate has two application deadlines: November 1 for spring admission and July 1 for fall admission.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.
Required Courses
CSPH 5711 - Optimal Healing Environments (3.0 cr)
NURS 7610 - System Leadership and Innovation (3.0 cr)
HUMF 5874 - Service Design: Designing complex systems to improve service delivery (4.0 cr)
NURS 6707 - Health Care Design and Innovation Practicum (2.0 cr)
Twin Cities Campus
Health Informatics M.H.I.
Health Informatics, AHC Inst
Graduate School

Link to a list of faculty for this program.

Contact Information:
Physical Address: 8-100 PWB, 516 Delaware St. SE, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
612-626-3348
Email: ihi@umn.edu
Website: http://healthinformatics.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Health Informatics

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health informatics (also known as biomedical informatics) is an interdisciplinary field of scholarship that applies computer, information, statistical, management, and related scientific methods to enable biomedical discovery and support the effective and efficient use and analysis of data, management of information, and application of knowledge across the spectrum from basic science to clinical care. The ultimate goal of the field is to improve the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics and biostatistics and take electives in technical and health science areas.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants are expected to have at least a bachelor of science or equivalent degree from a regionally accredited institution of higher education or an international equivalent.

Required prerequisites
Health or Biological Sciences
Applicants must have taken 6 semester-credits or 9 quarter-credits at the undergraduate or graduate level in medical, life, or biological sciences from a regionally accredited institution of higher learning or equivalent. This broadly defined requirement includes most courses with a health or biology emphasis, including biostatistics, health services research, and public health, as well as more traditional biology or life science courses.

Programming Language
Documented work or educational experience working with a programming language such as C, C++, Java, Python, R, Visual Basic, etc.
- or HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
- or Department Consent

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 151
  - General Test - Quantitative Reasoning: 153
  - General Test - Analytical Writing: 4
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language (TOEFL).

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 31 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** The capstone project is a 3- or 4-credit course in which students apply their newly acquired knowledge and skills to a project involving a practical problem in health informatics. Students learn how to design these projects properly through review of past exemplary projects. With the help of their advisors and the capstone course director, students design and carry out their own projects, which can take a variety of forms, including developing design and evaluation specifications for software to address a specific healthcare need; working on, observing, analyzing, and reporting the actions of a team involved in implementing a new information system; or observing and measuring the impact of such a system in a healthcare setting. Students submit a written project report, graded by the capstone project instructor and the student’s advisor, in lieu of a final examination.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**HINF Courses**

Take HINF 5436 AHC Informatics Grand Rounds twice for a total of 2 credits.

- HINF 5430 - Foundations of Health Informatics I (3.0 cr)
- HINF 5431 - Foundations of Health Informatics II (3.0 cr)
- HINF 5436 - AHC Informatics Grand Rounds (1.0 cr)
- HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
- HINF 5520 - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)
- HINF 5531 - Health Data Analytics and Data Science (3.0 cr)

**Other Required Courses**

- NURS 5116 - Consumer Health Informatics (1.0 cr)
- NURS 7108 - Population Health Informatics (2.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)

**Final Project**

- MHI students take HINF 5499 (3 credits).
- MD/MHI students take LAMP 7195 (4 credits).
- HINF 5499 - Capstone Project for the Masters of Health Informatics (3.0 cr)
- or LAMP 7195 - Medical Informatics (4.0 cr)

**Electives**

Take electives as needed to meet the 31-credit minimum. If labs or practicums are selected as electives, they must be taken concurrently with the associated course (i.e. take HINF 8430 with HINF 5430). Electives must be approved by the advisor.

- BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
- BIOC 8007 - Molecular Biology of DNA (2.0 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOC 8008</td>
<td>Molecular Biology of RNA</td>
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<td>CGSC 8410</td>
<td>Perspectives in Learning, Perception, and Cognition</td>
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<td>CSCI 5106</td>
<td>Programming Languages</td>
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<td>CSCI 5115</td>
<td>User Interface Design, Implementation and Evaluation</td>
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<td>CSCI 5271</td>
<td>Introduction to Computer Security</td>
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<td>CSCI 5421</td>
<td>Advanced Algorithms and Data Structures</td>
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<td>CSCI 5461</td>
<td>Functional Genomics, Systems Biology, and Bioinformatics</td>
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<td>CSCI 5481</td>
<td>Computational Techniques for Genomics</td>
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<td>Artificial Intelligence I</td>
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<td>CSCI 5608</td>
<td>Fundamentals of Computer Graphics II</td>
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<td>CSCI 5707</td>
<td>Principles of Database Systems</td>
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<td>CSCI 5708</td>
<td>Architecture and Implementation of Database Management Systems</td>
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<td>CSCI 5801</td>
<td>Software Engineering I</td>
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<td>CSCI 8725</td>
<td>Databases for Bioinformatics</td>
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<td>DES 5185</td>
<td>Human Factors in Design</td>
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<td>Survey Design, Sampling, and Implementation</td>
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<td>EPSY 5262</td>
<td>Intermediate Statistical Methods</td>
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<td>Assessment and Instructional Design for Students with Developmental Disabilities</td>
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<td>GCD 8103</td>
<td>Human Histology</td>
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<td>HINF 5440</td>
<td>Foundations of Translational Bioinformatics</td>
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<td>HINF 5450</td>
<td>Foundations of Precision Medicine Informatics</td>
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<td>HINF 5496</td>
<td>Internship in Health Informatics</td>
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<td>HINF 5610</td>
<td>Foundations of Biomedical Natural Language Processing</td>
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<td>HINF 5620</td>
<td>Data Visualization for the Health Sciences</td>
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<td>HINF 5630</td>
<td>Clinical Data Mining</td>
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<td>HINF 5640</td>
<td>Advanced Translational Bioinformatics Methods</td>
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<td>HINF 5650</td>
<td>Integrative Genomics and Computational Methods</td>
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<td>HINF 8220</td>
<td>Computational Causal Analytics</td>
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<td>HINF 8405</td>
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<td>Foundations of Health Informatics I</td>
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<td>Foundations of Health Informatics II</td>
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<td>HINF 8440</td>
<td>Foundations of Translational Bioinformatics Lab</td>
<td>2.0 cr</td>
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<tr>
<td>HINF 8492</td>
<td>Advanced Readings or Research in Health Informatics</td>
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<td>HINF 8525</td>
<td>Health Informatics Teaching</td>
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<td>HINF 8535</td>
<td>Advanced Health Informatics Research Methods</td>
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<td>IDSC 6040</td>
<td>Information Technology Management</td>
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<td>IDSC 6050</td>
<td>Information Technologies and Solutions</td>
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<td>IDSC 6471</td>
<td>Knowledge Management</td>
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<td>Behavioral Decision Theory</td>
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<td>LING 5205</td>
<td>Semantics</td>
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<td>Introduction to the Mathematics of Image and Data Analysis</td>
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<td>Introduction to Stochastic Processes</td>
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<td>MEDC 5245</td>
<td>Introduction to Drug Design</td>
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<td>MILI 6992</td>
<td>Healthcare Delivery Innovations; Optimizing Cost and Quality</td>
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<td>Medical Industry Valuation Laboratory</td>
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<td>NURS 5115</td>
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<td>NURS 6105</td>
<td>Systems Analysis and Design</td>
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<td>Knowledge Representation and Interoperability Practicum</td>
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<td>NURS 7113</td>
<td>Clinical Decision Support: Theory</td>
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<td>PHAR 6224</td>
<td>Pharmacogenomics: Genetic Basis for Variability in Drug Response</td>
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<td>PUBH 6020</td>
<td>Fundamentals of Social and Behavioral Science</td>
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<td>PUBH 6025</td>
<td>Designing e-Interventions for Public Health</td>
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<td>PUBH 6102</td>
<td>Issues in Environmental Health</td>
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<td>PUBH 6131</td>
<td>Working in Global Health</td>
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<td>Fundamentals of Epidemiology</td>
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<td>Data Processing with PC-SAS</td>
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<td>PUBH 6341</td>
<td>Epidemiologic Methods I</td>
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<td>PUBH 6386</td>
<td>Public Health Aspects of Cardiovascular Disease</td>
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<td>PUBH 6420</td>
<td>Introduction to SAS Programming</td>
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<td>PUBH 6541</td>
<td>Statistics for Health Management Decision Making</td>
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<td>PUBH 6555</td>
<td>Topics in Health Economics</td>
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<td>PUBH 6556</td>
<td>Health and Health Systems</td>
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<td>PUBH 6557</td>
<td>Health Finance I</td>
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<td>PUBH 6558</td>
<td>Health Finance II</td>
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<td>PUBH 6564</td>
<td>Private Purchasers of Health Care: Roles of Employers and Health Plans in U.S. Health Care System</td>
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<tr>
<td>PUBH 6565</td>
<td>Innovation of Healthcare Services</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6617</td>
<td>Practical Methods for Secondary Data Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6717</td>
<td>Decision Analysis for Health Care</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6724</td>
<td>The Health Care System and Public Health</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6742</td>
<td>Ethics in Public Health: Research and Policy</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>PUBH 6751</td>
<td>Principles of Management in Health Services Organizations</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6765</td>
<td>Continuous Quality Improvement: Methods and Techniques</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6780</td>
<td>Topics: Public Health Administration and Policy</td>
<td>1.0 - 3.0 cr</td>
</tr>
<tr>
<td>PUBH 6800</td>
<td>Topics: Health Services Research and Policy</td>
<td>0.5 - 4.0 cr</td>
</tr>
<tr>
<td>PUBH 6802</td>
<td>Managing Electronic Health Information</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6803</td>
<td>Conducting a Systematic Literature Review</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6809</td>
<td>Advanced Methods in Health Decision Science</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 6814</td>
<td>Data and Information for Population Health Management</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6832</td>
<td>Economics of the Health Care System</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 6862</td>
<td>Cost-Effectiveness Analysis in Health Care</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 6863</td>
<td>Understanding Health Care Quality</td>
<td>2.0 cr</td>
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<tr>
<td>PUBH 6876</td>
<td>Public Health Systems Analysis and Design</td>
<td>2.0 cr</td>
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<tr>
<td>PUBH 6840</td>
<td>Topics: Biostatistics</td>
<td>0.5 - 4.0 cr</td>
</tr>
<tr>
<td>PUBH 7401</td>
<td>Fundamentals of Biostatistical Inference</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PUBH 7402</td>
<td>Biostatistics Modeling and Methods</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PUBH 7405</td>
<td>Biostatistics: Regression</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PUBH 7407</td>
<td>Analysis of Categorical Data</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7415</td>
<td>Introduction to Clinical Trials</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7420</td>
<td>Clinical Trials: Design, Implementation, and Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7430</td>
<td>Statistical Methods for Correlated Data</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7440</td>
<td>Introduction to Bayesian Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7445</td>
<td>Statistics for Human Genetics and Molecular Biology</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 7460</td>
<td>Advanced Statistical Computing</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 7475</td>
<td>Statistical Learning and Data Mining</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 7588</td>
<td>Information Uses in Long-Term Care</td>
<td>2.0 cr</td>
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<tr>
<td>PUBH 8432</td>
<td>Probability Models for Biostatistics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8442</td>
<td>Bayesian Decision Theory and Data Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8445</td>
<td>Statistics for Human Genetics and Molecular Biology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8446</td>
<td>Advanced Statistical Genetics and Genomics</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 8452</td>
<td>Advanced Longitudinal Data Analysis</td>
<td>3.0 cr</td>
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<tr>
<td>PUBH 8462</td>
<td>Advanced Survival Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8472</td>
<td>Spatial Biostatistics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8801</td>
<td>Health Services Policy Analysis: Theory</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 8810</td>
<td>Research Studies in Health Care</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>STAT 5101</td>
<td>Theory of Statistics I</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>STAT 5302</td>
<td>Applied Regression Analysis</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>STAT 5303</td>
<td>Designing Experiments</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>STAT 5401</td>
<td>Applied Multivariate Methods</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>STAT 5511</td>
<td>Time Series Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>STAT 8051</td>
<td>Advanced Regression Techniques: linear, nonlinear and nonparametric methods</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>STAT 8052</td>
<td>Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>
STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)

**Joint- or Dual-degree Coursework:** MD/MHI program Student may take a total of 3 credits in common among the academic programs.
Twin Cities Campus
Health Informatics M.S.
Health Informatics, AHC Inst
Graduate School

Link to a list of faculty for this program.

Contact Information:
Physical Address: 8-100 PWB, 516 Delaware St. SE, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://healthinformatics.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health informatics (also known as biomedical informatics) is an interdisciplinary field of scholarship that applies computer, information, statistical, management, and related scientific methods to enable biomedical discovery and support the effective and efficient use and analysis of data, management of information, and application of knowledge across the spectrum from basic science to clinical care. The ultimate goal of the field is to improve the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics, computing, and biostatistics, and electives in technical and health science areas. Possible areas of emphasis include health information systems, telehealth, bioinformatics, user interface design, system impact evaluation, database construction and analysis, clinical decision-making, evaluation of health programs, and physiological monitoring and control.

The health informatics MS is intended for students who are interested in research, but who do not have the background or are not ready to commit to the PhD program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.30.

Applicants are expected to have at least a bachelor of science or equivalent degree from a regionally accredited institution of higher education.

Required prerequisites
Health or Biological Sciences
Applicants must have taken 6 semester-credits or 9 quarter-credits at the undergraduate or graduate level in medical, life, or biological sciences from a regionally accredited institution of higher learning or equivalent. This broadly defined requirement includes most courses with a health or biology emphasis, including biostatistics, health services research, and public health, as well as more traditional biology or life science courses.

Programming Language
Documented work or educational experience working with a programming language such as C, C++, Java, Python, R, Visual Basic, etc.
- HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
- or Department Consent

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 151
  - General Test - Quantitative Reasoning: 160
- General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 26 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 36 major credits and up to null credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Required HINF Courses (16 credits)**

All students must take AHC Informatics Grand Rounds (HINF 5436) twice for a total of two credits.

- **HINF 5430** - Foundations of Health Informatics I (3.0 cr)
- **HINF 5431** - Foundations of Health Informatics II (3.0 cr)
- **HINF 5436** - AHC Informatics Grand Rounds (1.0 cr)
- **HINF 5510** - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
- **HINF 5520** - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)
- **HINF 5531** - Health Data Analytics and Data Science (3.0 cr)

**Other Required Courses (7 credits)**

- **NURS 5116** - Consumer Health Informatics (1.0 cr)
- **NURS 7108** - Population Health Informatics (2.0 cr)
- **PUBH 6450** - Biostatistics I (4.0 cr)

**Electives**

Plan A students must take at least 3 credits, and Plan B students must take at least 9 credits of electives to meet the 36-credit minimum. If labs or practicums are selected as electives, they must be taken concurrently with the associated course (i.e. take HINF 8430 with HINF 5430). Electives must be approved by the advisor.

- **BIOC 5361** - Microbial Genomics and Bioinformatics (3.0 cr)
- **BIOC 8007** - Molecular Biology of DNA (2.0 cr)
- **BIOC 8008** - Molecular Biology of RNA (2.0 cr)
- **CGSC 8410** - Perspectives in Learning, Perception, and Cognition (2.0 cr)
- **CSCI 5106** - Programming Languages (3.0 cr)
- **CSCI 5115** - User Interface Design, Implementation and Evaluation (3.0 cr)
- **CSCI 5271** - Introduction to Computer Security (3.0 cr)
- **CSCI 5421** - Advanced Algorithms and Data Structures (3.0 cr)
- **CSCI 5461** - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
CSCI 5511 - Artificial Intelligence I (3.0 cr)
CSCI 5521 - Introduction to Machine Learning (3.0 cr)
CSCI 5525 - Machine Learning (3.0 cr)
CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
CSCI 5707 - Principles of Database Systems (3.0 cr)
CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
CSCI 5801 - Software Engineering I (3.0 cr)
CSCI 8725 - Databases for Bioinformatics (3.0 cr)
DES 5185 - Human Factors in Design (3.0 cr)
EPSY 5244 - Survey Design, Sampling, and Implementation (3.0 cr)
EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
EPSY 5621 - Assessment and Instructional Design for Students with Developmental Disabilities (3.0 cr)
GEOG 8103 - Human Histology (5.0 cr)
HINF 5440 - Foundations of Translational Bioinformatics (3.0 cr)
HINF 5450 - Foundations of Precision Medicine Informatics (3.0 cr)
HINF 5494 - Topics in Health Informatics (3.0 cr)
HINF 5496 - Internship in Health Informatics (1.0 - 6.0 cr)
HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
HINF 5610 - Foundations of Biomedical Natural Language Processing (3.0 cr)
HINF 5620 - Data Visualization for the Health Sciences (3.0 cr)
HINF 5630 - Clinical Data Mining (3.0 cr)
HINF 5640 - Advanced Translational Bioinformatics Methods (3.0 cr)
HINF 5650 - Integrative Genomics and Computational Methods (3.0 cr)
HINF 8405 - Advanced Topics in Health Informatics I (1.0 - 4.0 cr)
HINF 8406 - Advanced Topics in Health Informatics II (1.0 - 4.0 cr)
HINF 8430 - Foundations of Health Informatics I Lab (2.0 cr)
HINF 8431 - Foundations of Health Informatics II Lab (2.0 cr)
HINF 8440 - Foundations of Translational Bioinformatics Lab (2.0 cr)
HINF 8450 - Health Informatics Teaching (2.0 cr)
HINF 8535 - Advanced Health Informatics Research Methods (3.0 cr)
IDSC 6040 - Information Technology Management (2.0 cr)
IDSC 6050 - Information Technologies and Solutions (2.0 cr)
IDSC 6471 - Knowledge Management (2.0 cr)
IDSC 8721 - Behavioral Decision Theory (3.0 cr)
IE 8521 - Optimization (4.0 cr)
IE 8531 - Discrete Optimization (4.0 cr)
KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)
LING 5205 - Semantics (3.0 cr)
LING 5801 - Introduction to Computational Linguistics (3.0 cr)
MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
MATH 5467 - Introduction to the Mathematics of Image and Data Analysis (4.0 cr)
MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
MEDC 5245 - Introduction to Drug Design (3.0 cr)
MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5117 - Consumer Health Informatics Practicum (1.0 cr)
NURS 6105 - Systems Analysis and Design (3.0 cr)
NURS 7106 - Knowledge Representation and Interoperability Practicum (2.0 cr)
NURS 7109 - Population Health Informatics Practicum (2.0 cr)
NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
NURS 7114 - Clinical Decision Support Practicum (2.0 cr)
NURS 7118 - Human Factors and Human-Computer Interaction in Health Informatics (3.0 cr)
NURS 7610 - System Leadership and Innovation (3.0 cr)
PHAR 6224 - Pharmacogenomics: Genetic Basis for Variability in Drug Response (2.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)
PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6131 - Working in Global Health (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)

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Information current as of August 31, 2018
Plan Options

Plan A
Take at least 10 master's thesis credits.
HINF 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Plan B
Take the following course:
HINF 8770 - Plan B Project (4.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.
Twin Cities Campus
Health Informatics Minor
Health Informatics, AHC Inst
Graduate School

Link to a list of faculty for this program.

Contact Information:
Physical Address: 8-100 PWB, 516 Delaware St. SE, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://healthinformatics.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health informatics (also known as biomedical informatics) is an interdisciplinary field of scholarship that applies computer, information, statistical, management, and related scientific methods to enable biomedical discovery and support the effective and efficient use and analysis of data, management of information, and application of knowledge across the spectrum from basic science to clinical care. The ultimate goal of the field is to improve the health, well-being, and economic functioning of society. The minor provides an opportunity for students to supplement their primary training with additional knowledge and skills in health informatics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Required prerequisites
Health or Biological Sciences
Applicants must have taken 6 semester-credits or 9 quarter-credits at the undergraduate or graduate level in medical, life, or biological sciences from a regionally accredited institution of higher learning or equivalent. This broadly defined requirement includes most courses with a health or biology emphasis, including biostatistics, health services research, and public health, as well as more traditional biology or life science courses.

Programming language
Documented work or educational experience working with a programming language such as C, C++, Java, Python, R, Visual Basic, etc.

or HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
or Department Consent

Special Application Requirements:
Applicants must be earning a graduate-level degree from the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
Required Coursework
All students pursuing the Health Informatics minor must complete the following course:
HINF 5430 - Foundations of Health Informatics I (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Course
Take the following course to complete the 6-credit minimum for the master's minor:
HINF 5431 - Foundations of Health Informatics II (3.0 cr)

Doctoral
Required courses
HINF 5440 - Foundations of Translational Bioinformatics (3.0 cr)

Foundations Lab
Students must take at least one lab concurrently with the associated course (i.e. take 8430 concurrently with 5430 or 8440 concurrently with 5440).
Take 1 - 2 course(s) from the following:
• HINF 8430 - Foundations of Health Informatics I Lab (2.0 cr)
• HINF 8440 - Foundations of Translational Bioinformatics Lab (2.0 cr)

Electives
Take HINF electives to meet the 12-credit minimum for the doctoral minor.
HINF 5431 - Foundations of Health Informatics II (3.0 cr)
HINF 5436 - AHC Informatics Grand Rounds (1.0 cr)
HINF 5450 - Foundations of Precision Medicine Informatics (3.0 cr)
HINF 5494 - Topics in Health Informatics (3.0 cr)
HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
HINF 5520 - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)
HINF 5531 - Health Data Analytics and Data Science (3.0 cr)
HINF 5610 - Foundations of Biomedical Natural Language Processing (3.0 cr)
HINF 5620 - Data Visualization for the Health Sciences (3.0 cr)
HINF 5630 - Clinical Data Mining (3.0 cr)
HINF 5640 - Advanced Translational Bioinformatics Methods (3.0 cr)
HINF 5650 - Integrative Genomics and Computational Methods (3.0 cr)
HINF 8220 - Computational Causal Analytics (3.0 cr)
HINF 8405 - Advanced Topics in Health Informatics I (1.0 - 4.0 cr)
HINF 8406 - Advanced Topics in Health Informatics II (1.0 - 4.0 cr)
HINF 8492 - Advanced Readings or Research in Health Informatics (1.0 - 6.0 cr)
Twin Cities Campus
Health Informatics Ph.D.
Health Informatics, AHC Inst
Graduate School

Contact Information:
Physical Address: 8-100 PWB, 516 Delaware St. SE, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://healthinformatics.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 70
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health informatics (also known as biomedical informatics) is an interdisciplinary field of scholarship that applies computer, information, statistical, management, and related scientific methods to enable biomedical discovery and support the effective and efficient use and analysis of data, management of information, and application of knowledge across the spectrum from basic science to clinical care. The ultimate goal of the field is to improve the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics, computing, and biostatistics, and electives in technical and health science areas, and pursue one of four tracks: data science and informatics for learning health systems; clinical informatics; translational bioinformatics; or precision and personalized medicine (PPM) informatics. Students pursuing the data science and informatics for learning health systems track are expected to complete the University's data science MS degree en route to the PhD. Students pursuing any of the other three tracks are expected to complete the health informatics MS degree en route to the PhD. Phase I is the MS phase, and Phase II is the PhD phase of the program. Phase II is completed after students have earned the MS degree. Students who have an MS in data science or health informatics from a comparable program may be exempt from this requirement in whole or in part, subject to Academic Program Committee (APC) review and approval.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Applicants must have a BS or equivalent in science, technology, engineering, computer science, math, or another pertinent field from a regionally accredited university or international equivalent.

Required prerequisites
Health or Biological Sciences
Applicants must have taken 6 semester-credits or 9 quarter-credits at the undergraduate or graduate level in medical, life, or biological sciences from a regionally accredited institution of higher learning or equivalent. This broadly defined requirement includes most courses with a health or biology emphasis, including biostatistics, health services research, and public health, as well as more traditional biology or life science courses.
6-9 credits

Computer Science
Clinical Informatics Track
Documented work or educational experience working with a general purpose programming language such as C, C++, Java, Visual Basic, PASCAL, etc.
or HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
or Other Tracks
Applicants to the data science for learning health systems, translational bioinformatics, and precision and personalized medicine informatics tracks must also have taken an introduction to data structures and algorithms, such as the course listed below.
CSCI 1933 - Introduction to Algorithms and Data Structures (4.0 cr)

Track-Specific Prerequisites
Applicants to the data science for learning health systems, translational bioinformatics, and precision and personalized medicine informatics tracks must also have the following prerequisites or must take remedial courses at the discretion of the admissions committee:

Mathematics
Applicants must have college-level calculus and linear algebra, such as the courses listed below.
- MATH 1271 - Calculus I [MATH] (4.0 cr)
- CSCI 2033 - Elementary Computational Linear Algebra (4.0 cr)
  or MATH 4242 - Applied Linear Algebra (4.0 cr)

Statistics
Applicants must have college-level statistics, such as the courses below.
- STAT 3011 - Introduction to Statistical Analysis [MATH] (4.0 cr)
  or STAT 3021 - Introduction to Probability and Statistics (3.0 cr)

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 151
  - General Test - Quantitative Reasoning: 160
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
46 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

All courses taken, milestones met, and progress made in the program are subject to Academic Program Committee (APC) review. The inclusion of 4000-level coursework requires APC approval.

Required Core Coursework (14 credits)

Phase I (12 credits)
All students take the following core coursework for a total of 12 credits. HINF 5436 must be taken twice.
- HINF 5430 - Foundations of Health Informatics I (3.0 cr)
- HINF 5430 - Foundations of Health Informatics I Lab (2.0 cr)
- HINF 5436 - AHC Informatics Grand Rounds (1.0 cr)
HINF 5440 - Foundations of Translational Bioinformatics (3.0 cr)
HINF 8440 - Foundations of Translational Bioinformatics Lab (2.0 cr)

Phase II (2 credits)
All students take the following core course after completing the Phase I core, and with the approval of the APC.
HINF 8525 - Health Informatics Teaching (2.0 cr)

Doctoral Thesis Credits (24 credits)
All students must take at least 24 doctoral thesis credits, in consultation with the APC.
HINF 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Clinical Informatics
The clinical informatics track provides instruction and training for students interested in clinical applications methods and applications. The curriculum includes instruction in health data and coding, systems analysis, human-computer interaction, current informatics research, and current applications such as decision support systems, natural language processing, and predictive modeling. Additionally, students learn biostatistical methods, relational database theory and practice, analytics and data science methodologies, consumer health informatics, and interprofessional practice. Electives supplement individual student interests in areas such as computer programming, health data management, health care finance, and public and population health (with scope to include person-empowered participation and inter-professional engagement). Courses use a mixture of theoretical and applied subject matter to provide a solid grounding in current informatics thinking and practice.

Students who pursue the clinical informatics track must complete the health informatics MS degree en route to completing the PhD. Students must consult with the APC to coordinate completion of coursework and other requirements for the health informatics MS, the health informatics PhD, and the clinical informatics track. Students who have an MS in health informatics from a comparable program may be exempt from this requirement in whole or in part, subject to APC review and approval.

Clinical Informatics Coursework (32 credits)
Core Coursework (16 credits)
Take the following core courses:
HINF 5431 - Foundations of Health Informatics II (3.0 cr)
HINF 8431 - Foundations of Health Informatics II Lab (2.0 cr)
HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
HINF 5520 - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)
HINF 5531 - Health Data Analytics and Data Science (3.0 cr)
NURS 5116 - Consumer Health Informatics (1.0 cr)
NURS 7108 - Population Health Informatics (2.0 cr)

Required Biostatistics Coursework (8 credits)
Take the following two courses:
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)

Electives
Select at least 8 elective credits, in consultation with the APC, to complete the 46 course credits required for the PhD degree.
BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
BIOC 8007 - Molecular Biology of DNA (2.0 cr)
BIOC 8008 - Molecular Biology of RNA (2.0 cr)
CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
CSCI 5108 - Programming Languages (3.0 cr)
CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
CSCI 5271 - Introduction to Computer Security (3.0 cr)
CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
CSCI 5511 - Artificial Intelligence I (3.0 cr)
CSCI 5521 - Introduction to Machine Learning (3.0 cr)
CSCI 5525 - Machine Learning (3.0 cr)
CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
CSCI 5707 - Principles of Database Systems (3.0 cr)
CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
CSCI 5801 - Software Engineering I (3.0 cr)
CSCI 8725 - Databases for Bioinformatics (3.0 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>DES 5185</td>
<td>Human Factors in Design (3.0 cr)</td>
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<tr>
<td>EPSY 5244</td>
<td>Survey Design, Sampling, and Implementation (3.0 cr)</td>
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<tr>
<td>EPSY 5262</td>
<td>Intermediate Statistical Methods (3.0 cr)</td>
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<td>EPSY 5621</td>
<td>Assessment and Instructional Design for Students with Developmental Disabilities (3.0 cr)</td>
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<td>GCD 8103</td>
<td>Human Histology (5.0 cr)</td>
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<tr>
<td>HINF 5450</td>
<td>Foundations of Precision Medicine Informatics (3.0 cr)</td>
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<td>HINF 5494</td>
<td>Topics in Health Informatics (3.0 cr)</td>
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<tr>
<td>HINF 5496</td>
<td>Internship in Health Informatics (1.0 - 6.0 cr)</td>
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<tr>
<td>HINF 5502</td>
<td>Python Programming Essentials for the Health Sciences (1.0 cr)</td>
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<td>HINF 5610</td>
<td>Foundations of Biomedical Natural Language Processing (3.0 cr)</td>
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<td>HINF 5620</td>
<td>Data Visualization for the Health Sciences (3.0 cr)</td>
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<td>HINF 5630</td>
<td>Clinical Data Mining (3.0 cr)</td>
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<tr>
<td>HINF 5640</td>
<td>Advanced Translational Bioinformatics Methods (3.0 cr)</td>
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<tr>
<td>HINF 5650</td>
<td>Integrative Genomics and Computational Methods (3.0 cr)</td>
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<tr>
<td>HINF 8405</td>
<td>Advanced Topics in Health Informatics I (1.0 - 4.0 cr)</td>
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<td>HINF 8406</td>
<td>Advanced Topics in Health Informatics II (1.0 - 4.0 cr)</td>
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<td>IDSC 6040</td>
<td>Information Technology Management (2.0 cr)</td>
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<td>IDSC 6050</td>
<td>Information Technologies and Solutions (2.0 cr)</td>
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<td>IDSC 6471</td>
<td>Knowledge Management (2.0 cr)</td>
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<td>IDSC 8721</td>
<td>Behavioral Decision Theory (3.0 cr)</td>
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<td>IE 8521</td>
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<td>KIN 5001</td>
<td>Foundations of Human Factors/Ergonomics (3.0 cr)</td>
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<td>LING 5001</td>
<td>Introduction to Linguistics (4.0 cr)</td>
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<td>LING 5205</td>
<td>Semantics (3.0 cr)</td>
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<td>LING 5801</td>
<td>Introduction to Computational Linguistics (3.0 cr)</td>
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<tr>
<td>MATH 5445</td>
<td>Mathematical Analysis of Biological Networks (4.0 cr)</td>
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<td>MATH 5467</td>
<td>Introduction to the Mathematics of Image and Data Analysis (4.0 cr)</td>
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<td>MATH 5652</td>
<td>Introduction to Stochastic Processes (4.0 cr)</td>
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<td>MEDC 5245</td>
<td>Introduction to Drug Design (3.0 cr)</td>
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<td>MILI 6992</td>
<td>Healthcare Delivery Innovations:Optimizing Cost and Quality (2.0 cr)</td>
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<td>MILI 6995</td>
<td>Medical Industry Valuation Laboratory (2.0 cr)</td>
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<td>NURS 5115</td>
<td>Interprofessional Health Care Informatics (3.0 cr)</td>
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<td>NURS 5117</td>
<td>Consumer Health Informatics Practicum (1.0 cr)</td>
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<td>NURS 6105</td>
<td>Systems Analysis and Design (3.0 cr)</td>
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<td>NURS 7106</td>
<td>Knowledge Representation and Interoperability Practicum (2.0 cr)</td>
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<td>NURS 7109</td>
<td>Population Health Informatics Practicum (2.0 cr)</td>
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<td>NURS 7113</td>
<td>Clinical Decision Support: Theory (2.0 cr)</td>
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<tr>
<td>NURS 7114</td>
<td>Clinical Decision Support Practicum (2.0 cr)</td>
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<td>NURS 7118</td>
<td>Human Factors and Human-Computer Interaction in Health Informatics (3.0 cr)</td>
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<td>NURS 7610</td>
<td>System Leadership and Innovation (3.0 cr)</td>
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<td>PHAR 6224</td>
<td>Pharmacogenomics: Genetic Basis for Variability in Drug Response (2.0 cr)</td>
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<td>PUBH 6020</td>
<td>Fundamentals of Social and Behavioral Science (2.0 cr)</td>
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<td>PUBH 6025</td>
<td>Designing e-Interventions for Public Health (2.0 cr)</td>
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<td>PUBH 6102</td>
<td>Issues in Environmental Health (2.0 cr)</td>
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<td>PUBH 6131</td>
<td>Working in Global Health (2.0 cr)</td>
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<td>PUBH 6320</td>
<td>Fundamentals of Epidemiology (3.0 cr)</td>
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<td>PUBH 6325</td>
<td>Data Processing with PC-SAS (1.0 cr)</td>
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<td>PUBH 6341</td>
<td>Epidemiologic Methods I (3.0 cr)</td>
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<td>PUBH 6366</td>
<td>Public Health Aspects of Cardiovascular Disease (2.0 cr)</td>
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<td>PUBH 6420</td>
<td>Introduction to SAS Programming (1.0 cr)</td>
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<td>PUBH 6541</td>
<td>Statistics for Health Management Decision Making (3.0 cr)</td>
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<td>PUBH 6555</td>
<td>Topics in Health Economics (2.0 cr)</td>
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<td>PUBH 6556</td>
<td>Health and Health Systems (3.0 cr)</td>
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<td>PUBH 6557</td>
<td>Health Finance I (3.0 cr)</td>
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<td>PUBH 6558</td>
<td>Health Finance II (3.0 cr)</td>
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<td>PUBH 6560</td>
<td>Operations Research and Quality in Health Care (3.0 cr)</td>
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<td>PUBH 6562</td>
<td>Information Technology in Health Care (2.0 cr)</td>
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<td>PUBH 6564</td>
<td>Private Purchasers of Health Care: Roles of Employers and Health Plans in U.S. Health Care System (2.0 cr)</td>
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<td>PUBH 6565</td>
<td>Innovation of Healthcare Services (2.0 cr)</td>
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<td>PUBH 6617</td>
<td>Practical Methods for Secondary Data Analysis (3.0 cr)</td>
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<tr>
<td>PUBH 6717</td>
<td>Decision Analysis for Health Care (2.0 cr)</td>
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Data Science and Informatics for Learning Health Systems

The data science and informatics for learning health systems track builds on the highly regarded data science program offered jointly by the School of Engineering, School of Public Health, and School of Statistics. It also takes advantage of School of Nursing’s breadth of nursing and health informatics courses. It requires students to fulfill the requirements of the master’s in data science program and use their elective courses to gain exposure to health sciences and health care in the form of a suite of required foundational courses: Foundations of Health Informatics I and Lab, Foundations of Translational Bioinformatics I and Lab and the US Health Care System offered by the Institute for Health Informatics. The MS capstone project will address a research question related to health sciences or healthcare. Specialization to the health care field intensifies at the PhD level by offering additional courses focusing on advanced analytics and its applications to healthcare. The thesis research will naturally relate to health science or healthcare.

Students who pursue the data science and informatics for learning health systems track are expected to earn the University’s data science MS degree en route to completing the PhD. Students will have to apply and be admitted to both the PhD in health informatics and the MS in data science separately. Acceptance into one program does not guarantee acceptance into the other program. Students must meet the requirements of both programs as determined by each program. See the data science catalog page and website (https://datascience.umn.edu) for more information about the MS in data science requirements. Students must consult with the APC to coordinate completion of coursework and other requirements for the data science MS, the health informatics PhD, and the data science and informatics for learning health systems track. Credits earned in the University’s data science MS program may be used to fulfill required courses or elective credits in the data science and informatics for learning health systems track, subject to APC approval. Students who have an MS in data science from a comparable program may be exempt from this requirement in whole or in part, subject to APC review and approval.
Data Science and Informatics Coursework (32 credits)

Core Coursework (18 credits)
Take the following courses, in consultation with the APC, after completion of the data science MS degree. Take HINF 5496 and HINF 8492 for at least 3 credits each.
- HINF 5496 - Internship in Health Informatics (1.0 - 6.0 cr)
- HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
- HINF 5630 - Clinical Data Mining (3.0 cr)
- HINF 8220 - Computational Causal Analytics (3.0 cr)
- HINF 8492 - Advanced Readings or Research in Health Informatics (1.0 - 6.0 cr)

Elective Coursework (14 credits)
Select at least 14 elective credits from the following list, in consultation with the APC, to complete the 46 course credits required for the PhD degree. Credits earned in pursuit of the data science MS may be used to fulfill elective course requirements for this track, subject to APC approval.

Take 14 or more course(s) from the following:

Informatics
Take 0 or more course(s) from the following:
- HINF 5431 - Foundations of Health Informatics II (3.0 cr)
- HINF 8431 - Foundations of Health Informatics II Lab (2.0 cr)
- HINF 5610 - Foundations of Biomedical Natural Language Processing (3.0 cr)
- HINF 5620 - Data Visualization for the Health Sciences (3.0 cr)
- MATH 5467 - Introduction to the Mathematics of Image and Data Analysis (4.0 cr)

Applications
Take 0 or more course(s) from the following:
- NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
- PUBH 6102 - Issues in Environmental Health (2.0 cr)
- PUBH 6560 - Operations Research and Quality in Health Care (3.0 cr)
- PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
- PUBH 6809 - Advanced Methods in Health Decision Science (3.0 cr)
- PUBH 6814 - Data and Information for Population Health Management (2.0 cr)
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 6876 - Public Health Systems Analysis and Design (2.0 cr)

Advanced Methodology
Take 0 or more course(s) from the following:
- PUBH 8452 - Advanced Longitudinal Data Analysis (3.0 cr)
- PUBH 8462 - Advanced Survival Analysis (3.0 cr)
- PUBH 8472 - Spatial Biostatistics (3.0 cr)

Data Science
Take 0 or more course(s) from the following:
- STAT 5101 - Theory of Statistics I (4.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5511 - Time Series Analysis (3.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5523 - Introduction to Data Mining (3.0 cr)
- CSCI 5525 - Machine Learning (3.0 cr)
- PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
- CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
- CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
- CSCI 5707 - Principles of Database Systems (3.0 cr)

Translational Bioinformatics
The translational bioinformatics track bridges genomics and bioinformatics to precision medicine through its methods and techniques development and innovation that directly relate to the study of basic biological science and diseases. The computational methods related to genomics, epigenomics, transcriptomics, proteomics, metabolomics and pharmacogenomics are included, which build the connection of molecular findings and phenotypes to characterize disease susceptibility or determine disease markers, and predict response to treatment and prognosis. The program offers three specialized areas: structural and functional genomics, microbiomics and metagenomics, and cancer genomics.
Students pursuing the translational bioinformatics track are expected to earn the health informatics MS degree en route to completing the PhD. Students must consult with the APC to coordinate completion of coursework and other requirements for the health informatics MS, the health informatics PhD, and the translational bioinformatics track. Students who have an MS in health informatics from a comparable program may be exempt from this requirement in whole or in part, subject to APC review and approval.

Translational Bioinformatics Coursework (32 credits)
Phase 1 (22 credits)
Take the following courses for a total of 22 credits:
- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
- HINF 8220 - Computational Causal Analytics (3.0 cr)
- HINF 5650 - Integrative Genomics and Computational Methods (3.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling (3.0 cr)
- BIOC 8007 - Molecular Biology of DNA (2.0 cr)
- BIOC 8008 - Molecular Biology of RNA (2.0 cr)

Phase II (6 credits)
Take the following courses after completing Phase I, and with the approval of the APC:
- HINF 5496 - Internship in Health Informatics (1.0 - 6.0 cr)
- HINF 8492 - Advanced Readings or Research in Health Informatics (1.0 - 6.0 cr)

Elective Coursework (4 credits)
Select at least 4 elective credits from the following list, in consultation with the APC, to complete the 46 course credits required for the PhD degree.
- HINF 5431 - Foundations of Health Informatics II (3.0 cr)
- HINF 8431 - Foundations of Health Informatics II Lab (2.0 cr)
- HINF 5450 - Foundations of Precision Medicine Informatics (3.0 cr)
- HINF 5610 - Foundations of Biomedical Natural Language Processing (3.0 cr)
- MEDC 5245 - Introduction to Drug Design (3.0 cr)
- PHAR 6224 - Pharmacogenomics: Genetic Basis for Variability in Drug Response (2.0 cr)
- PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 8445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)

Precision and Personalized Medicine Informatics
The precision and personalized medicine informatics track provides a didactic program for students training in informatics who will develop specialized knowledge in precision informatics methods applied to personal and population health-focused problems. The scope of this track includes social determinants of health and inter-professional research and expertise. Students will develop skills in quantitative methods and biomedical sciences for their application to precision medicine. In addition, students will gain an understanding of medical and biological science to provide needed context on which to apply informatics methods.

Students who pursue the precision and personalized medicine informatics track are expected to earn the health informatics MS degree en route to completing the PhD. Students must consult with the APC to coordinate completion of coursework and other requirements for the health informatics MS, the health informatics PhD, and the precision and personalized medicine informatics track. Students who have an MS in health informatics from a comparable program may be exempt from this requirement in whole or in part, subject to APC review and approval.

Precision and Personalized Medicine Informatics Coursework (32 credits)
Phase I (19 credits)
Take the following coursework for at least 19 credits.
- HINF 5450 - Foundations of Precision Medicine Informatics (3.0 cr)
- HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
- HINF 5520 - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)
- HINF 5531 - Health Data Analytics and Data Science (3.0 cr)
- or HINF 5630 - Clinical Data Mining (3.0 cr)

Phase II (8 credits)
Take the following courses after completing Phase I, and with the approval of the APC. Take HINF 5496 and HINF 8492 for at least 3 credits each.
- HINF 5496 - Internship in Health Informatics (1.0 - 6.0 cr)
- HINF 8492 - Advanced Readings or Research in Health Informatics (1.0 - 6.0 cr)
- PHAR 6224 - Pharmacogenomics: Genetic Basis for Variability in Drug Response (2.0 cr)

Elective Coursework (5 credits)
Select at least 5 elective credits, in consultation with the APC, to complete the 46 course credits required for the PhD degree.
HINF 5431 - Foundations of Health Informatics II (3.0 cr)
MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
PUBH 8432 - Probability Models for Biostatistics (3.0 cr)
PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
PUBH 8445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
PUBH 8446 - Advanced Statistical Genetics and Genomics (3.0 cr)
STAT 5511 - Time Series Analysis (3.0 cr)
STAT 5401 - Applied Multivariate Methods (3.0 cr)
Twin Cities Campus
Health Journalism and Communication M.A.
School of Journalism & Mass Communication
Graduate School

Link to a list of faculty for this program.

Contact Information:
Health Journalism and Communication M.A. Program, School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street S.E., Minneapolis MN 55455 (612-626-1851; fax 612-625-9525)
Email: dans@umn.edu
Website: http://sjmc.umn.edu/grad/hjComm.html#degree

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 33
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: This program has been temporarily suspended. Applications are not being accepted at this time. Please contact Graduate Student Services at sjmcgrad@umn.edu with questions.

A joint program of the School of Journalism and Mass Communication and the School of Public Health, the professional master's in health journalism and communication promotes improved public communication about health matters by combining knowledge, skills, and experience from both disciplines. The program is designed for journalists and health professionals, who earn a master's degree in health journalism. Journalists and communications professionals learn the fundamentals of medical research and public health. Health professionals learn basic journalistic principles and ethics, and how to develop meaningful health stories. Those pursuing other master's degrees, (e.g., master's in public health), earn the M.A. in health journalism and communication in addition to the other degree.

The Health Journalism and Communication program has two distinct, but overlapping, programs of study. Students in the health journalism emphasis will gain advanced knowledge about public health and the evaluation of claims from health, medical, and scientific sources, as well as advanced training on reporting health stories for different media. Students in the health communication emphasis will learn the fundamentals of writing about health topics for different audiences in different formats, as well as health campaign development and evaluation.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Applications to this master's program are not currently being accepted. Please contact sjmcgrad@umn.edu with questions.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Plan B: Plan B requires 25 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Contact the program for capstone project information.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The M.A. in health journalism and communication requires a minimum of 33 semester credits, to be completed over a two-year schedule. The program has two distinct areas of emphasis: health journalism and health communication. Students in the health journalism emphasis area learn to evaluate claims from health, medical, and scientific sources and to tell health-oriented stories in broadcast or magazine journalism. Students in the health communication emphasis learn the fundamentals of writing about health topics for different audiences, as well as health campaign development and evaluation.
**Twin Cities Campus**

Health Journalism and Communication Minor

*School of Journalism & Mass Communication*

**Graduate School**

Link to a list of faculty for this program.

**Contact Information:**
Health Journalism and Communication M.A. Program, School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street S.E., Minneapolis MN 55455 (612-626-1851; fax 612-625-9525)
Email: dans@umn.edu
Website: [http://sjmc.umn.edu/grad/hjComm.html#degree](http://sjmc.umn.edu/grad/hjComm.html#degree)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: This program has been temporarily suspended. Applications are not being accepted at this time. Please contact the School of Journalism's Graduate Student Services office at sjmcgrad@umn.edu with questions.

A joint program of the School of Journalism and Mass Communication and the School of Public Health, the professional master's in health journalism and communication promotes improved public communication about health matters by combining knowledge, skills, and experience from both disciplines. The program is designed for journalists and health professionals, who earn a master's degree in health journalism. Journalists and communications professionals learn the fundamentals of medical research and public health. Health professionals learn basic journalistic principles and ethics, and how to develop meaningful health stories. Those pursuing other master's degrees, (e.g., master's in public health), earn the M.A. in health journalism and communication in addition to the other degree.

**Program Delivery**
This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

The master's minor requires 6 credits. The doctoral minor requires 12 credits.
Twin Cities Campus
History of Science, Technology, and Medicine M.A.
History of Science & Technology
Graduate School

Link to a list of faculty for this program.

Contact Information:
Program in the History of Science, Technology, and Medicine, University of Minnesota, 154 Shepherd Labs, 100 Union Street S.E., Minneapolis, MN 55455 (612-624-7069; fax: 612-301-1442)
Email: hstm@umn.edu
Website: http://www.hstm.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program offers opportunities for advanced research and study in the history of science and technology (with particular expertise in the history of the physical sciences, history of the biological sciences, history of technology, and history of American science and technology) and in the history of medicine.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students must have a bachelor's degree with a preferred grade average of B or better and must be capable of interdisciplinary study. Depending on background and career objectives, additional preparatory studies may be necessary in either the science-technology area or in the humanities and social sciences.

Although it is not strictly required for admission, it's strongly recommended that applicants submit a GRE score.

Special Application Requirements:
All application materials are submitted online to the University. Check the HSTM website (www.hstm.umn.edu) for more information. Applications are accepted for fall admission only. The application deadline is December 1.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 15 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading proficiency in one foreign language.

A minimum GPA of 3.30 is required for students to remain in good standing.

The MA is offered under Plan A and Plan B. Following the guidelines in the Graduate Student Handbook for the program (www.hstm.umn.edu), MA students select one of two tracks, the history of science and technology or the history of medicine, and, within the chosen track, select courses subject to distribution requirements in terms of area and period. All of the courses selected for the requirements must be passed with a grade of B or better.

Plan A requires 31 credits consisting of 6 credits in the required courses HSCI/HMED 8112 and 8113, 9 additional credits in HSCI or HMED, 6 credits in an outside field or in a minor, and 10 thesis credits.

Plan B requires 30 credits consisting of 6 credits in the required courses HSCI/HMED 8112 and 8113, 15 additional credits in HSCI or HMED, 3 credits in a directed study course, and 6 credits in an outside field or in a minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

History of Medicine

Plan A
Required Courses
Take the two-semester sequence of historiography and research preparation, plus an additional 9 credits in HMED chosen in consultation with advisor.
HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
HMED 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)

Outside Field Coursework
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or in a minor.

Thesis Credits
Take 10 thesis credits
HMED 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Required Courses
Take the two-semester sequence of historiography and research preparation, plus an additional 15 credits in HMED chosen in consultation with advisor.
HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
HMED 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)

Outside Field Coursework
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or in a minor.

Directed Study
Take 3 credits in a directed study course.
HMED 8631 - Directed Study (1.0 - 6.0 cr)
or HMED 8632 - Directed Study (1.0 - 6.0 cr)

History of Science and Technology

Plan A
Required Courses
Take the two-semester sequence of historiography and research preparation, plus an additional 9 credits in HSCI chosen in
consultation with advisor.

**HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)**

**HSCI 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)**

**Outside Field Coursework**
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or in a minor.

**Thesis Credits**
Take 10 thesis credits

**HSCI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)**

**Plan B**

**Required Courses**
Take the two-semester sequence of historiography and research preparation, plus an additional 15 credits in HSCI chosen in consultation with advisor.

**HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)**

**HSCI 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)**

**Outside Field Coursework**
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or in a minor.

**Directed Study**
Take 3 credits in a directed study course.

**HSCI 8993 - Directed Studies (1.0 - 5.0 cr)**

or **HSCI 8994 - Directed Research (1.0 - 5.0 cr)**
History of Science, Technology, and Medicine Minor

Program in the History of Science, Technology, and Medicine, University of Minnesota, 154 Shepherd Labs, 100 Union Street SE, Minneapolis, MN 55455 (612-624-7069; fax: 612-301-1442)
Email: hstm@umn.edu
Website: http://www.hstm.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program offers opportunities for advanced research and study in the history of science and technology (with particular expertise in the history of the physical sciences, history of the biological sciences, history of technology, and history of American science and technology) and in the history of medicine.

Prerequisites for Admission
Other requirements to be completed before admission:
Students must have a bachelor's degree with a preferred grade average of B or better and must be capable of interdisciplinary study. Depending on background and career objectives, additional preparatory studies may be necessary in either the science-technology area or in the humanities and social sciences.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Students who wish to take the graduate minor in the history of science, technology, and medicine are required to take 6 credits for the master's minor and 12 credits for a doctoral minor. The historiography course (HSCI or HMED 8112) is strongly recommended, along with other courses that are selected to define a course of study that should have some identifiable focus but also a certain breadth. Students should not plan to take all courses in the minor from the same faculty member.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
The master's minor requires two 3-credit courses in HSTM or HMED at the 5xxx level or above.

Recommended Courses
HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
or HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
Doctoral
The doctoral minor requires four 3-credit courses in HSTM or HMED at the 5xxx level or above.

Recommended Courses
HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
or HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
Twin Cities Campus
History of Science, Technology, and Medicine Ph.D.
History of Science & Technology
Graduate School

Link to a list of faculty for this program.

Contact Information:
Program in the History of Science, Technology, and Medicine, University of Minnesota, 154 Shepherd Labs, 100 Union Street S.E., Minneapolis, MN 55455 (612-624-7069; fax: 612-301-1442)
Email: hstm@umn.edu
Website: http://www.hstm.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 54
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program offers opportunities for advanced research and study in the history of science and technology (with particular expertise in the history of the physical sciences, history of the biological sciences, history of technology, and history of American science and technology) and in the history of medicine.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students must have a bachelor's degree with a preferred grade average of B or better and must be capable of interdisciplinary study. Depending on background and career objectives, additional preparatory studies may be necessary in either the science-technology area or in the humanities and social sciences.

Although it is not strictly required for admission, it's strongly recommended that applicants submit a GRE score.

Special Application Requirements:
All application materials are submitted online to the University. Check the HSTM website (www.hstm.umn.edu) for more information. Applications are accepted for fall semester only. The application deadline is December 1.

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
24 credits are required in the major.
6 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading proficiency in two foreign languages.

A minimum GPA of 3.30 is required for students to remain in good standing.

Following the guidelines in the Graduate Student Handbook for the program (www.hstm.umn.edu), Ph.D. students select one of two tracks: the history of science and technology or the history of medicine; and within the chosen track, select courses subject to distribution requirements in terms of area and period. All of the courses selected for the requirements must be passed with a grade of B or better.

The PhD requires 54 credits consisting of the following: 6 credits in the required courses HSCI/HMED 8112 and 8113, 15 additional credits in HSCI or HMED courses, 3 credits in a directed study course, 6 credits in outside fields, and 24 thesis credits.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

History of Medicine
Required Courses
Take the two-semester sequence of historiography and research preparation, plus an additional 15 credits in HMED chosen in consultation with advisor.
HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
HMED 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)

Directed Study
Take 3 credits in a directed study course.
HMED 8631 - Directed Study (1.0 - 6.0 cr)
or HMED 8632 - Directed Study (1.0 - 6.0 cr)

Outside Field Coursework
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or towards a doctoral minor.

Thesis Credits
Take 24 credits after passing preliminary oral exam.
HMED 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

History of Science and Technology
Required Courses
Take the two-semester sequence of historiography and research preparation, plus an additional 15 credits in HSCI chosen in consultation with advisor.
HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
HSCI 8113 - Research Methods in the History of Science, Technology, and Medicine (3.0 cr)

Directed Study
Take 3 credits in a directed study course.
HSCI 8993 - Directed Studies (1.0 - 5.0 cr)
or HSCI 8994 - Directed Research (1.0 - 5.0 cr)

Outside Field Coursework
In consultation with advisor and the director of graduate studies, take 6 credits in courses from either the track alternative to the one in which you are enrolled, in outside fields, or towards a doctoral minor.

Thesis Credits
Take 24 credits after passing preliminary oral exam.
HSCI 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Human Rights M.H.R.
Global Studies Department
Graduate School

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 45
- This program does not require summer semesters for timely completion.
- Degree: Master of Human Rights

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's of human rights is a two-year interdisciplinary professional master's degree to prepare students to work in the field of human rights or to advance their knowledge and skills in the field. This degree equips graduate students with core professional and conceptual knowledge and analytical tools necessary to operate on the professional level in the field of human rights, along with the in-depth academic and professional training needed for the specific human rights area in which they practice or intend to practice. Students follow a core curriculum that includes the study of human rights norms and law, methodology, critical views of human rights, and human rights policy that will equip them with the skills needed to address the problems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, GRE scores, TOEFL scores (if applicable), at least three letters of recommendation, and an optional diversity statement.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 45 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.
Capstone Project: Students will participate in a three-credit capstone seminar rather than a thesis. The capstone seminar is one of the required core courses.

This program may be completed with a minor.
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

In addition to course requirements, a non-credit professional internship of 400 hours, supervised by the Human Rights Program, is required. Ideally, it will be completed during the summer after the first year.

4xxx-level courses are limited to language courses; other subjects allowed only with DGS approval.

**Human Rights Core**
- **PA 5885** - Human Rights Policy: Issues and Actors (3.0 cr)
- **PA 5886** - Master of Human Rights Cohort Seminar I (1.0 cr)
- **PA 5887** - Master of Human Rights Cohort Seminar II (1.0 cr)

Take 2 or more course(s) totaling 6 or more credit(s) from the following:
- **LAW 6886** - International Human Rights Law (3.0 cr)
- **GLOS 5403** - Human Rights Advocacy (3.0 cr)
- **SOC 8171** - Cross-Disciplinary Perspectives in Human Rights (3.0 cr)

**Professional Core**
Minimum 12 credits

**Quantitative**
- Higher-level options available for students with strong statistical background, with DGS approval.
- Take 1 or more course(s) from the following:
  - **PA 5031** - Statistics for Public Affairs (4.0 cr)
  - **PA 5032** - Applied Regression (2.0 cr)
  - **PA 5033** - Multivariate Techniques (2.0 cr)
  - **PA 5044** - Applied Regression, Accelerated (2.0 cr)
  - **SOC 5811** - Social Statistics for Graduate Students [MATH] (4.0 cr)
  - **STAT 5021** - Statistical Analysis (4.0 cr)
  - **STAT 5201** - Sampling Methodology in Finite Populations (3.0 cr)
  - **STAT 5401** - Applied Multivariate Methods (3.0 cr)

**Qualitative**
- Take 1 or more course(s) from the following:
  - **PA 5041** - Qualitative Methods for Policy Analysts (4.0 cr)
  - **OLPD 5061** - Ethnographic Research Methods (3.0 cr)
  - **SOC 8852** - Advanced Qualitative Research Methods: Ethnographic Practicum (3.0 cr)

**Management**
- Take 1 or more course(s) from the following:
  - **PA 5011** - Management of Organizations (3.0 cr)
  - **PA 5101** - Management and Governance of Nonprofit Organizations (3.0 cr)
  - **PA 5151** - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)

**Policy and Economic Analysis**
- Take 1 or more course(s) from the following:
  - **PA 5002** - Introduction to Policy Analysis (1.5 cr)
  - **PA 5021** - Microeconomics for Policy Analysis (3.0 cr)
  - **PA 5012** - The Politics of Public Affairs (3.0 cr)
  - **PA 5801** - Global Public Policy (3.0 cr)

**Capstone or Professional Paper**
- Take 1 or more course(s) from the following:
  - **PA 8081** - Capstone Workshop (3.0 cr)
  - **PA 8082** - Professional Paper-Writing Seminar (3.0 cr)
  - **PA 8921** - Master's: Professional Paper (Individual Option) (1.0 - 3.0 cr)

**Concentration and Electives**
Concentration (12 credits) plus electives to bring total credits to 45.

**Concentrations: Pre-Designed**
Students complete 12 credits in a pre-designed or self-designed concentration. Pre-designed concentrations are listed below. Consult the program or adviser for courses which do not appear but which may be eligible with consent of adviser.

**Human Rights, Race, and Ethnicity**
Take 12 or more credit(s) from the following:

- **AFRO 5866** - The Civil Rights and Black Power Movement, 1954–1984 (3.0 cr)
- **AFRO 8202** - Seminar: Intellectual History of Race (3.0 cr)
- **AFRO 8554** - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
- **PA 5002** - Introduction to Policy Analysis (1.5 cr)
- **PA 5311** - Program Evaluation (3.0 cr)
- **PA 5422** - Diversity and Public Policy (3.0 cr)
- **PA 5421** - Racial Inequality and Public Policy (3.0 cr)
- **PA 8302** - Applied Policy Analysis (4.0 cr)
- **PA 8312** - Analysis of Discrimination (4.0 cr)
- **PSY 8210** - Law, Race, and Social Psychology (3.0 cr)

-OR-

**Human Rights, Gender, and Sexuality**
Take 12 or more credit(s) from the following:

- **GWSS 5104** - Transnational Feminist Theory (3.0 cr)
- **GWSS 8101** - Intellectual History of Feminism (3.0 cr)
- **GWSS 8103** - Feminist Theories of Knowledge (3.0 cr)
- **LAW 6827** - Women's International Human Rights (2.0 cr)
- **PA 5601** - Global Survey of Gender and Public Policy (3.0 cr)
- **PA 5561** - Gender and International Development (3.0 cr)
- **PUBH 6675** - Women's Health (2.0 cr)

-OR-

**Human Rights in the Arts and Humanities**
Take 12 or more credit(s) from the following:

- **ARTS 5710** - Advanced Photography (4.0 cr)
- **ARTS 5760** - Experimental Film and Video (4.0 cr)
- **ENGW 5102** - Graduate Fiction Writing (4.0 cr)
- **ENGW 5106** - Graduate Literary Nonfiction Writing (4.0 cr)

-OR-

**Human Rights, NGO Leadership, and Management Course**
Take 12 or more credit(s) from the following:

- **PA 5101** - Management and Governance of Nonprofit Organizations (3.0 cr)
- **PA 5104** - Strategic Human Resource Management (3.0 cr)
- **PA 5108** - Board leadership development (1.0 cr)
- **PA 5116** - Financing Public and Nonprofit Organizations (1.5 cr)
- **PA 5123** - Philanthropy in America: History, Practice, and Trends (3.0 cr)
- **PA 5137** - Project Management in the Public Arena (1.5 cr)
- **PA 5144** - Social Entrepreneurship (3.0 cr)
- **PA 5145** - Civic Participation in Public Affairs (3.0 cr)
- **PA 5151** - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
- **PA 5251** - Strategic Planning and Management (3.0 cr)
- **PA 5311** - Program Evaluation (3.0 cr)
- **PA 5405** - Public Policy Implementation (3.0 cr)
- **PA 5501** - Theories and Policies of Development (3.0 cr)
- **PA 5801** - Global Public Policy (3.0 cr)
- **PA 5927** - Effective Grantwriting for Nonprofit Organizations (1.5 cr)

-OR-

**Human Rights and Project/Policy Evaluation**
Take 12 or more credit(s) from the following:

- **PA 5311** - Program Evaluation (3.0 cr)
- **PA 5103** - Leadership and Change (3.0 cr)
- **PA 5104** - Strategic Human Resource Management (3.0 cr)
- **PA 5105** - Integrative Leadership Seminar (3.0 cr)
- **PA 5145** - Civic Participation in Public Affairs (3.0 cr)
- **PA 5251** - Strategic Planning and Management (3.0 cr)
- **PA 5405** - Public Policy Implementation (3.0 cr)
- **PUBH 6852** - Program Evaluation in Health and Mental Health Settings (2.0 cr)
- **SW 8602** - Direct Practice Evaluation (2.0 cr)

-OR-
Human Rights and Development
Take 12 or more credit(s) from the following:
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
- OLPD 5107 - Gender, Education, and International Development (3.0 cr)
- OLPD 5121 - Educational Reform in International Context (3.0 cr)
- PA 5151 - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
- PA 5405 - Public Policy Implementation (3.0 cr)
- PA 5501 - Theories and Policies of Development (3.0 cr)
- PA 5503 - Economics of Development (3.0 cr)
- PA 5521 - Development Planning and Policy Analysis (4.0 cr)
- PA 5522 - International Development Policy, Families, and Health (3.0 cr)
- PA 5561 - Gender and International Development (3.0 cr)
- PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)

-OR-

Human Rights, Conflict and International Security
Take 12 or more credit(s) from the following:
- LAW 6027 - Law of the Sea (2.0 cr)
- LAW 6889 - Laws of War (3.0 cr)
- LAW 6918 - Rule of Law (2.0 cr)
- PA 5801 - Global Public Policy (3.0 cr)
- PA 5813 - US Foreign Policy: The Institutional Basis (3.0 cr)
- PA 5823 - Managing Humanitarian and Refugee Crises: Challenges for Policymakers & Practitioners (1.0 cr)
- PA 8821 - National Security Policy (3.0 cr)
- POL 5885 - International Conflict and Security (3.0 cr)
- POL 5465 - Democracy and Dictatorship in Southeast Asia [GP] (3.0 cr)
- SOC 5315 - Never Again! Memory & Politics after Genocide [GP] (3.0 cr)
- GLOS 5315 - Never Again! Memory & Politics after Genocide [GP] (3.0 cr)
- SOC 5411 - Terrorist Networks & Counterterror Organizations (3.0 cr)

-OR-

Human Rights and Migration
Take 12 or more credit(s) from the following:
- PA 5281 - Immigrants, Urban Planning and Policymaking in the U.S. (3.0 cr)
- PA 5301 - Population Methods & Issues for the United States & Global South (3.0 cr)
- PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
- PA 5452 - Immigration and Public Policy (3.0 cr)
- PA 5801 - Global Public Policy (3.0 cr)
- LAW 6027 - Law of the Sea (2.0 cr)
- LAW 6872 - Immigration Law (3.0 cr)
- CHIC 5374 - Migrant Farmworkers in the United States: Families, Work, and Advocacy [CIV] (4.0 cr)

-OR-

Human Rights: Crime, Law, and Justice
Take 12 or more credit(s) from the following:
- LAW 6648 - International Criminal Law (3.0 cr)
- LAW 6893 - Transitional Justice (2.0 cr)
- LAW 6918 - Rule of Law (2.0 cr)
- POL 5403 - Constitutions, Democracy, and Rights: Comparative Perspectives (3.0 cr)
- POL 5492 - Law and (In)Justice in Latin America (3.0 cr)
- SOC 5104 - Crime and Human Rights (3.0 cr)
- SOC 5170 - Sociology of International Law: Human Rights, Trafficking, and Business Regulation [GP] (3.0 cr)
- SOC 5411 - Terrorist Networks & Counterterror Organizations (3.0 cr)
- SOC 5315 - Never Again! Memory & Politics after Genocide [GP] (3.0 cr)
- GLOS 5315 - Never Again! Memory & Politics after Genocide [GP] (3.0 cr)

-OR-

Human Rights and Research Methods (Qualitative and/or Quantitative)
Take 12 or more credit(s) from the following:
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- PA 5031 - Statistics for Public Affairs (4.0 cr)
- PA 5032 - Applied Regression (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
- OR -

Human Rights and Area Studies (Latin America, Asia, Middle East, Africa, etc.)
The potential area studies courses offered at the University are vast. Students will work with their advisor to select at least 12 credits for an area studies concentration.

Take 12 or more credit(s) from the following:

-OR-

Human Rights and Public Health
Take 12 or more credit(s) from the following:
- BTHX 5520 - Social Justice and Bioethics (3.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
- PUBH 6034 - Evaluation (3.0 cr)
- PUBH 6115 - Worker Protection Law (1.0 cr)
- PUBH 6134 - Sustainable Development and Global Public Health (2.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6606 - Children's Health: Issues, Programs, and Policies (2.0 cr)
- PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
- PUBH 6801 - Health and Human Rights (3.0 cr)
- PUBH 6804 - Community Mental Health (2.0 cr)

-OR-

Human Rights and Environment
Take 12 or more credit(s) from the following:
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- LAW 6215 - Environmental Law (3.0 cr)
- LAW 6400 - International Environmental Law (2.0 cr)
- LAW 7012 - CL: Environment and Energy Law (3.0 cr)
- PA 5242 - Environmental Planning, Policy, and Decision Making (3.0 cr)
- PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5723 - Water Policy (3.0 cr)
- PA 5724 - Climate Change Policy (3.0 cr)
- PA 5752 - Material-Energy Flows & Sustainable Development (3.0 cr)
- PA 5721 - Energy Systems and Policy (3.0 cr)
Twin Cities Campus
Integrated Biosciences M.S.
Medical School - Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota, 251 Swenson Science Building, 1035 Kirby Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8152)
Email: ibs@d.umn.edu
Website: http://www.d.umn.edu/ibs

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The all-University integrated biosciences graduate program offers study toward the master of science (M.S.) degree under Plan A (coursework and original thesis). The program has two areas of emphasis: cell, molecular, and physiological (CMP) biology; and ecology, organismal, and population (EOP) biology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree or equivalent from an accredited college/university in the biological or physical sciences or a related field. Background in a variety of subdisciplines is appropriate preparation.

Other requirements to be completed before admission:
Recommended undergraduate courses for applicants pursuing the M.S. degree include one year each of chemistry, biology, and physics. One semester of calculus is also recommended. Applicants are strongly encouraged to have taken other advanced courses in chemistry, biology, additional calculus, and introductory statistics.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

**Required Coursework**
Twin Cities Campus
Integrated Biosciences Ph.D.
Medical School - Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Integrated Biosciences Graduate Program, University of Minnesota, 251 Swenson Science Building, 1035 Kirby Drive, Duluth, MN 55812 (218-726-6898; fax: 218-726-8152)
Email: ibs@d.umn.edu
Website: http://www.d.umn.edu/ibs

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 56
- This program does not require summer semesters for timely completion.
- The Integrated Biosciences Ph.D. is an All-University program delivered on the Twin Cities and Duluth Campuses. The University of Minnesota Twin Cities is the degree granting authority for the Integrated Biosciences Ph.D. program in Duluth.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The all-University integrated biosciences graduate program offers study toward the doctor of philosophy (Ph.D.) degree. The program has two areas of emphasis: cell, molecular, and physiological (CMP) biology; and ecology, organismal, and population (EOP) biology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree or equivalent from an accredited college or university in the biological or physical sciences or a related field.

Other requirements to be completed before admission:
Recommended undergraduate courses for applicants pursuing the Ph.D. degree include one year each of chemistry, biology, physics, calculus, and advanced chemistry. One semester (minimum) of statistics is also recommended.

Additional recommended courses for students in the ecology, organismal, and population (EOP) emphasis include one year of calculus, one semester each of ecology and evolutionary biology along with one course in two of the following subjects: genetics, cell biology, and biochemistry.

Additional recommended courses for students in the cell, molecular, and physiological (CMP) emphasis include one year of organic chemistry plus one course in each of the following: genetics, cell biology, and biochemistry.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80
The preferred English language test is Test of English as Foreign Language
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
20 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Ph.D. Written Preliminary Examination: In addition to completing the curriculum for the major and internal related fields, students will be required to pass both a written and oral preliminary examination prior to completing the Ph.D. program. The preliminary written examination will be administered once the student has completed the majority of the required coursework. This will typically occur in the summer of the second year. The written examination will consist of a completed NIH or NSF grant application for the student's proposed research project. The project will be evaluated by the Thesis Examining Committee, which will also serve as the student's Final Oral Examining Committee to provide continuity of advice during the length of the student's research program.

Ph.D. Oral Preliminary Examination: The oral preliminary examination will be administered within two months of the successful completion of the preliminary written examination. The examination will be administered by the graduate faculty according to University regulations and all students will be required to pass the oral examination to continue in the Ph.D. program.

Most students will complete the requirements for the Ph.D. degree within five years. The final oral defense will be conducted by the graduate faculty according to University regulations. It will consist of a public seminar presented by the student.
Twin Cities Campus
Integrative Health & Wellbeing Coaching M.A.
Spirituality and Healing, Earl E Bakken Center for Graduate School

Link to a list of faculty for this program.

Contact Information:
Earl E. Bakken Center for Spirituality & Healing
C591 Mayo Memorial Building
420 Delaware St SE
Minneapolis, MN 55455
Email: fider002@umn.edu
Website: http://www.csh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 38
- This program requires summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health coaching is an emerging method of partnering with clients to achieve their overall goals. It is practiced from a holistic perspective that views each person as intrinsically whole and the ultimate expert in his or her healing journey. Health coaching is being offered in a wide range of venues including hospitals, clinics, community health and fitness facilities, corporations, educational institutions, and private practices. The Earl E. Bakken Center for Spirituality & Healing is a pioneer in the field of health coaching, working to advance education, research and care model innovation.

The master's of arts degree is designed for individuals with a bachelor's degree in either a healthcare or non-healthcare field. Students without healthcare backgrounds are eligible for admission with the prior completion of required prerequisites. The degree is designed for students who wish to further their education so that they may hold positions of responsibility coaching individuals and groups, initiating and leading new coaching service lines, and developing outcomes assessments for coaching initiatives. Although the instruction is based on research in the field, this Plan B degree is not intended to provide intensive research training and is understood to be a terminal degree. The degree consists of 38 credits of coursework, including 6 credits of electives, and a minimum 2-credit project that is presented in both verbal and written format prior to graduation. Elective credits may be chosen from CSPH courses or students may complete a minor from other departments, if approved by their academic adviser. In all cases, the student's faculty advisor will work with the student in designing a program plan that accommodates the student's unique learning objectives.

The program is structured to prepare a wide variety of students to be skilled and knowledgeable advocates and support agents for individuals on their path to greater health and healing. Students must be able to demonstrate the following competencies prior to being admitted into the Advanced Health Coaching Seminar:
- Demonstrate appropriate knowledge of major health problems.
- Demonstrate familiarity with the routine mechanics of the conventional healthcare system and its processes.
- Demonstrate basic knowledge of physical and psychological symptoms related to disease and treatment.
- Demonstrate basic knowledge of pharmacology, pathophysiology of disease, and assessment of symptoms across the life span.

Students whose previous coursework does not enable them to meet these competencies may arrange with the program director to do additional outside coursework during the first year of the program.

University of Minnesota health coaching programs are accredited by the National Consortium for Credentialing Health and Wellness Coaches (www.nccchwco.org). Students in the MA program are eligible to sit for National Board Certification when the required core courses are completed (CSPH 5701-5702-5703-5705-5706).

Program Delivery
This program is available:
* primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.
Bachelor's degree in a health-related field or a bachelor's in a non-health-related field with specific coursework in psychology, physiology, and statistics from an accredited institution.

**Required prerequisites**

**Required Prerequisite Coursework**

Previous coursework in basic psychology, human physiology, and statistics must have been completed. Statistics must be completed within 7 years prior to application. All prerequisites must be completed at an accredited institution for a grade equal to B (3.0) or better.

Other requirements to be completed before admission:

In addition to the University's online application, applicants submit a personal statement describing their goals for the program and their professional qualifications. This three to five page statement should focus on what led to the applicant's interest in health coaching as a professional activity, including a description of interest in, and experience with, holistic integrative health and healing. Three letters of recommendation, transcripts and a current CV or resume are also required. All items are uploaded into the University's online application. Selected applicants will be invited for admissions interviews.

**Special Application Requirements:**

The M.A. is designed for individuals with a bachelor's degree in a health-related field, or for professionals without healthcare backgrounds who have extensive interest in working with individuals and groups to optimize wellbeing, assuming completion of required prerequisites. All applicants must have completed the prerequisite courses in Physiology, Statistics (within past 7 years) and Psychology before beginning core health coaching coursework the Fall semester of entrance. All prerequisite courses must be completed at an accredited institution with a grade equal to B (3.0) or better.

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan B:** Plan B requires 32 to 38 major credits and 0 to 6 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** Culminating course for the master's of arts in integrative health and wellbeing coaching program. Students use coaching data collected during the Advanced Health Coaching Practicum, Health Coaching Professional Internship, or group health coaching course to write and orally present a research-informed concept analysis and retrospective narrative case report. Prerequisites: Integrative Health and Wellbeing Coaching MA student, CSPH 5701, 5702, 5703, 5704, 5706, 5707, 5709* (*may be taken concurrently).

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Up to 3 credits of CSPH courses at the 4xxx-level may be used for elective credits.
Core Required Coursework
Core courses require a grade of B (3.0) or higher, except CSPH 5705 and 8701, which require a grade of S. Final skills assessments for CSPH 5702, 5703, 5705 and 5709 must earn scores of at least 80%. If a core course or skills assessment is not successfully completed, students may be required at instructors' discretion to repeat the course and/or take CSPH 5712 for 1-2 credits for remediation within one calendar year. CSPH 5712 taken for remediation cannot be counted as an elective.

CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
CSPH 5702 - Fundamentals of Health Coaching II (4.0 cr)
CSPH 5703 - Advanced Health Coaching Practicum (3.0 cr)
CSPH 5704 - Business of Health Coaching (2.0 cr)
CSPH 5705 - Health Coaching Professional Internship (2.0 cr)
CSPH 5706 - Lifestyle Medicine (2.0 cr)
CSPH 5707 - Coaching People with Clinical Conditions (2.0 cr)
CSPH 5709 - Health and Wellbeing Group Coaching (2.0 cr)
CSPH 8701 - Integrative Health and Wellbeing Coaching MA Capstone Project (2.0 cr)

Additional Required Coursework
Each additional required course must be taken on an A-F grading basis and requires a grade of B- or higher. Failure to earn at least a B- may result in required remediation work at the discretion of the instructor, the program director, and the director of graduate studies. Remediation work may include repeating the course for an acceptable grade within one calendar year.

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
KIN 5123 - Motivational Interventions in Physical Activity (3.0 cr)

Electives
Complete 6 CSPH credits. Up to 3 credits may be from 4xxx-level CSPH courses. Electives require a passing grade of C- or higher or S, provided an overall GPA of 3.0 is maintained.

Take 6 or more credit(s) from the following:
- CSPH 4311 - Foundations of Hatha Yoga: Alignment & Movement Principles (3.0 cr)
- CSPH 4312 - Hatha Yoga Philosophy, Lifestyle, & Ethics (3.0 cr)
- CSPH 4313 - Hatha Yoga Teaching Principles & Methodology (2.0 cr)
- CSPH 5000 - Explorations in Integrative Therapies and Healing Practices (1.0 - 4.0 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
- CSPH 5118 - Whole Person, Whole Community: The Reciprocity of Wellbeing (3.0 cr)
- CSPH 5121 - Whole Systems Healing: Health and the Environment (2.0 cr)
- CSPH 5201 - Spirituality and Resilience (2.0 cr)
- CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)
- CSPH 5212 - Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community (3.0 cr)
- CSPH 5215 - Forgiveness and Healing: A Journey Toward Wholeness (3.0 cr)
- CSPH 5225 - Meditation: Integrating Body and Mind (2.0 cr)
- CSPH 5226 - Advanced Meditation: Body, Brain, Mind, and Universe (1.0 cr)
- CSPH 5311 - Introduction to Traditional Chinese Medicine (2.0 cr)
- CSPH 5313 - Acupuncture (1.0 cr)
- CSPH 5315 - Traditional Tibetan Medicine: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5317 - Yoga: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5318 - Tibetan Medicine, Ayurveda, and Yoga in India (4.0 cr)
- CSPH 5319 - Yoga and Ayurveda in India (4.0 cr)
- CSPH 5331 - Foundations of Shamanism and Shamanic Healing (2.0 cr)
- CSPH 5332 - Global Healing Traditions: Amazonia Plant Spirit Medicine (2.0 cr)
- CSPH 5341 - Overview of Indigenous Hawaiian Healing (2.0 cr)
- CSPH 5343 - Ayurveda Medicine: The Science of Self-healing (2.0 cr)
- CSPH 5401 - People, Plants, and Drugs: Introduction to Ethnopharmacology (3.0 cr)
- CSPH 5421 - Botanical Medicines in Integrative Healthcare (3.0 cr)
- CSPH 5423 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
- CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
- CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
- CSPH 5511 - Interdisciplinary Palliative Care: An Experiential Course in a Community Setting (2.0 cr)
- CSPH 5512 - Spiritual Aspects of Palliative Care (2.0 cr)
- CSPH 5513 - Living Well, Dying Well: Empowering Patient Communication at the End of Life (2.0 cr)
- CSPH 5521 - Therapeutic Landscapes (3.0 cr)
- CSPH 5522 - Therapeutic Horticulture (3.0 cr)
- CSPH 5523 - Applications in Therapeutic Horticulture (2.0 cr)
- CSPH 5533 - Introduction to Energy Healing (2.0 cr)
• CSPH 5535 - Reiki Healing (1.0 cr)
• CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
• CSPH 5541 - Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind (2.0 cr)
• CSPH 5555 - Introduction to Body and Movement-based Therapies (2.0 cr)
• CSPH 5561 - Overview of the Creative Arts in Health and Healing (2.0 cr)
• CSPH 5601 - Music, Health and Healing (2.0 cr)
• CSPH 5605 - Movement and Music for Well-being and Healing (2.0 cr)
• CSPH 5631 - Healing Imagery I (2.0 cr)
• CSPH 5641 - Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3.0 cr)
• CSPH 5642 - Nature Heals: An Introduction to Nature-Based Therapeutics (3.0 cr)
• CSPH 5643 - Horse as Teacher: Intro to Nature-Based Therapeutics Equine-Assisted Activities & Therapies (EAAT) (3.0 cr)
• CSPH 5711 - Optimal Healing Environments (3.0 cr)
• CSPH 5712 - Supervised Health Coaching Skills Advancement (1.0 - 2.0 cr)
• CSPH 5713 - Health Coaching for Health Professionals (2.0 cr)
• CSPH 5805 - Wellbeing in the Workplace (3.0 cr)
• CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
• CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
• CSPH 5805 - Food Matters: Cook Like Your Life Depends On It (1.0 cr)
• CSPH 6000 - Integrative Therapies and Healing Practices Topics (1.0 - 4.0 cr)
• CSPH 8101 - Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research (2.0 cr)
• CSPH 8191 - Independent Study in Integrative Therapies and Healing Practices (1.0 - 6.0 cr)
Twin Cities Campus
Integrative Therapies and Healing Practices Minor
Spirituality and Healing, Earl E Bakken Center for
Graduate School

Link to a list of faculty for this program.

Contact Information:
Earl E. Bakken Center for Spirituality & Healing, Mayo Memorial Building, Room C591, MMC 505, 420 Delaware Street SE, Minneapolis, MN 55455 (612-624-9459; fax: 612-626-5280)
Website: http://www.csh.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The integrative therapies and healing practices minor is an interdisciplinary program designed to expose students to a global range of integrative, complementary, cross-cultural and spiritual healing practices. Courses enhance the preparation of graduate students in health sciences and other disciplines by developing knowledge and skills in the emerging field of integrative health care. Specifically, the minor provides students with a theoretical basis for applying integrative therapies and healing practices; prepares students to research integrative therapies and healing practices; and prepares students to work collaboratively with other health professionals and patients in a multicultural, pluralistic healthcare system. The curriculum includes a core introductory course that provides the theoretical foundation for the program. Students choose additional courses offered by the Earl E. Bakken Center for Spirituality & Healing in clinical applications, spirituality, or cross-cultural health and healing. The program draws upon the rich expertise of University and community-based faculty who encourage and challenge students to discover new ways of caregiving, and to cultivate diverse skills that will transform their life's work, experiences and relationships with others.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The minor is designed for graduate students pursuing health or other careers, and who are seeking to deepen their understanding of integrative therapeutic topics.

Graduate students come from wide-ranging backgrounds and careers, including nursing, pharmacy, medicine, nutrition, psychology, physical therapy, liberal studies and public health.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Note that students may not use course credits to satisfy requirements for both a major and the minor.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.
Masters

Required Course
All students complete the Introduction to Integrative Therapies and Healing Practices course.

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)

Elective Options
Take 2 or more course(s) totaling 5 or more credit(s) from the following:

- CSPH 5000 - Explorations in Integrative Therapies and Healing Practices (1.0 - 4.0 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
- CSPH 5118 - Whole Person, Whole Community: The Reciprocity of Wellbeing (3.0 cr)
- CSPH 5121 - Whole Systems Healing: Health and the Environment (2.0 cr)
- CSPH 5201 - Spirituality and Resilience (2.0 cr)
- CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)
- CSPH 5212 - Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community (3.0 cr)
- CSPH 5215 - Forgiveness and Healing: A Journey Toward Wholeness (3.0 cr)
- CSPH 5225 - Meditation: Integrating Body and Mind (2.0 cr)
- CSPH 5226 - Advanced Meditation: Body, Brain, Mind, and Universe (1.0 cr)
- CSPH 5311 - Introduction to Traditional Chinese Medicine (2.0 cr)
- CSPH 5313 - Acupressure (1.0 cr)
- CSPH 5315 - Traditional Tibetan Medicine: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5317 - Yoga: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5318 - Tibetan Medicine, Ayurveda, and Yoga in India (4.0 cr)
- CSPH 5319 - Yoga and Ayurveda in India (4.0 cr)
- CSPH 5331 - Foundations of Shamanism and Shamantic Healing (2.0 cr)
- CSPH 5332 - Global Healing Traditions: Amazonia Plant Spirit Medicine (2.0 cr)
- CSPH 5341 - Overview of Indigenous Hawaiian Healing (2.0 cr)
- CSPH 5343 - Ayurveda Medicine: The Science of Self-healing (2.0 cr)
- CSPH 5401 - People, Plants, and Drugs: Introduction to Ethnopharmacology (3.0 cr)
- CSPH 5421 - Botanical Medicines in Integrative Healthcare (3.0 cr)
- CSPH 5423 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
- CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
- CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
- CSPH 5511 - Interdisciplinary Palliative Care: An Experiential Course in a Community Setting (2.0 cr)
- CSPH 5512 - Spiritual Aspects of Palliative Care (2.0 cr)
- CSPH 5513 - Living Well, Dying Well: Empowering Patient Communication at the End of Life (2.0 cr)
- CSPH 5521 - Therapeutic Landscapes (3.0 cr)
- CSPH 5522 - Therapeutic Horticulture (3.0 cr)
- CSPH 5523 - Applications in Therapeutic Horticulture (2.0 cr)
- CSPH 5533 - Introduction to Energy Healing (2.0 cr)
- CSPH 5535 - Reiki Healing (1.0 cr)
- CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
- CSPH 5541 - Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind (2.0 cr)
- CSPH 5555 - Introduction to Body and Movement-based Therapies (2.0 cr)
- CSPH 5556 - Overview of the Creative Arts in Health and Healing (2.0 cr)
- CSPH 5560 - Movement and Music for Well-being and Healing (2.0 cr)
- CSPH 5563 - Healing Imagery I (2.0 cr)
- CSPH 5564 - Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3.0 cr)
- CSPH 5564 - Nature Heals: An Introduction to Nature-Based Therapeutics (3.0 cr)
- CSPH 5600 - Nature Heals: An Introduction to Nature-Based Therapeutics Equine-Assisted Activities & Therapies (EAAT) (3.0 cr)
- CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
- CSPH 5706 - Lifestyle Medicine (2.0 cr)
- CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
- CSPH 5711 - Optimal Healing Environments (3.0 cr)
- CSPH 5712 - Supervised Health Coaching Skills Advancement (1.0 - 2.0 cr)
- CSPH 5713 - Health Coaching for Health Professionals (2.0 cr)
- CSPH 5805 - Wellbeing in the Workplace (3.0 cr)
- CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
- CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
- CSPH 5905 - Food Matters: Cook Like Your Life Depends On It (1.0 cr)
- CSPH 6000 - Integrative Therapies and Healing Practices Topics (1.0 - 4.0 cr)
- CSPH 8101 - Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research (2.0 cr)
- CSPH 8191 - Independent Study in Integrative Therapies and Healing Practices (1.0 - 6.0 cr)
Doctoral

Required Course
All students take the Introduction to Integrative Therapies and Healing Practices course.

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)

Elective Options
Take 2 or more course(s) totaling 9 or more credit(s) from the following:

- CSPH 5000 - Explorations in Integrative Therapies and Healing Practices (1.0 - 4.0 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
- CSPH 5118 - Whole Person, Whole Community: The Reciprocity of Wellbeing (3.0 cr)
- CSPH 5121 - Whole Systems Healing: Health and the Environment (2.0 cr)
- CSPH 5201 - Spirituality and Resilience (2.0 cr)
- CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)
- CSPH 5212 - Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community (3.0 cr)
- CSPH 5215 - Forgiveness and Healing: A Journey Toward Wholeness (3.0 cr)
- CSPH 5225 - Meditation: Integrating Body and Mind (2.0 cr)
- CSPH 5226 - Advanced Meditation: Body, Brain, Mind, and Universe (1.0 cr)
- CSPH 5311 - Introduction to Traditional Chinese Medicine (2.0 cr)
- CSPH 5313 - Acupressure (1.0 cr)
- CSPH 5315 - Traditional Tibetan Medicine: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5317 - Yoga: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5318 - Tibetan Medicine, Ayurveda, and Yoga in India (4.0 cr)
- CSPH 5319 - Yoga and Ayurveda in India (4.0 cr)
- CSPH 5331 - Foundations of Shamanism and Shamanic Healing (2.0 cr)
- CSPH 5392 - Global Healing Traditions: Amazonia Plant Spirit Medicine (2.0 cr)
- CSPH 5341 - Overview of Indigenous Hawaiian Healing (2.0 cr)
- CSPH 5343 - Ayurveda Medicine: The Science of Self-healing (2.0 cr)
- CSPH 5401 - People, Plants, and Drugs: Introduction to Ethnopharmacology (3.0 cr)
- CSPH 5421 - Botanical Medicines in Integrative Healthcare (3.0 cr)
- CSPH 5423 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
- CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
- CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
- CSPH 5511 - Interdisciplinary Palliative Care: An Experiential Course in a Community Setting (2.0 cr)
- CSPH 5512 - Spiritual Aspects of Palliative Care (2.0 cr)
- CSPH 5513 - Living Well, Dying Well: Empowering Patient Communication at the End of Life (2.0 cr)
- CSPH 5521 - Therapeutic Landscapes (3.0 cr)
- CSPH 5522 - Therapeutic Horticulture (3.0 cr)
- CSPH 5523 - Applications in Therapeutic Horticulture (2.0 cr)
- CSPH 5533 - Introduction to Energy Healing (2.0 cr)
- CSPH 5535 - Reiki Healing (1.0 cr)
- CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
- CSPH 5541 - Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind (2.0 cr)
- CSPH 5555 - Introduction to Body and Movement-based Therapies (2.0 cr)
- CSPH 5561 - Overview of the Creative Arts in Health and Healing (2.0 cr)
- CSPH 5601 - Music, Health and Healing (2.0 cr)
- CSPH 5605 - Movement and Music for Well-being and Healing (2.0 cr)
- CSPH 5631 - Healing Imagery I (2.0 cr)
- CSPH 5641 - Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3.0 cr)
- CSPH 5642 - Nature Heals: An Introduction to Nature-Based Therapeutics (3.0 cr)
- CSPH 5643 - Horse as Teacher: Intro to Nature-Based Therapeutics Equine-Assisted Activities & Therapies (EAAT) (3.0 cr)
- CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
- CSPH 5706 - Lifestyle Medicine (2.0 cr)
- CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
- CSPH 5711 - Optimal Healing Environments (3.0 cr)
- CSPH 5712 - Supervised Health Coaching Skills Advancement (1.0 - 2.0 cr)
- CSPH 5713 - Health Coaching for Health Professionals (2.0 cr)
- CSPH 5805 - Wellbeing in the Workplace (3.0 cr)
- CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
- CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
- CSPH 5905 - Food Matters: Cook Like Your Life Depends On It (1.0 cr)
- CSPH 6000 - Integrative Therapies and Healing Practices Topics (1.0 - 4.0 cr)
- CSPH 8101 - Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research (2.0 cr)
- CSPH 8191 - Independent Study in Integrative Therapies and Healing Practices (1.0 - 6.0 cr)

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Information current as of August 31, 2018
Twin Cities Campus
Integrative Therapies and Healing Practices Postbaccalaureate Certificate
Spirituality and Healing, Earl E Bakken Center for Graduate School

Link to a list of faculty for this program.

Contact Information:
Earl E. Bakken Center for Spirituality & Healing, Mayo Memorial Building, Room C591, MMC 505, 420 Delaware Street SE, Minneapolis, MN 55455 (612-624-9459; fax: 612-626-5280).
Website: http://www.csh.umn.edu

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2018
• Length of program in credits: 12 to 20
• This program does not require summer semesters for timely completion.
• Degree: Integrative Thpys & Healing Practices PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The integrative therapies and healing practices certificate is an interdisciplinary program designed to expose students to a global range of integrative, complementary, cross-cultural and spiritual healing practices. Courses enhance the preparation of students in health sciences and other disciplines by developing knowledge and skills in the emerging field of integrative health care. Specifically, the certificate provides students with a theoretical basis for applying integrative therapies and healing practices; prepares students to research integrative therapies and healing practices; and prepares students to work collaboratively with other health professionals and patients in a multicultural, pluralistic healthcare system. The curriculum for the 12-credit certificate includes a core introductory course that provides the theoretical foundation for the program, as well as a course in self care. Students choose additional courses offered by the Earl E. Bakken Center for Spirituality & Healing in clinical applications, spirituality, or cross-cultural health and healing. The program draws upon the rich expertise of University and community-based faculty who encourage and challenge students to discover new ways of care-giving, and to cultivate diverse skills that will transform their life’s work, experiences and relationships with others.

The certificate is also available with a health coaching track. Students who pursue the certificate with the health coaching track complete a total of 20 credits, including the core introductory course.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The certificate requires applicants to have a bachelors or higher degree in a healthcare or healthcare-related field.

Other requirements to be completed before admission:
This field of study is designed for the healthcare professional, those currently enrolled in a graduate health professions program, board-certified chaplains with at least three years in a healthcare setting, and those with a non-healthcare bachelor's degree with direct work experience in health related areas. Such fields include nursing, social work, psychology, medicine, nutrition, pharmacy, chiropractic, naturopathy, and licensed acupuncture.

The certificate’s Health Coaching track requires an applicant interview prior to admission.

Special Application Requirements:
In addition to the University's online application, applicants submit a personal statement describing their goals for obtaining the certificate and their professional qualifications. The statement should address your interest in integrative therapies and short- and long-term professional goals after completing the program. Two letters of recommendation are required, preferably one from an academic source and one from an employer/supervisor. A current C.V. or resume is also required. All items are uploaded directly into the University's online application.
Applicants to the Health Coaching track are required to provide three letters of recommendation and a three-to-five page personal statement focusing on what led to the applicant's interest in Health Coaching as a professional activity, including a description of interest in and experience with holistic integrative health and healing. A current C.V. or resume is also required. All items are uploaded directly into the University's online application. Selected Health Coaching track applicants will be chosen for admissions interviews.

The application deadline is March 15 for entrance into program the following fall semester.

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

#### Required Course

Students pursuing either the general certificate or the certificate with health coaching track must complete this course.

**CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)**

#### Certificate Options

**General Certificate**

**Self Care Course Requirement**

General certificate students complete one of the two following courses for at least one credit:

- **CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)**
- or **CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)**

**Electives**

Students are encouraged to choose electives, in consultation with their faculty advisor, from CSPH courses consistent with their academic training and professional goals. Up to 3 credits of CSPH courses at the 4xxx-level may be applied to the certificate.

Take 3 or more course(s) totaling 8 or more credit(s) from the following:

- **CSPH 4311 - Foundations of Hatha Yoga: Alignment & Movement Principles (3.0 cr)**
- **CSPH 4312 - Hatha Yoga Philosophy, Lifestyle, & Ethics (3.0 cr)**
- **CSPH 4313 - Hatha Yoga Teaching Principles & Methodology (2.0 cr)**
- **CSPH 5000 - Explorations in Integrative Therapies and Healing Practices (1.0 - 4.0 cr)**
- **CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)**
- **CSPH 5111 - Ways of Thinking about Health (2.0 cr)**
- **CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)**
- **CSPH 5118 - Whole Person, Whole Community: The Reciprocity of Wellbeing (3.0 cr)**
- **CSPH 5121 - Whole Systems Healing: Health and the Environment (2.0 cr)**
- **CSPH 5201 - Spirituality and Resilience (2.0 cr)**
- **CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)**
- **CSPH 5212 - Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community (3.0 cr)**
- **CSPH 5215 - Forgiveness and Healing: A Journey Toward Wholeness (3.0 cr)**
- **CSPH 5225 - Meditation: Integrating Body and Mind (2.0 cr)**
- **CSPH 5226 - Advanced Meditation: Body, Brain, Mind, and Universe (1.0 cr)**
• CSPH 5311 - Introduction to Traditional Chinese Medicine (2.0 cr)
• CSPH 5313 - Acupressure (1.0 cr)
• CSPH 5315 - Traditional Tibetan Medicine: Ethics, Spirituality, and Healing (2.0 cr)
• CSPH 5317 - Yoga: Ethics, Spirituality, and Healing (2.0 cr)
• CSPH 5318 - Tibetan Medicine, Ayurveda, and Yoga in India (4.0 cr)
• CSPH 5319 - Yoga and Ayurveda in India (4.0 cr)
• CSPH 5331 - Foundations of Shamanism and Shamanic Healing (2.0 cr)
• CSPH 5332 - Global Healing Traditions: Amazonia Plant Spirit Medicine (2.0 cr)
• CSPH 5341 - Overview of Indigenous Hawaiian Healing (2.0 cr)
• CSPH 5343 - Ayurveda Medicine: The Science of Self-healing (2.0 cr)
• CSPH 5401 - People, Plants, and Drugs: Introduction to Ethnopharmacology (3.0 cr)
• CSPH 5421 - Botanical Medicines in Integrative Healthcare (3.0 cr)
• CSPH 5423 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
• CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
• CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
• CSPH 5511 - Optimal Healing Environments: An Experiential Course in a Community Setting (2.0 cr)
• CSPH 5512 - Spiritual Aspects of Palliative Care (2.0 cr)
• CSPH 5513 - Living Well, Dying Well: Empowering Patient Communication at the End of Life (2.0 cr)
• CSPH 5521 - Therapeutic Landscapes (3.0 cr)
• CSPH 5522 - Therapeutic Horticulture (3.0 cr)
• CSPH 5523 - Applications in Therapeutic Horticulture (2.0 cr)
• CSPH 5533 - Introduction to Energy Healing (2.0 cr)
• CSPH 5535 - Reiki Healing (1.0 cr)
• CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
• CSPH 5541 - Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind (2.0 cr)
• CSPH 5544 - Introduction to Body and Movement-based Therapies (2.0 cr)
• CSPH 5561 - Overview of the Creative Arts in Health and Healing (2.0 cr)
• CSPH 5601 - Music, Health, and Healing (2.0 cr)
• CSPH 5605 - Movement and Music for Well-being and Healing (2.0 cr)
• CSPH 5631 - Healing Imagery I (2.0 cr)
• CSPH 5641 - Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3.0 cr)
• CSPH 5642 - Nature Heals: An Introduction to Nature-Based Therapeutics (3.0 cr)
• CSPH 5643 - Horse as Teacher: Intro to Nature-Based Therapeutics Equine-Assisted Activities & Therapies (EAAT) (3.0 cr)
• CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
• CSPH 5706 - Lifestyle Medicine (2.0 cr)
• CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
• CSPH 5711 - Optimal Healing Environments (3.0 cr)
• CSPH 5712 - Supervised Health Coaching Skills Advancement (1.0 - 2.0 cr)
• CSPH 5713 - Health Coaching for Health Professionals (2.0 cr)
• CSPH 5805 - Wellbeing in the Workplace (3.0 cr)
• CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
• CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
• CSPH 5905 - Food Matters: Cook Like Your Life Depends On It (1.0 cr)
• CSPH 6000 - Integrative Therapies and Healing Practices (1.0 - 4.0 cr)
• CSPH 8101 - Critiquing and Synthesizing Complementary and Alternative Healing Practices (CAHP) Research (2.0 cr)
• CSPH 8191 - Independent Study in Integrative Therapies and Healing Practices (1.0 - 6.0 cr)

-OR-

Health Coaching track
Coursework for the certificate with the health coaching track is detailed in sub-plan requirements.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Health Coaching
Health coaching is an emerging method of partnering with clients to achieve their overall goals. It is practiced from a holistic perspective that views each person as intrinsically whole and the ultimate expert in his or her healing journey. Health coaching is being offered in a wide range of venues including hospitals, clinics, community health and fitness facilities, corporations, educational institutions, and private practices. The Earl E. Bakken Center for Spirituality & Healing is a pioneer in the field of health coaching, working to advance education, research and care model innovation.

University of Minnesota health coaching programs have program approval from the National Consortium for Credentialing Health and...
Wellness Coaches (www.ncchwc.org), and were permanently accredited in 2017.

In addition to the required CSPH 5101 introduction course, students complete the health coaching track course requirements for a minimum of 20 credits. Students are strongly encouraged to confer with their faculty advisor concerning the specific sequence in which the track coursework must be taken. A minimum GPA of 3.0 must be maintained for all required track coursework.

Coursework may be completed in a minimum of four semesters or may be spread over a variable amount of time up to a maximum of four years.

**Health Coaching track requirements**

- CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
- CSPH 5702 - Fundamentals of Health Coaching II (4.0 cr)
- CSPH 5703 - Advanced Health Coaching Practicum (3.0 cr)
- CSPH 5704 - Business of Health Coaching (2.0 cr)
- CSPH 5705 - Health Coaching Professional Internship (2.0 cr)
- CSPH 5706 - Lifestyle Medicine (2.0 cr)
**Twin Cities Campus**

**Molecular, Cellular, Developmental Biology and Genetics M.S.**

**Graduate School**

Link to a list of faculty for this program.

**Contact Information:**
MCDB&G Graduate Program, 6-160 Jackson Hall, 321 Church Street SE, University of Minnesota, Minneapolis, MN, 55455 (612-624-7470, fax: 612-626-6140)
Email: mcdbg@umn.edu OR gcgrad@umn.edu
Website: [http://mcdbg.umn.edu](http://mcdbg.umn.edu) OR [http://cbs.umn.edu/genetic-counseling/home](http://cbs.umn.edu/genetic-counseling/home)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 55
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The MCDB&G MS degree can be earned in one of three ways:

1. The MS with a genetic counseling track: This full-time program is designed to provide students with the academic foundation and clinical expertise necessary to enter the profession of genetic counseling. The curriculum integrates selected coursework with firsthand experience in the diagnostic medical genetics laboratories and supervised work in clinical settings with patients and families. The clinical component involves work in multiple clinical settings throughout the Twin Cities, the Mayo clinic in Rochester, St. Cloud and other centers. The MS with a genetic counseling track is accredited by the Accreditation Council for Genetic Counseling, and all graduates are eligible to apply to the American Board of Genetic Counseling for active candidate status and to sit for board certification.

2. The joint JD/MS-MCDB&G program: This program, offered in conjunction with the joint degree program in law, science, and technology, is unique in the nation and enables students to combine a JD degree with the MCDB&G MS degree. Students entering this program must be admitted to both MCDB&G and the Law School.

3. Eligible MCDB&G PhD students, who leave before they have completed their doctoral degree, may be offered the option to complete the MS. Eligibility to complete the MS is determined by the student's advisor and the MCDB&G director of graduate studies. MCDB&G does not offer a free-standing MS degree program in research.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

For genetic counseling admissions information go to [http://cbs.umn.edu/genetic-counseling/admissions](http://cbs.umn.edu/genetic-counseling/admissions)

For JD/MS admissions info - [http://cbs.umn.edu/academics/departments/gcd/graduate/prospective](http://cbs.umn.edu/academics/departments/gcd/graduate/prospective)

Other requirements to be completed before admission:
Applications to the MS with the genetic counseling track are stronger if the applicant has interacted with a practicing genetic counselor--in the clinical setting, or in another capacity such as personal interviews--that affords the applicant a real-life understanding of the profession. The application deadline date is December 15, and admission is for fall semester only.

Successful applicants to the joint JD/MS program must have previous research experience in an academic or industrial setting, in addition to any course-related laboratory experience. Demonstrated familiarity with and aptitude for basic science research is important prior to embarking on this dual degree program. The application deadline date is December 1, and admission is for fall semester only. Entry into the joint JD/MS program requires separate admittance to both the Law School and MCDB&G.

Applicants must submit their test score(s) from the following:
- GRE
International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 to 55 major credits and 0 credits outside the major. The final exam is written and oral.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Plan A
Take the following courses for at least 17 credits. Non-GCD coursework, selected in consultation with the advisor, may be applied to this requirement. MCDG 8900 can be taken for one credit four times (over four semesters). MCDG 8950 can be taken for one credit twice (over two semesters).
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
- GCD 8171 - Literature Analysis (1.0 - 2.0 cr)
- BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
- MCDG 8900 - Student Research Seminar (1.0 cr)
- MCDG 8950 - Teaching Practicum (1.0 cr)

Required Coursework
Take at least one of the following courses for three credits:
- GCD 5005 - Computer Programming for Biology (3.0 cr)
  or GCD 8920 - Special Topics (1.0 - 4.0 cr)

Plan A thesis credits
10 thesis credits are required.
Take 10 or more credit(s) from the following:
- MCDG 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Take at least 27 credits of coursework from the following list. Non-GCD courses, selected in consultation with the advisor, can be applied to this requirement. MCDG 8900 can be taken for one credit four times (over four semesters). MCDG 8950 can be taken for one credit twice (over two semesters).
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
- GCD 8171 - Literature Analysis (1.0 - 2.0 cr)
- BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
- MCDG 8900 - Student Research Seminar (1.0 cr)
- MCDG 8950 - Teaching Practicum (1.0 cr)

Required Coursework
Take at least one of the following courses for three credits:
- GCD 8920 - Special Topics (1.0 - 4.0 cr)
  or GCD 5005 - Computer Programming for Biology (3.0 cr)

Joint- or Dual-degree Coursework: JD/MS-MCDB&G (Joint Degree Program in Law, Science and Technology) Student may take a total of 12 credits in common among the academic programs.
Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Genetic Counseling
This sub-plan is limited to students completing the program under Plan B.

The MS with genetic counseling track is designed to be completed in 4 semesters and the interim summer. Most of the coursework is taken the first year, with more time during the second year dedicated to clinical experience. Students will be placed in laboratory and clinical observation experiences during the first year, five clinical genetic counseling internships during the second year, and will complete a minimum of 800 hours of direct patient contact. Students must earn a passing grade in their five clinical internship rotations and present a completed log of at least 50 clinical cases before the final oral examination.

Only under exceptional circumstances will the course of study be varied to meet the needs of a student with many of the courses already completed or with extensive clinical laboratory experience.

Plan B projects that qualify for the genetic counseling track include those that study a genetic counseling problem and add to the existing genetic counseling literature; produce materials that add to the profession, such as teaching materials or ways of evaluating the service; or produce educational materials needed by patient populations or the general public.

First Year
Students will observe in a clinical setting one day per week, and gain experience in the clinical laboratories one day per week. An elective course of the student's choice is an option.
Credit requirement for these courses are: GCD 6110 (6.0 crs); GCD 8994 (2.0 crs, S/N only). Register for GCD 8993 for 2.0 crs twice (over two semesters), S/N only.
GCD 8911 - Introduction to Genetic Counseling Skills and Practice (3.0 cr)
GCD 8912 - Genetic Counseling in Practice (4.0 cr)
GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
GCD 6110 - Science of Medical Practice (3.0 - 6.0 cr)
PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
GCD 8993 - Directed Studies (1.0 - 5.0 cr)
GCD 8994 - Research (1.0 - 5.0 cr)

Summer
During the summer between the first and second year of the program, students will begin their first clinical internship rotation with patient responsibilities. This 10-week rotation includes the expectation that students will spend between 2-3 days per week in the clinic. The students time in the clinic, which is set by the clinical supervisor, may exceed the 20-hour minimum.
GCD 8001 - Genetic Counseling Clinical Internship I (3.0 cr)

Second Year
Students will complete internships in a clinical setting 2-3 days per week for 15 weeks. An elective course of the student's choice is an option.

Register for GCD 8994 for 2.0 crs twice (over two semesters), S/N only.
GCD 8002 - Genetic Counseling Clinical Internship II (5.0 cr)
GCD 8003 - Genetic Counseling Clinical Internship III (5.0 cr)
GCD 8913 - Psychosocial Issues in Genetic Counseling I (3.0 cr)
GCD 8914 - Ethical and Legal Issues in Genetic Counseling (3.0 cr)
GCD 8915 - Psychosocial Issues in Genetic Counseling II (3.0 cr)
GCD 8994 - Research (1.0 - 5.0 cr)
Twin Cities Campus
Molecular, Cellular, Developmental Biology and Genetics Minor
Genetics, Cell Biology, and Development TCBS, Genetics, Cell Biology, and Development TMED
Graduate School

Link to a list of faculty for this program.

Contact Information:
MCDB&G Graduate Program, 6-160 Jackson Hall, 321 Church Street SE, University of Minnesota, Minneapolis, MN 55455 (612-624-7470, fax: 612-626-6140).
Email: mcdbg@umn.edu
Website: http://mcdbg.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 12
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program provides scientific training in the basic life sciences, with emphasis on the molecular basis of genetics, development, and cell biology. Areas of specialization include membranes, receptors, membrane transport, cell interactions, macromolecular structure, extracellular matrix, cytoskeleton, cell motility, regulation of gene expression, neuroscience, developmental mechanisms, human genetics, plant cell and molecular biology, genetic mechanisms, and genomics.

The program is interdisciplinary and involves faculty from several departments in the College of Biological Sciences, the Medical School, and the College of Food, Agricultural and Natural Resource Sciences. Institutes for human genetics, plant molecular genetics, biological process technology, Genome Engineering, Stem Cell research and a center for developmental biology provide opportunities for graduate study.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Courses taken for the minor must be graded A-F. A minimum GPA of 3.0 for these courses is required.

Required Coursework (9 credits)
Take the following courses for 9 credits. With approval of the director of the MCDB&G director of graduate studies, other courses may be substituted.

GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
GCD 8161 - Advanced Cell Biology and Development (3.0 cr)

Electives (3 credits)
Choose at least one of the following courses. GCD 8920 Special Topics: Computational Genomics must be taken for 3 credits.
GCD 8920 - Special Topics (1.0 - 4.0 cr)
or GCD 5005 - Computer Programming for Biology (3.0 cr)
Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Twin Cities Campus

Molecular, Cellular, Developmental Biology and Genetics Ph.D.
Genetics, Cell Biology, and Development TCBS, Genetics, Cell Biology, and Development TMED

Graduate School

Link to a list of faculty for this program.

Contact Information:
MCDB&G Graduate Program, 6-160 Jackson Hall, 321 Church Street SE, University of Minnesota, Minneapolis, MN 55455 (612-624-7470, fax: 612-626-6140)
Email: mcdbg@umn.edu
Website: http://mcdbg.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 48
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program provides scientific training in the basic life sciences, with emphasis on the molecular basis of genetics, development, and cell biology. Areas of specialization include membranes, receptors, membrane transport, cell interactions, macromolecular structure, extracellular matrix, cytoskeleton, cell motility, regulation of gene expression, neuroscience, developmental mechanisms, human genetics, plant cell and molecular biology, genetic mechanisms, and genomics.

The program is interdisciplinary and involves faculty from several departments in the College of Biological Sciences, the Medical School, and the College of Food, Agricultural and Natural Resource Sciences. Institutes for human genetics, plant molecular genetics, biological process technology, genome engineering, stem cell research and a center for developmental biology provide opportunities for graduate study.

PhD students are admitted to MCDB&G under the auspices of Molecular, Cellular and Structural Biology (MCSB), a first year program administered by the MCDB&G and the Biochemistry, Molecular Biology and Biophysics (BMBB) graduate programs. After the first year, students select either MCDB&G or BMBB to complete their degree. MCDB&G does NOT have a freestanding master's program.

The MCDB&G PhD is also part of two joint degree programs: The Joint Degree Program in Law, Health, and Life Sciences; and the MD/PhD program.

The Joint Degree Program in Law, Health, and Life Sciences is unique in the nation and enables students to combine a JD degree with a PhD or MS degree. Students entering this program must be admitted to both the MCDB&G program and the Law School. Admission qualifications for MS and PhD students are identical; only the student's career objectives distinguish the degree that they pursue.

The MD/PhD program emphasizes integration of the two major components of training--medicine and research--to ensure excellence in both. The program features a special curriculum that facilitates the transition from Medical School to the first year of formal graduate training, and the transition from graduate training back to Medical School.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Applications from students with an undergraduate or master's degree in the biological, chemical, or physical sciences are preferred.

Other requirements to be completed before admission:
Recommended academic preparation includes coursework in molecular biology, genetics, biology, and biochemistry.

Successful applicants must have previous research experience in an academic or industrial setting in addition to any course-related laboratory experiences. It is important to demonstrate familiarity with and aptitude for basic science research prior to embarking on a
graduate career in this program.

**Special Application Requirements:**
Applicants must submit three letters of recommendation from persons familiar with their academic and research capabilities. A statement of interests and goals, a complete set of transcripts, and scores from the General Test of the GRE are required. We will accept copies of the transcripts and GRE scores. The GRE Subject Test in biochemistry, cell and molecular biology, biology, or chemistry is strongly recommended, but not required. The deadline for receipt of completed applications is December 1. Graduate studies begin fall semester only.

Entry into the J.D./Ph.D. program requires separate admittance to both the Law School and the MCDB&G Graduate Program. Entry into the M.D./Ph.D. program requires separate admittance to both the Medical School and the MCDB&G Graduate Program.

Applicants must submit their test score(s) from the following:
- **GRE**
  - General Test - Verbal Reasoning: 550
  - General Test - Quantitative Reasoning: 600
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 107
  - Internet Based - Writing Score: 25
  - Internet Based - Reading Score: 25
  - Paper Based - Total Score: 625

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

**Required Coursework (24 credits)**
Take all of the following courses for at least 21 credits. MCDG 8900 can be taken for one credit four times (over four semesters). MCDG 8950 and MCDG 8920 each can be taken for one credit twice (over two semesters).
- **GCD 8151** - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- **GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
- **GCD 8161** - Advanced Cell Biology and Development (3.0 cr)
- **GCD 8171** - Literature Analysis (1.0 - 2.0 cr)
- **BIOC 8401** - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
- **MCDG 8920** - Special Topics (1.0 - 4.0 cr)
- **MCDG 8900** - Student Research Seminar (1.0 cr)
- **MCDG 8950** - Teaching Practicum (1.0 cr)

Take at least one of the following courses for 3 credits to complete the 24-credit course requirement.
- **GCD 5005** - Computer Programming for Biology (3.0 cr)
  or **GCD 8920** - Special Topics (1.0 - 4.0 cr)

**Electives**
Students may take additional elective credits if necessary. Select courses from the following list, or in consultation with the advisor and director of graduate studies.
Take 0 or more credit(s) from the following:
• BIOC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
• BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
• BIOC 5309 - Biocatalysis and Biodegradation (3.0 cr)
• BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
• BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• BIOC 5444 - Muscle (3.0 cr)
• BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
• BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
• CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
• GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
• GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
• MICA 8003 - Immunity and Immunopathology (4.0 cr)
• MICA 8004 - Cellular and Cancer Biology (4.0 cr)
• MATH 8540 - Topics in Mathematical Biology (1.0 - 3.0 cr)
• NSC 8211 - Developmental Neurobiology (3.0 cr)
• OBIO 8012 - Basic Concepts in Skeletal Biology (2.0 cr)
• PHCL 5111 - Pharmacogenomics (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• SCB 8181 - Stem Cell Biology (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• BIOC 5535 - Introduction to Modern Structural Biology -- Diffraction (2.0 cr)
• BIOC 5536 - Introduction to Modern Structural Biology - Nuclear Magnetic Resonance (2.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.

MCDG 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: Joint Degree Program in Law, Science and Technology (JD/PhD). Medical Scientist Training Program (MD/PhD) Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus

Water Resources Science M.S.
Water Resources Center
Graduate School

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, University of Minnesota, 193 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456)
Email: wrs@umn.edu
Website: http://wrs.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 32
- This program does not require summer semesters for timely completion.
- University of Minnesota, Duluth
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of interest: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. A Limnology and Oceanography track is also offered. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Plant Biology; and Soil, Water, and Climate. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Geography; Geological Sciences; and Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The program is flexible enough to accommodate students from a variety of backgrounds. Normally students have a bachelor's degree in physical, biological, or environmental science or engineering.

Other requirements to be completed before admission:
Recommended academic preparation includes one year (or two semesters) each of calculus, physics, and chemistry, and one biology course.

Availability of funding and willingness of a member of the graduate faculty to serve as an advisor are important criteria for admission to the program.

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Information current as of August 31, 2018
Special Application Requirements:
Applicants must submit three letters of recommendation via the University of Minnesota's ApplyYourself website. These letters should be from professors qualified to estimate applicant's class rank and evaluate their ability to complete a program of graduate study, or from persons who can assess their professional or research potential.

Applicants must also submit a résumé of their academic history and professional experience and a statement of purpose, including the proposed area of emphasis. Applicants should submit results of the GRE General Test. Students may be admitted any semester but are strongly encouraged to submit their application by December 15 for fall semester admission. More specific application instructions can be found on the program website: wrs.umn.edu/admissions/admissions-info.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 22 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is defined by the faculty advisor. The Plan B option is well suited to students who have little undergraduate course work in water resources science and thus need more coursework to gain the combination of depth and breadth needed in this field. Plan B projects involve field, laboratory, or computer work and the analysis, synthesis, or interpretation of data.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Credits from a minor may count toward the total credits of your master's degree, with adviser approval.

All course credits must be at the post-baccalaureate level, taken for graduate credits, and assessed at the graduate tuition rate. Masters students may request to transfer 40% of their coursework from another accredited graduate program.

Students with WRS-equivalent core courses taken as undergraduates may substitute other classes to meet program requirements, with advisor approval.

Water Resources Seminar

WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 cr)

Water Resources Ethics

WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Hydrology Core

Take at least 3 credits from the following:
BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)

Environmental/Water Chemistry Core
Take at least 3 credits from the following:
CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)

Limnology Core
EEB 5601 - Limnology (3.0 cr)

Water Resources Policy Core
WRS 5101 - Water Policy (3.0 cr)

WRS Electives
Plan A students need at least 9 credits from the following list and Plan B students need at least 17 credits.
APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
or BBE 5523 - Ecological Engineering Design (3.0 cr)
or BBE 5513 - Watershed Engineering (3.0 cr)
or BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
or BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or CEGE 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
or CEGE 4351 - Groundwater Mechanics (3.0 cr)
or CEGE 4352 - Groundwater Modeling (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
or CEGE 4511 - Hydraulic Structures (3.0 cr)
or CEGE 4512 - Open Channel Hydraulics (4.0 cr)
or CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
or CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
or CEGE 5551 - Environmental Microbiology (3.0 cr)
or CEGE 8504 - Theory of Unit Operations (4.0 cr)
or CEGE 8505 - Biological Processes (3.0 cr)
or CEGE 8506 - Stochastic Hydrology (4.0 cr)
or CEGE 8507 - Advanced Methods in Hydrology (4.0 cr)
or CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
or ESCI 8511 - Mechanics of Sediment Transport (3.0 cr)
or CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
or CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
or CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
or ESCI 8601 - Introduction to Stream Restoration (3.0 cr)
or CEGE 8602 - Stream Restoration Practice (2.0 cr)
or EEB 8602 - Stream Restoration Practice (2.0 cr)
or ESCI 8602 - Stream Restoration Practice (2.0 cr)
or CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
or EEB 4611 - Biogeochemical Processes (3.0 cr)
or EEB 5601 - Limnology (3.0 cr)
or ENT 5081 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
or ENT 5361 - Aquatic Insects (4.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
or ESCI 5971 - Field Hydrogeology (2.0 cr)
or ESPM 4216 - Contaminant Hydrology (3.0 cr)
or ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
or ESPM 5402 - Biometeorology (3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
or SOIL 5555 - Wetland Soils (3.0 cr)
or ESPM 5575 - Wetlands (3.0 cr)
or ESPM 5601 - Principles of Waste Management (3.0 cr)
or ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
or FW 4136 - Ichthyology (4.0 cr)
or FW 5604W - Fisheries Ecology and Management [WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or GEOG 5426 - Climatic Variations (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
or FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
or FW 5459 - Stream and River Ecology (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or WRS 5150 - Watershed Specialist Training (2.0 cr)

Plan A Option:
Take 10 or more credit(s) from the following:
- WRS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B Option
Select additional courses in consultation with your advisor to compete the Plan B option.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Limnology and Oceanography
The science of inland waters, or "limnology," includes the study of streams, lakes, ponds, and wetlands. While Lake Superior falls into this category, the style of research, particularly the nature of sampling and the scale of the processes investigated, makes the study of Lake Superior and other Great Lakes more akin to oceanography than to classical limnology.

A program that focuses on the study of both limnology and oceanography strengthens understanding of both systems, through comparative studies and by fostering interaction between groups that focus more strongly on one or the other system. Limnology and oceanography are by necessity interdisciplinary fields, with major components contributed by biological, geological, physical and chemical sciences. Such interdisciplinary fields in the modern research university require mechanisms to ensure cross-fertilization of ideas, approaches, methods, techniques, and knowledge. The limnology and oceanography track in WRS provides just such a much-needed mechanism. The goal of the program is to produce scientists with strong technical skills in aquatic science and a broad understanding of limnology and oceanography.

Students with WRS-equivalent coursework taken as undergraduates may substitute other classes to meet minimum credit requirements.

The faculty advisor must be a member of the limnology and oceanography track faculty.

Water Resources Seminar
- WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 cr)

Water Resources Ethics
- WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Hydrology Core for Limnology/Oceanography Students
Take at least 3 credits from the following:
- BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)

Environmental/Water Chemistry Core for Limnology/Oceanography Students
Take at least 3 credits from the following:
- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or EEB 4611 - Biogeochemical Processes (3.0 cr)

Limnology Core
EEB 5601 - Limnology (3.0 cr)

Water Resources Policy Core
WRS 5101 - Water Policy (3.0 cr)

WRS Electives
Plan A students need at least 9 credits from the following list and Plan B students need at least 17 credits. Electives must be selected under the guidance of your L&O committee. Choose from the following:

APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
or BBE 5523 - Ecological Engineering Design (3.0 cr)
or BBE 5513 - Watershed Engineering (3.0 cr)
or BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
or BBE 5513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
or CECE 4351 - Groundwater Mechanics (3.0 cr)
or CECE 4352 - Groundwater Modeling (3.0 cr)
or CECE 4501 - Hydrologic Design (4.0 cr)
or CECE 4502 - Water and Wastewater Treatment (3.0 cr)
or CECE 4511 - Hydraulic Structures (3.0 cr)
or CECE 4512 - Open Channel Hydraulics (4.0 cr)
or CECE 5541 - Environmental Water Chemistry (3.0 cr)
or CECE 4562 - Environmental Remediation Technologies (3.0 cr)
or CECE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
or CECE 5551 - Environmental Microbiology (3.0 cr)
or CECE 8504 - Theory of Unit Operations (4.0 cr)
or CECE 8505 - Biological Processes (3.0 cr)
or CECE 8506 - Stochastic Hydrology (4.0 cr)
or CECE 8507 - Advanced Methods in Hydrology (4.0 cr)
or CECE 8511 - Mechanics of Sediment Transport (3.0 cr)
or ESCI 8511 - Mechanics of Sediment Transport (3.0 cr)
or CECE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
or CECE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
or CECE 8601 - Introduction to Stream Restoration (3.0 cr)
or EEB 8601 - Introduction to Stream Restoration (3.0 cr)
or CECE 8602 - Stream Restoration Practice (2.0 cr)
or EEB 8602 - Stream Restoration Practice (2.0 cr)
or ESCI 8602 - Stream Restoration Practice (2.0 cr)
or CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
or EEB 4611 - Biogeochemical Processes (3.0 cr)
or EEB 5601 - Limnology (3.0 cr)
or ENT 5081 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
or ENT 5361 - Aquatic Insects (4.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
or ESCI 5971 - Field Hydrogeology (2.0 cr)
or ESPM 4216 - Contaminant Hydrology (3.0 cr)
or ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
or ESPM 5402 - Biometeorology (3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
or SOIL 5555 - Wetlands (3.0 cr)
or ESPM 5575 - Wetlands (3.0 cr)
or ESPM 5601 - Principles of Waste Management (3.0 cr)
or ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
or FW 4136 - Ichthyology (4.0 cr)
or FW 5604W - Fisheries Ecology and Management [WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or GEOG 5426 - Climatic Variations (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
or WRS 5150 - Watershed Specialist Training (2.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
or FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
or FW 5459 - Stream and River Ecology (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)

**Plan A Option:**
Take 10 or more credit(s) from the following:
- WRS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B Option**
Select additional courses in consultation with your advisor to complete the Plan B option.
Twin Cities Campus
Water Resources Science Minor
Water Resources Center
Graduate School

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, 193 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456; fax: 612-625-1263)
Email: wrs@umn.edu
Website: http://wrs.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.
- University of Minnesota Duluth

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas of interest: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. A Limnology and Oceanography track is also offered. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Plant Biology; and Soil, Water, and Climate. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Geography; Geological Sciences; and Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Required Course
WRS 5101 - Water Policy (3.0 cr)
**Electives**

Master's students must take at least 6 credits, and doctoral students must take at least 9 credits from the following list of electives.

Take 6 - 9 credit(s) from the following:

• BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
• CEGE 4501 - Hydrologic Design (4.0 cr)
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
• ESCI 4702 - General Hydrogeology (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)

**Program Sub-plans**

Students are required to complete one of the following sub-plans.

Students may not complete the program with more than one sub-plan.

**Master's**

**Doctoral**
Twin Cities Campus
Water Resources Science PhD
Water Resources Center
Graduate School

Link to a list of faculty for this program.

Contact Information:
Water Resources Science, 193 McNeal Hall, 1985 Buford Avenue, St. Paul MN 55108 (612-624-7456)
Email: wrs@umn.edu
Website: http://wrs.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 48
• This program does not require summer semesters for timely completion.
• The Water Resources Science PhD is an All-University program delivered on the Twin Cities and Duluth Campuses. The University of Minnesota Twin Cities is the degree granting authority for the Water Resources Science PhD program in Duluth.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This cross-campus interdisciplinary program provides comprehensive training in water resources science, with integration across scientific disciplines. A structured interdisciplinary graduate curriculum is offered. The program includes a set of core courses plus electives in the following areas: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. A limnology and oceanography track is also available. Approximately 80 courses offered within 15 other graduate programs are available to students majoring in water resources science.

The goal of the program is to produce scientists with strong technical skills in disciplines relevant to water resources and a broad understanding of 1) the hydrologic cycle and associated ecosystems, 2) the interconnectedness of the sciences involved in managing aquatic resources, and 3) the interplay between the biophysical sciences and social sciences in developing and implementing public policies related to water.

Students in the program develop the breadth of scientific knowledge appropriate to understand the complicated aquatic ecosystems and watersheds on which they will work, as well as social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

The program involves faculty from the following departments on the Twin Cities campus: Applied Economics; Bioproducts and Biosystems Engineering; Civil Engineering; Earth Sciences; Ecology, Evolution, and Behavior; Entomology; Environmental and Occupational Health; Fisheries, Wildlife, and Conservation Biology; Forest Resources; Geography; Horticultural Science; Plant Biology; and Soil, Water, and Climate. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering Geography; Geological Sciences; Physics; as well as the Large Lakes Observatory and the Natural Resources Research Institute in Duluth.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The program is flexible enough to accommodate students from a variety of backgrounds. Normally students have a master’s degree in physical, biological, or environmental science or engineering.

Other requirements to be completed before admission:
Recommended academic preparation includes one year (or two semesters) each of calculus, physics, and chemistry, and one biology course at the undergraduate level.

Availability of funding and willingness of a member of the graduate faculty to serve as an advisor are important criteria for admission to
the PhD program.

Special Application Requirements:
Applicants must submit three letters of recommendation via the University of Minnesota’s ApplyYourself website. These letters should be from professors qualified to estimate applicant's class rank and evaluate their ability to complete a program of graduate study, or from persons who can assess their professional or research potential.

Applicants must also submit a résumé of their academic history and professional experience and a statement of purpose, including the proposed area of emphasis. Applicants should submit results of the GRE. Students may be admitted any semester but are strongly encouraged to submit their application by December 15 for fall semester admission. More specific application instruction can be found on the program website: wrs.umn.edu/admissions/admissions-info.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Water Resources Seminar
Students must take WRS 8100 for 0.5 credits.
WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 cr)

Water Resources Ethics
WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Hydrology Core
Take at least 3 credits from the following:
BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)

Environmental/Water Chemistry Core
Take at least 3 credits from the following:
CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)

**Limnology Core**
- EEB 5601 - Limnology (3.0 cr)

**Water Resources Policy Core**
- WRS 5101 - Water Policy (3.0 cr)

**WRS Electives**
Approved electives to fulfill the required 24 course credits, choose from the following:
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- BBE 5523 - Ecological Engineering Design (3.0 cr)
- BBE 5513 - Watershed Engineering (3.0 cr)
- BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
- BBE 5513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
- PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
- CEGE 4351 - Groundwater Mechanics (3.0 cr)
- CEGE 4352 - Groundwater Modeling (3.0 cr)
- CEGE 4501 - Hydrologic Design (4.0 cr)
- CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
- CEGE 4511 - Hydraulic Structures (3.0 cr)
- CEGE 4512 - Open Channel Hydraulics (4.0 cr)
- CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
- CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
- CEGE 5551 - Environmental Microbiology (3.0 cr)
- CEGE 8504 - Theory of Unit Operations (4.0 cr)
- CEGE 8505 - Biological Processes (3.0 cr)
- CEGE 8505 - Stochastic Hydrology (4.0 cr)
- CEGE 8507 - Advanced Methods in Hydrology (4.0 cr)
- CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
- ESCI 8511 - Mechanics of Sediment Transport (3.0 cr)
- ESCI 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
- CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
- CEGE 8501 - Introduction to Stream Restoration (3.0 cr)
- EEB 8601 - Introduction to Stream Restoration (3.0 cr)
- CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
- CEGE 8602 - Stream Restoration Practice (2.0 cr)
- EEB 8602 - Stream Restoration Practice (2.0 cr)
- ESCI 8602 - Stream Restoration Practice (2.0 cr)
- CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
- EEB 4611 - Biogeochemical Processes (3.0 cr)
- EEB 5601 - Limnology (3.0 cr)
- ENT 5081 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
- ENT 5361 - Aquatic Insects (4.0 cr)
- ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
- ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
- ESCI 4702 - General Hydrogeology (4.0 cr)
- ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
- ESCI 5971 - Field Hydrogeology (2.0 cr)
- ESPM 4216 - Contaminant Hydrology (3.0 cr)
- ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
- ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
- ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
- ESPM 5402 - Biometeorology (3.0 cr)
- ESPM 5555 - Wetland Soils (3.0 cr)
- SOIL 5555 - Wetland Soils (3.0 cr)
- ESPM 5575 - Wetlands (3.0 cr)
- ESPM 5601 - Principles of Waste Management (3.0 cr)
- ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
- FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
- FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
- FW 4136 - Ichthyology (4.0 cr)
- FW 5604W - Fisheries Ecology and Management [WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or GEOG 5426 - Climatic Variations (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
or FW 5459 - Stream and River Ecology (3.0 cr)
or FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or WRS 5150 - Watershed Specialist Training (2.0 cr)

Thesis Requirement
All doctoral students must take 24 doctoral thesis credits.
WRS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Limnology and Oceanography
The science of inland waters, or "limnology," includes the study of streams, lakes, ponds, and wetlands. While Lake Superior falls into this category, the style of research, particularly the nature of sampling and the scale of the processes investigated, makes study of Lake Superior and other Great Lakes more akin to oceanography than to classical limnology. A program that focuses on the study of both limnology and oceanography strengthens understanding of both systems, through comparative studies and by fostering interaction between groups that focus more strongly on one or the other system. Limnology and oceanography are by necessity interdisciplinary fields, with major components contributed by biological, geological, physical, and chemical sciences.

This track within the cross-campus interdisciplinary WRS program provides comprehensive training in limnology and oceanography. As is the case for the WRS graduate program as a whole, the L&O program includes a set of core courses plus electives in the subfield of limnology and oceanography.

The goal of the program is to produce scientists with strong technical skills in aquatic science and a broad understanding of limnology and oceanography. Faculty on both Twin Cities and Duluth campuses participate in the limnology and oceanography track.

PhD students pursuing the limnology and oceanography track must have at least two members of the limnology and oceanography faculty on their committee, including the advisor.

Water Resources Seminar
Students must take WRS 8100 for 0.5 credits.
WRS 8100 - Interdisciplinary Seminar in Water Resources (0.5 cr)

Water Resources Ethics
WRS 8581 - Research and Professional Ethics in Water Resources and Environmental Science (0.5 cr)

Hydrology Core for Limnology/Oceanography Students
Take 3 or more credit(s) from the following:
• BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)

Environmental/Water Chemistry Core for Limnology/Oceanography Students
Take at least 3 credits from the following:
CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or EEB 4611 - Biogeochemical Processes (3.0 cr)

Limnology Core
EEB 5601 - Limnology (3.0 cr)

Water Resources Policy Core
WRS 5101 - Water Policy (3.0 cr)

WRS Electives
Approved electives to fulfill the required 24 course credits must be chosen in consultation with your L&O committee. Choose from the following:
APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
or BBE 5523 - Ecological Engineering Design (3.0 cr)
or BBE 5513 - Watershed Engineering (3.0 cr)
or BBE 5535 - Assessment and Diagnosis of Impaired Waters (3.0 cr)
or BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
or PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
or CEGE 4351 - Groundwater Mechanics (3.0 cr)
or CEGE 4352 - Groundwater Modeling (3.0 cr)
or CEGE 4501 - Hydrologic Design (4.0 cr)
or CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
or CEGE 4511 - Hydraulic Structures (3.0 cr)
or CEGE 4512 - Open Channel Hydraulics (4.0 cr)
or CEGE 4562 - Environmental Remediation Technologies (3.0 cr)
or CEGE 5541 - Environmental Water Chemistry (3.0 cr)
or CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
or CEGE 5551 - Environmental Microbiology (3.0 cr)
or CEGE 8504 - Theory of Unit Operations (4.0 cr)
or CEGE 8505 - Biological Processes (3.0 cr)
or CEGE 8506 - Stochastic Hydrology (4.0 cr)
or CEGE 8507 - Advanced Methods in Hydrology (4.0 cr)
or CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
or CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
or CEGE 8572 - Computational Environmental Fluid Dynamics (4.0 cr)
or CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
or EEB 8601 - Introduction to Stream Restoration (3.0 cr)
or ESCI 8601 - Introduction to Stream Restoration (3.0 cr)
or CEGE 8602 - Stream Restoration Practice (2.0 cr)
or EEB 8602 - Stream Restoration Practice (2.0 cr)
or ESCI 8602 - Stream Restoration Practice (2.0 cr)
or CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
or EEB 4611 - Biogeochemical Processes (3.0 cr)
or EEB 5601 - Limnology (3.0 cr)
or ENT 5081 - Insects, Aquatic Habitats, and Pollution (3.0 cr)
or ENT 5361 - Aquatic Insects (4.0 cr)
or ESCI 4401 - Aqueous Environmental Geochemistry (3.0 cr)
or ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
or ESCI 4702 - General Hydrogeology (4.0 cr)
or ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)
or ESCI 5971 - Field Hydrogeology (2.0 cr)
or ESPM 4216 - Contaminant Hydrology (3.0 cr)
or ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
or ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)
or ESPM 5256 - Natural Resource Law and the Management of Public Lands and Waters (3.0 cr)
or ESPM 5402 - Biometeorology (3.0 cr)
or ESPM 5555 - Wetland Soils (3.0 cr)
or SOIL 5555 - Wetland Soils (3.0 cr)
or ESPM 5575 - Wetlands (3.0 cr)
or ESPM 5601 - Principles of Waste Management (3.0 cr)
or ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
or FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
or FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
or FW 4136 - Ichthyology (4.0 cr)
or FW 5604W - Fisheries Ecology and Management [WI] (3.0 cr)
or FW 8459 - Stream and River Ecology (3.0 cr)
or FW 8465 - Fish Habitats and Restoration (3.0 cr)
or GEOG 5426 - Climatic Variations (3.0 cr)
or HORT 5071 - Ecological Restoration (4.0 cr)
or LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
or PUBH 6190 - Environmental Chemistry (3.0 cr)
or SOIL 5232 - Vadose Zone Hydrology (3.0 cr)
or WRS 5150 - Watershed Specialist Training (2.0 cr)
or ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
or FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
or FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
or FW 5459 - Stream and River Ecology (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)

**Thesis Requirement**
All doctoral students must take 24 doctoral thesis credits.

WRS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Development Practice M.D.P.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002).
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 50
- This program requires summer semesters for timely completion.
- Degree: Master of Development Practice

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of development practice (MDP) prepares students for careers in international development. The degree provides rigorous interdisciplinary training and equips students with the skills needed to address the problems of poverty and sustainable development in the developing world.

The MDP program is jointly administered by the Humphrey School of Public Affairs and the Interdisciplinary Center for the Study of Global Change (ICGC) and spans several academic units across the University of Minnesota. The degree provides training in policy analysis and management, health and education, natural sciences, social sciences, and interdisciplinary research methods. An international field experience and capstone workshop in development practice also are required.

The MDP degree is part of a global consortium of international development programs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
While no specific experience or academic pathway is required, students with a strong liberal education background and sound quantitative and analytical skills will be best prepared for academic success at the Humphrey School of Public Affairs.

Previous coursework in mathematics, statistics, and economics is recommended. Past applicants needing to strengthen this part of their skill set have found courses in introductory microeconomics, college algebra, and introductory statistics to be helpful preparation. Prior to admission students may find such courses available online; many are also available at the University of Minnesota.

International professional experience and foreign language competency are strongly preferred.

Special Application Requirements:
A complete application will include a University of Minnesota graduate application, personal statement, resume or C.V., transcripts, GRE scores, TOEFL scores, at least three letters of recommendation, and an optional diversity statement.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600
- IELTS - Total Score: 7

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 50 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The capstone project is an opportunity for MDP students in their second year to apply their knowledge through a client-based team project. Each student team and the workshop instructor will work with an NGO or public sector client engaged in some dimension of international development, preferably situated in a developing country, to identify a suitable project. While the specifics of each project will vary, all will include in-depth research, analysis, and the creation of a professional written report. Student teams will be expected to develop an appropriate presentation of this product to the relevant stakeholders. The projects will be done by small groups and can have multiple dimensions. Students will have the opportunity to integrate various aspects of development such as economic development, public health, environmental sustainability, education and skills development, and citizen participation.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Core Courses

AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
MDP 5001 - Ways of Knowing for Sustainable Development (2.0 cr)
MDP 5002 - Program Development Workshop (3.0 cr)
MDP 5004 - International Field Experience (3.0 cr)
MDP 5005 - Qualitative Methods for Development Practice (3.0 cr)
MDP 5100 - Post-Field / Pre-Capstone Seminar (1.0 cr)
MDP 5200 - Capstone Workshop in Development Practice (3.0 cr)
PA 5031 - Statistics for Public Affairs (4.0 cr)
PA 5501 - Theories and Policies of Development (3.0 cr)
PA 5503 - Economics of Development (3.0 cr)
PA 5521 - Development Planning and Policy Analysis (4.0 cr)

Additional Methods

PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
or PA 5032 - Applied Regression (2.0 cr)
or PA 5044 - Applied Regression, Accelerated (2.0 cr)
or PA 5311 - Program Evaluation (3.0 cr)
or EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
or OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

International Education

OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
or OLPD 5107 - Gender, Education, and International Development (3.0 cr)

Environmental Science

GEOG 5401 - Geography of Environmental Systems and Global Change (4.0 cr)
or GCC 5008 - Policy and Science of Global Environmental Change [ENV] (3.0 cr)

Leadership and Management

PA 5151 - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
or PA 5405 - Public Policy Implementation (3.0 cr)

Public Health

PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6134 - Sustainable Development and Global Public Health (2.0 cr)

Electives
Electives to bring total degree credits to at least 50. See www.hhh.umn.edu/degrees/mdp/ for further information.
Twin Cities Campus
Early Childhood Policy Postbaccalaureate Certificate
HHH Social Policy Academic Program
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Humphrey School of Public Affairs, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Early Childhood Policy PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The early childhood policy post-baccalaureate certificate gives students expertise in applying research-based knowledge to public policies affecting young children and the adults who care for them. In addition to completing coursework, students in the certificate program complete a capstone workshop or independent study focused on early childhood policy. These certificate components provide a vehicle for students to gain fundamental early childhood policy skills and knowledge and to foster connection between the University of Minnesota and the early childhood policy community. Students will have opportunities to participate in the work of the University of Minnesota's renowned Human Capital Research Collaborative.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission to the certificate will be allowed in fall and spring semesters. Admission decisions will be made by a subcommittee of the faculty advisory group. A complete application will include a Graduate School application, personal statement, resume or C.V., and transcripts.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Early Childhood and Public Policy Course (3 credits)
Take one of the following courses for a total of 3 credits:
PA 5413 - Early Childhood and Public Policy (3.0 cr)
or CPSY 5413 - Early Childhood and Public Policy (3.0 cr)

Electives (6 Credits)
Take one course from the Policy Electives list, and one course from the Open Electives list for a total of 6 credits.

Policy Electives (3 Credits)
Topics courses (such as PA 5490) are eligible if they cover early childhood.
PA 5415 - Economics of Early Childhood Development (1.5 - 3.0 cr)
PA 5442 - Education Law and Policy (3.0 cr)
FSOS 8104 - Family Policy Seminar (3.0 cr)
PREV 8001 - Prevention Science: Principles and Practices (3.0 cr)
SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)
SW 8804 - Child Welfare Policy (3.0 cr)

Open Electives (3 Credits)
Topics courses (such as PA 5490) are eligible if they cover early childhood.
PA 5311 - Program Evaluation (3.0 cr)
PA 5480 - Topics in Race, Ethnicity, and Public Policy (1.0 - 3.0 cr)
CI 8900 - Family, Youth, and Community Colloquium (1.0 - 4.0 cr)
CPSY 5251W - Social and Philosophical Foundations of Early Childhood Education [WI] (3.0 cr)
CPSY 5252 - Facilitating Social and Emotional Learning in Early Childhood Education (3.0 cr)
CPSY 5253 - Facilitating Cognitive and Language Learning in Early Childhood Education (3.0 cr)
CPSY 5254 - Facilitating Creative and Motor Learning in Early Childhood Education (2.0 cr)
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
EPSY 5849 - Multi-tiered Systems of Support in Early Childhood Education (3.0 cr)
FSOS 5032 - Family Systems Theories and Interventions (3.0 cr)
FSOS 8106 - Seminar: Families From an Economic Perspective (3.0 cr)
NURS 5032 - Human Response to Health and Illness: Children and Childbearing Families (5.0 cr)
OLPD 5346 - Politics of Education (3.0 cr)
OLPD 5356 - Disability Policy and Services (3.0 cr)
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
OLPD 8015 - Inquiry strategies in educational and organizational research (3.0 cr)
OLPD 8016 - Research Design and Educational Policy (3.0 cr)
OLPD 8087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
OLPD 8095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
OLPD 8302 - Educational Policy Perspectives (3.0 cr)
POL 8602 - Families, Children, and the State (3.0 cr)
PUBH 6606 - Children's Health: Issues, Programs, and Policies (2.0 cr)
PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 cr)
PUBH 6613 - Children and Youth With Special Health Care Needs (2.0 cr)
PUBH 6630 - Foundations of Maternal and Child Health Leadership (3.0 cr)
PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
PUBH 6655 - Principles and Programs in Maternal and Child Health (2.0 cr)
PUBH 6945 - From Kid to Community: Personal, Environmental, and Policy Interventions Targeting Youth Obesity (1.0 cr)
SW 5905 - Permanency in Child Welfare (2.0 cr)
SW 8363 - Social Work in Child Welfare (3.0 cr)

Final Paper (3 Credits)
The final paper can be completed by taking PA 8081, 8082, 8921 or 8991. The paper must have a focus on early childhood policy.
Papers may be completed under other designators by permission.
PA 8081 - Capstone Workshop (3.0 cr)
or PA 8082 - Professional Paper-Writing Seminar (3.0 cr)
or PA 8921 - Master's: Professional Paper (Individual Option) (1.0 - 3.0 cr)
or PA 8991 - Independent Study (0.5 - 4.0 cr)

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Information current as of August 31, 2018
Twin Cities Campus
Election Administration Postbaccalaureate Certificate
HHH Politics and Governance Academic Program
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Humphrey School of Public Affairs, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Election Administration PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The election administration post-baccalaureate certificate prepares students across the country for mid-career positions in election administration. Students will acquire and develop the skills and knowledge of election operations and procedures they need to serve as election staff or to further their existing careers in election administration. All courses are offered in an on-line format and include topics such as election law, election design, and voter participation.

Program Delivery
This program is available:
• completely online (all program coursework can be completed online)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to the certificate will be allowed in fall and spring semesters. Admission decisions will be made by a subcommittee of the faculty advisory group. The application must include a personal statement, resume or C.V., and transcripts.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Core
PA 5971 - Survey of Election Administration (3.0 cr)
PA 5972 - Elections and the Law (3.0 cr)
PA 5973 - Strategic Management of Election Administration (2.0 cr)
PA 5974 - Election Administration Capstone Project (2.0 cr)

Electives

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Information current as of August 31, 2018
Take 2 or more credit(s) from the following:
• PA 5975 - Election Design (2.0 cr)
• PA 5976 - Voter Participation (1.0 cr)
• PA 5982 - Data Analysis for Election Administration (2.0 cr)
• PA 5983 - Cybersecurity and Elections (1.0 cr)
Twin Cities Campus

Human Services Leadership Postbaccalaureate Certificate
HHH Leadership and Management Academic Program
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- N/A

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human service professionals face extraordinary challenges that require innovative thinking and an interdisciplinary approach. The certificate in human services leadership provides mid-career professionals knowledge and skills in leadership, public policy, and public service redesign for greater success plus increased potential for advancement to serve in mid- to senior-level leadership positions in county, state, and nonprofit agencies. Designed with input from industry leaders, the program is intended for working professionals involved in human service program development and delivery. The program allows students to complete a professional 12-credit graduate-level certificate that can serve as a stepping stone to the mid-career master of public affairs degree.

Accreditation
This program is accredited by N/A

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Special Application Requirements:
At least 8 years of post-baccalaureate professional work experience. Pre-baccalaureate experience may be considered for applicants with a significant gap between completion of high school and the bachelor's degree. Sufficient prior academic preparation as demonstrated in a four-year bachelor's degree. A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, TOEFL scores (if applicable), at least three letters of recommendation, and a diversity statement.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Listening Score: 25
  - Internet Based - Writing Score: 25
  - Internet Based - Reading Score: 25
  - Internet Based - Speaking Score: 25
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7
• MN Batt
Key to test abbreviations (TOEFL, IELTS, MN Batt).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Coursework
PA 5161 - Human-Centered Service Redesign (3.0 cr)
PA 5162 - Public Service Redesign Workshop (3.0 cr)

Elective Courses
PA 5190 is limited to "Leading Across Boundaries" (2 cr).
Take 6 or more credit(s) from the following:
• PA 5011 - Management of Organizations (3.0 cr)
• PA 5103 - Leadership and Change (3.0 cr)
• PA 5137 - Project Management in the Public Arena (1.5 cr)
• PA 5190 - Topics in Public and Nonprofit Leadership and Management (1.0 - 3.0 cr)
• PA 5311 - Program Evaluation (3.0 cr)
• PA 5405 - Public Policy Implementation (3.0 cr)
• PA 5421 - Racial Inequality and Public Policy (3.0 cr)
• PA 5927 - Effective Grantwriting for Nonprofit Organizations (1.5 cr)
• OLPD 5011 - Leading Organizational Change: Theory and Practice (3.0 cr)
• PA 5145 - Civic Participation in Public Affairs (3.0 cr)
  or PA 5253 - Designing Planning and Participation Processes (3.0 cr)
• GCC 5023 - Grand Challenge: Leading Across Sectors to Address Grand Challenges [CIV] (3.0 cr)
  or PA 5105 - Integrative Leadership Seminar (3.0 cr)
Twin Cities Campus
Nonprofit Management Postbaccalaureate Certificate
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Graduate Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002).
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 13
- This program does not require summer semesters for timely completion.
- Degree: Nonprofit Management PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The nonprofit management certificate program is designed for both current students and professionals who are employed in nonprofit organizations, especially persons who do not have a formal educational background in managing and leading a nonprofit organization. Students acquire knowledge and skills in effective leadership and management, organizational development, nonprofit governance, strategic planning, policy analysis, human resource development, finance, and fundraising. This program offers a wide array of elective courses appropriate to a broad range of nonprofit settings.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited institution.

Other requirements to be completed before admission:
2 or more years experience as paid or volunteer staff member with nonprofit organizations.

Special Application Requirements:
A complete application will include a University of Minnesota application, personal statement, resume or C.V., and transcripts.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.
13 credits of coursework are required, including 7.5 credits of required courses. Required courses must be taken for a letter grade. In consultation with the faculty adviser, remaining elective credits are chosen to meet the student's individual goals and interests.

**Required Core Courses (7.5 credits)**
- PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
- PA 5251 - Strategic Planning and Management (3.0 cr)
- PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)

**Electives**
Students should take at least 5.5 credits from Electives. OTHER COURSES ALLOWED WITH ADVISOR APPROVAL.

Take 2 or more course(s) from the following:
- PA 5102 - Organization Performance and Change (3.0 cr)
- PA 5103 - Leadership and Change (3.0 cr)
- PA 5104 - Strategic Human Resource Management (3.0 cr)
- PA 5105 - Board Leadership Development (1.0 cr)
- PA 5114 - Budget Analysis in Public and Nonprofit Orgs (1.5 cr)
- PA 5116 - Financing Public and Nonprofit Organizations (1.5 cr)
- PA 5123 - Philanthropy in America: History, Practice, and Trends (3.0 cr)
- PA 5135 - Managing Conflict: Negotiation (3.0 cr)
- PA 5137 - Project Management in the Public Arena (1.5 cr)
- PA 5144 - Social Entrepreneurship (3.0 cr)
- PA 5145 - Civic Participation in Public Affairs (3.0 cr)
- PA 5151 - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
- PA 5190 - Topics in Public and Nonprofit Leadership and Management (1.0 - 3.0 cr)
- PA 5311 - Program Evaluation (3.0 cr)
- PA 5405 - Public Policy Implementation (3.0 cr)
- PA 5920 - Skills Workshop (0.5 - 4.0 cr)
- PA 5927 - Effective Grantwriting for Nonprofit Organizations (1.5 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5607 - Organization Development (3.0 cr)
- OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)
- OLPD 8703 - Public Policy in Higher Education (3.0 cr)
- PUBH 6557 - Health Finance I (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- SW 5552 - Global Social Work and Social Development (3.0 cr)
- SW 5904 - Facilitation and Conflict Management: Humanistic Approach (2.0 cr)
- SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)
- SW 8552 - Advanced Community Practice: Leadership, Planning, and Program Development (3.0 cr)
- SW 8561 - Human Resources Management in Human Services Agencies (3.0 cr)
- SW 8562 - Human Services Finances (2.0 cr)
- SW 8563 - Advanced Policy Advocacy (3.0 cr)
- SW 8804 - Child Welfare Policy (3.0 cr)
- SW 8805 - Aging and Disability Policy (3.0 cr)
- SW 8806 - Health and Mental Health Policy (3.0 cr)
- SW 8807 - International and Comparative Social Welfare Policy (3.0 cr)
- SW 8902 - Social Work Supervision, Consultation, and Leadership (2.0 cr)
- PA 5105 - Integrative Leadership Seminar (3.0 cr)
  or LAW 6623 - Integrative Leadership: From Theory to Practice (3.0 cr)
  or MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
  or OLPD 6402 - Integrative Leadership Seminar (3.0 cr)
  or PUBH 6702 - Integrative Leadership Seminar (3.0 cr)

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Information current as of August 31, 2018
Twin Cities Campus
Policy Issues on Work and Pay Postbaccalaureate Certificate
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Graduate Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Ave S, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Policy Issues on Work and Pay PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Policy Issues in Work and Pay certificate provides an understanding of, and the ability to evaluate and develop, federal, state, and local policies that affect the employment relationship. Students learn about the role of government in the employment relationship, including statutes, and how employers, unions, and the government interpret and utilize policies. Core courses are drawn from the Humphrey School of Public Affairs as well as the Center for Human Resources and Labor Studies in the Carlson School of Management, with auxiliary courses in law, history, sociology, and applied economics.

The certificate consists of at least 15 credits. Students complete 10 elective credits that allow them to focus on the area of public policy that is most relevant to their professional and educational goals and needs. Some elective courses require prerequisites, which do not count toward the certificate.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Mathematics courses at least through algebra; a one-semester course in microeconomics.

Special Application Requirements:
A complete application will include a Graduate School application, personal statement, resume or C.V., transcripts, and a diversity statement.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Required Courses (6 credits)**

Public Policies on Work and Pay
- PA 5431 - Public Policies on Work and Pay (3.0 cr)
- or HRIR 5655 - Public Policies on Work and Pay (3.0 cr)

Social Safety Nets/Social Insurance Programs
- Must take PA 5022: Economics of Social Insurance Programs (3 cr) to satisfy this requirement.
- PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)

**Elective Courses (9 credits)**
Take at least 9 credits from the following list, or select other elective coursework with the approval of the director of graduate studies.

- HRIR 5222 - Managing Diversity (2.0 cr)
- HRIR 5252 - Employment and Labor Law for the HRIR Professional (2.0 cr)
- HRIR 6701 - Labor Relations and Collective Bargaining (4.0 cr)
- PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
- PA 8386 - Research Methods in Public Policy (2.0 cr)
- APEC 5511 - Labor Economics (3.0 cr)
- LAW 6203 - Labor Law (2.0 cr)
- LAW 6625 - Disability in the Workplace (3.0 cr)
- LAW 6631 - Employment Discrimination (3.0 cr)
- LAW 6632 - Employment Law (3.0 cr)
- LAW 6833 - Alternative Dispute Resolution (2.0 - 3.0 cr)
- SOC 8421 *(Inactive)* (3.0 cr)
Twin Cities Campus
Public Affairs Leadership Postbaccalaureate Certificate
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Public Affairs Leadership PBac Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Certificate in Public Affairs Leadership offers mid-career professionals specific knowledge and skills in leadership, management, public policy, and analysis to succeed in today’s challenging environment. Intended for working professionals, the program allows students to complete a professional certificate in an integrative cohort format in nine months. The certificate stands on its own or can be a stepping stone to the mid-career Master of Public Affairs degree. The Certificate in Public Affairs Leadership is offered in a unique combination of on campus and online sessions, making it convenient for students from outside of the Twin Cities area to participate. The program starts with an intensive, introductory week in August, followed by monthly Friday-Saturday meetings from September to May. This cohort approach combines the intensity and depth of in-person instruction paired with the convenience of online coursework.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year bachelor's degree from an accredited U.S. university or foreign equivalent at time of enrollment is required.

Other requirements to be completed before admission:
At least 10 years of post-baccalaureate professional work experience is preferred and highly recommended. Pre-baccalaureate experience may be considered for applicants with a significant gap between completion of high school and the bachelor's degree. Sufficient prior academic preparation as demonstrated in a four-year bachelor's degree.

A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, TOEFL scores (when applicable), at least three letters of recommendation, and a diversity statement.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Required Courses
PA 5051 - Public Affairs Leadership I (2.0 cr)
PA 5052 - Public Affairs Leadership II (2.0 cr)
PA 5053 - Policy Analysis in Public Affairs (2.0 cr)
PA 5054 - Program Design and Implementation Analysis (2.0 cr)
PA 5055 - Qualitative Research Methods and Analysis (2.0 cr)
PA 5056 - Quantitative Research Methods and Analysis (2.0 cr)
Twin Cities Campus
Public Affairs M.P.A.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue S, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Public Affairs

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of public affairs (MPA) is intended for mid-career professionals, and prepares them for public leadership and policy making. The program is typically completed in two to three years of part-time enrollment. The program can be completed in one calendar year (fall, spring, summer semesters) by attending full-time. Courses in a self-designed concentration provide a knowledge base and skills to achieve career goals. Concentration courses can be from Public Affairs and from the 150+ graduate programs across the University of Minnesota. Required courses in this degree are taken in a cohort format. The cohort meets on campus one full week in August, one Friday/Saturday each month (September-May), and online throughout the year.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Special Application Requirements:
At least 10 years of post-baccalaureate professional work experience is preferred and highly recommended. Pre-baccalaureate experience may be considered for applicants with a significant gap between completion of high school and the bachelor's degree. Applicants must demonstrate sufficient prior academic preparation as demonstrated in a four-year bachelor's degree. A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, TOEFL scores (if applicable), at least three letters of recommendation, and an optional diversity statement.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 30 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.
**Capstone Project:** The capstone project is designed to provide a learning opportunity for students to apply their knowledge through a client-based team project. The workshop includes a written report for the client and an oral presentation to the client that summarizes the major findings of the semester-long study.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Required Core Courses (12 credits)**

- PA 5051 - Public Affairs Leadership I (2.0 cr)
- PA 5052 - Public Affairs Leadership II (2.0 cr)
- PA 5053 - Policy Analysis in Public Affairs (2.0 cr)
- PA 5054 - Program Design and Implementation Analysis (2.0 cr)
- PA 5055 - Qualitative Research Methods and Analysis (2.0 cr)
- PA 5056 - Quantitative Research Methods and Analysis (2.0 cr)

**Capstone Project**

- PA 5080 - Capstone Preparation Workshop (1.0 cr)
- PA 8081 - Capstone Workshop (3.0 cr)

**Remaining Credits (14)**

MPA students self-design a concentration, choosing from a wide variety of classes, including skills courses in management, analysis, and planning; courses in such areas as global policy; social policy; economic and community development; science, technology, and environmental policy; and urban and regional policy and planning; or courses from more than 150 different graduate programs in the University of Minnesota system.
Twin Cities Campus
Public Affairs, Ph.D.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue S, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhphd@umn.edu
Website: http://www.hhh.umn.edu/degrees/phd/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The doctor of philosophy (PhD) in public affairs offers students opportunities for rigorous, advanced study in the areas of public affairs, policy analysis, and planning. The goal of the PhD program is to train researchers who will enter academia or join highly respected public or nonprofit institutions involved in cutting edge research in public affairs, policy, planning, and management. Successful applicants to the program will be clear about the research they wish to undertake and why they think the Humphrey School is the best place to do that research. Students are expected to make original theoretical, methodological, or substantive contributions in the area of their specialization (sub-plans). Sub-plans are offered in public policy; urban planning; management and governance; and science, technology, and environmental policy. Students will be expected to complete the degree program within five years.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
The general requirement is the capability to pursue PhD-level work. Typically, an applicant should have an academic record from a recognized college that includes undergraduate coursework in microeconomics and mathematics (either calculus, statistics, or algebra).

Special Application Requirements:
A complete application will include a U of MN graduate application, a personal statement that includes motivation for pursuing doctoral studies, a resume or C.V., transcripts, GRE scores, a writing sample, TOEFL scores (if applicable), and at least three letters of recommendation.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements
42 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Practical teaching experience: Each candidate must complete training in pedagogy and a teaching experience as a course instructor or teaching assistant (TA) with instructional responsibilities. The pedagogical training may take place prior to or concurrent with the teaching experience. Evidence of English-speaking proficiency is required prior to the teaching experience.

Dissertation requirement: Each candidate must complete original academic research and fulfill a dissertation requirement by completing either an academic thesis or three related academic papers that are judged by the student's committee to be of publishable quality.

Core Courses
Key concepts, literature, and research questions of public affairs. PA 8006 (1.5 credits) is taken two semesters for total of 3 credits.
PA 8003 - Integrative Doctoral Seminar in Public Affairs I (3.0 cr)
PA 8004 - Integrative Doctoral Seminar in Public Affairs II (3.0 cr)
PA 8005 - Doctoral Research Seminar in Public Affairs (3.0 cr)
Take exactly 3 credit(s) from the following:
• PA 8006 - Current Research in Public Affairs: Topics, Approaches, and Cultures (1.5 cr)

Research Methods
Take 4 or more courses totaling 12 or more credits, including at least one course each in: research design, quantitative methods, and qualitative methods. Courses are chosen in consultation with advisor based on student's background and research interests. Students may use previous graduate-level coursework for up to three of the four methods courses (up to 9 credits) with approval of PhD program director.

Academic Sub-plan
Students are required to complete one of four sub-plans consisting of a minimum of 18 credits, as described below. Sub-plans offer students the opportunity for advanced, rigorous study in the theory, methods, and practice in their field. Students may use up to 18 credits of previous graduate-level coursework to fulfill sub-plan requirements.

Doctoral Thesis Credits
Take 24 or more credit(s) from the following:
• PA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Management and Governance
Required Courses
PA 8106 - Research Seminar in Management, Leadership & Governance (3.0 cr)
PA 5012 - The Politics of Public Affairs (3.0 cr)
Electives
12 credits in the area of public and nonprofit leadership and management. Courses are chosen in consultation with advisor based on student's background and research interests.

Public Policy
The public policy sub-plan is a self-designed set of topic-based courses (minimum 18 credits) determined by the student and advisor with the consent of the other faculty in the sub-plan area.

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Information current as of August 31, 2018
Science, Technology, and Environmental Policy
PA 8706 or PA 5711
   PA 8706 - Interdisciplinary Research Seminar on Science, Technology, and Environmental Policy (3.0 cr)
       or PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
PA 8707 or PA 5752
   PA 8707 - Interdisciplinary Sustainability Systems Research Seminar (3.0 cr)
       or PA 5752 - Material-Energy Flows & Sustainable Development (3.0 cr)
Focus Group
PA 5721 - Energy Systems and Policy (3.0 cr)
   or PA 5723 - Water Policy (3.0 cr)
   or PA 5724 - Climate Change Policy (3.0 cr)
   or PA 5731 - Emerging Sciences and Technologies: Law, Ethics and Policy (3.0 cr)
   or PA 5751 - Urban Infrastructure Systems for Sustainable and Healthy Cities (3.0 cr)

Environmental and Sustainability Systems
One course (at least 3 credits of coursework at the 8000-level, or advisor permission) providing depth in environmental and sustainability systems, such as:
   Health & well-being, environmental psychology
   Climate, environment and eco-system studies
   Environmental economics, applied economics
   Industrial ecology
   Models, scenarios, risk, uncertainty, decision analysis
Examples of courses offered in U of M departments related to these topics are available from faculty advisors.

Policy Process and Implementation
One course (at least 3 credits of coursework at the 8000-level, or advisor permission) providing depth in policy process and implementation, covering topics such as:
   Law, regulations, science and innovation policy
   Politics of public affairs
   Urban environmental planning
   Leadership and management
   Global policy
   Public finance, budgeting
   Policy implementation and evaluation
Examples of courses offered in U of M departments related to these topics are available from faculty advisors.

Additional electives (at least 3 credits) to be selected in consultation with your advisor.

Urban Planning
Required Courses
PA 8206 - Planning Theory (3.0 cr)
PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)

Urban Planning Electives
Four additional courses, for at least 12 credits, to be determined by student and advisor. Students must demonstrate proficiency in GIS.
Twin Cities Campus
Public Policy M.P.P.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 45
- This program does not require summer semesters for timely completion.
- Degree: Master of Public Policy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of public policy (MPP) curriculum is built upon a core of required theoretical and methodological courses. In remaining courses, students choose either to emphasize more advanced study of analysis or management, or to focus on a particular substantive area of public policy. Structured concentrations include advanced policy analysis methods; economic and community development; gender and public policy; global public policy; human rights; politics and governance; public and nonprofit leadership and management; science, technology, and environmental policy; and social policy. Students have multiple opportunities to apply the concepts learned in their coursework to real-life policy problems, including cases presented in courses, their internships, and workshops. Dual degrees include MPP/master of business administration; MPP/juris doctor; MPP/master of public health; and MPP/master of social work.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
While no specific experience or academic pathway is required, students with a strong liberal education background and sound quantitative and analytical skills will be best prepared for academic success at the Humphrey School of Public Affairs.

Previous coursework in mathematics, statistics, and economics is recommended. Past applicants needing to strengthen this part of their skill set have found courses in introductory microeconomics, college algebra, and introductory statistics to be helpful preparation.

Special Application Requirements:
A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, GRE scores, TOEFL scores (if applicable), at least three letters of recommendation, and an optional diversity statement.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the

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Information current as of August 31, 2018
Program Requirements

Plan C: Plan C requires 45 major credits and 0 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semester must be completed before filing a Degree Program Form.

Core
- PA 5011 - Management of Organizations (3.0 cr)
- PA 5012 - The Politics of Public Affairs (3.0 cr)
- PA 5021 - Microeconomics for Policy Analysis (3.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)

Statistics
- PA 5031 - Statistics for Public Affairs (4.0 cr)
  or PA 5045 - Statistics for Public Affairs, Accelerated (4.0 cr)

Economics
Take 3 or more credit(s) from the following:
- PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)
- PA 5431 - Public Policies on Work and Pay (3.0 cr)
- PA 5503 - Economics of Development (3.0 cr)
- PA 5521 - Development Planning and Policy Analysis (4.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5805 - Global Economics (3.0 cr)

Methods
- PA 5032 - Applied Regression (2.0 cr)
  or PA 5044 - Applied Regression, Accelerated (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
  or PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)

Concentration: 9-12 credits
- Global policy concentration requires 12 credits. All other concentrations require 9 credits.

Professional Paper
Professional paper through a capstone workshop, working group, or master's: professional paper (individual option).
- PA 8081 - Capstone Workshop (3.0 cr)
  or PA 8082 - Professional Paper-Writing Seminar (3.0 cr)
  or PA 8921 - Master's: Professional Paper (Individual Option) (1.0 - 3.0 cr)

Electives
- Electives to bring total credits to 45.

Joint- or Dual-degree Coursework: This program offers options for four dual degrees. Each dual degree option within the MPP allows for a different number of credits in common between the two programs: MPP/MBA: 24 credits in common allowed; MPP/JD: 29 credits in common allowed; MPP/MPH - Public Health Practice: 26 credits in common allowed; MPP/MSW: 21 credits in common allowed for full program, 15 for advanced standing, 11 for direct practice.

Program Sub-plans
- A sub-plan is not required for this program.
- Students may not complete the program with more than one sub-plan.
Twin Cities Campus
Public Policy Minor
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The public policy curriculum is built upon a core of required theoretical and methodological courses. In coursework, students study policy analysis or management or focus on a substantive area of public policy. Substantive areas include advanced policy analysis methods; economic and community development; global public policy; human rights; politics and governance; public and nonprofit leadership and management; public finance and budgeting; science, technology, and environmental policy; social policy; and gender and public policy. Students have multiple opportunities to apply the concepts learned to real-life policy problems.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Specific coursework for the minor is chosen in consultation with the student's minor advisor or the public policy director of graduate studies. Students are required to take a minimum of three credits from the public policy MPP curriculum. Up to 3 credits may be taken on an S/N grade basis. All other courses must be completed with grades of B or better.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Coursework
Students pursuing the master's-level minor must complete 9 credits from the following:
PA 5xxx
PA 8xxx

Doctoral
Required Coursework
Students pursuing the doctoral-level minor must complete at least 12 credits from the following:
PA 5xxx

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Information current as of August 31, 2018
Twin Cities Campus
Science, Technology, and Environmental Policy M.S.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36 to 41
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MS in science, technology, and environmental policy (STEP) provides students with an understanding of the role of science and technology in society, including food and agriculture, the economy, energy and the environment, security, health, and education; the impact of science and technology on the political and economic relationships within and among nations; and the analysis and design of policies for appropriate promotion and regulation of science and technology regionally, nationally, and internationally. The program educates students with natural and social science backgrounds to assume roles in public policy development.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
While no specific experience or academic pathway is required, students with a strong liberal education background and sound quantitative and analytical skills will be best prepared for academic success at the Humphrey School of Public Affairs.

Previous coursework in mathematics, statistics, and economics is recommended. Past applicants needing to strengthen this part of their skill set have found courses in introductory microeconomics, college algebra, and introductory statistics to be helpful preparation.

Applicants applying to the MS-STEP program should have completed a degree or taken advanced level coursework in the natural or engineering sciences prior to the date of their planned enrollment.

Special Application Requirements:
A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, GRE scores, TOEFL scores (if applicable), at least three letters of recommendation, and an optional diversity statement.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 29 to 31 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan C:** Plan C requires 36 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Elective credits are chosen in consultation with the student’s advisor.

**Science, Technology, and Environmental Policy Overview**

- PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
- PA 5715 - Survey of Current Issues in Science, Technology, and Environmental Policy (1.5 cr)

**Sustainability Systems Science**

- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5741 - Risk, Resilience and Decision Making (1.5 cr)
- PA 5752 - Material-Energy Flows & Sustainable Development (3.0 cr)

**Social and Policy Processes**

- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5012 - The Politics of Public Affairs (3.0 cr)

**Foundational Methods**

**Statistics**

- PA 5031 - Statistics for Public Affairs (4.0 cr)
- or PA 5045 - Statistics for Public Affairs, Accelerated (4.0 cr)

Take one of the following:

- PA 5032 - Applied Regression (2.0 cr)
- or PA 5044 - Applied Regression, Accelerated (2.0 cr)

Take one of the following:

- PA 5033 - Multivariate Techniques (2.0 cr)
- or PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)

**Focus Area - Take one of the following:**

Only the following 5790 titles are applicable: “Environmental Mgmt of Food, Water, and Energy Systems” and “Urban Agriculture and Food Systems Policy.”

- PA 5721 - Energy Systems and Policy (3.0 cr)
- or PA 5723 - Water Policy (3.0 cr)
- or PA 5724 - Climate Change Policy (3.0 cr)
- or PA 5731 - Emerging Sciences and Technologies: Law, Ethics and Policy (3.0 cr)
- or PA 5751 - Urban Infrastructure Systems for Sustainable and Healthy Cities (3.0 cr)
- or PA 5790 - Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)

**Electives**

Electives to bring total credits to required number, in consultation with the advisor.

**Plan Options**

**Plan A Requirements**

Take 10 master’s thesis credits.
PA 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan C Requirements - Take one of the following:
PA 8081 - Capstone Workshop (3.0 cr)
or PA 8082 - Professional Paper-Writing Seminar (3.0 cr)
or PA 8921 - Master's: Professional Paper (Individual Option) (1.0 - 3.0 cr)

Joint- or Dual-degree Coursework: MS-STEP/JD (Joint Degree Program in Law, Health, and the Life Sciences) Student may take a total of 24 credits in common among the academic programs.
Twin Cities Campus
Science, Technology, and Environmental Policy Minor
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate minor in Science, Technology, and Environmental Policy (STEP) provides students with the skills and knowledge to study public issues arising at the intersection of science, technology, environment and society that shape economic development, environmental sustainability, human health, and well-being. The STEP graduate minor is designed to facilitate a cohort experience through the required survey course, PA 5711, additional coursework offered by STEP and STEP-affiliated faculty, and opportunities outside of the classroom through the Center for Science, Technology, and Environmental Policy (CSTEP). Students pursuing the STEP minor are strongly encouraged to participate in the activities of CSTEP, particularly the regular STEP Feedback and Research (STEP-FAR) seminar.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Up to 3 credits may be taken on an S/N grade basis. All other courses must be completed with grades of B or better. Specific coursework is chosen in consultation with the student's minor adviser or director of graduate studies.

Required Course
PA 5711 - Science, Technology & Environmental Policy (3.0 cr)

Environmental Systems Thinking
Take 3 or more credit(s) from the following:
- PA 5712 - Science to Action: All Paths (1.5 cr)
- PA 5715 - Survey of Current Issues in Science, Technology, and Environmental Policy (1.5 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PA 5741 - Risk, Resilience and Decision Making (1.5 cr)
- PA 5742 - Interdisciplinary Environmental Study: Practice and Design (1.5 cr)
- PA 5743 - Acara Impact Venture Launchpad - Moving Your Idea to Impact (1.5 cr)
- PA 5752 - Material-Energy Flows & Sustainable Development (3.0 cr)
- APEC 5721 - Economics of Science and Technology Policy (3.0 cr)
Focus Area
Take 3 or more credit(s) from the following:
• PA 5721 - Energy Systems and Policy (3.0 cr)
• PA 5723 - Water Policy (3.0 cr)
• PA 5724 - Climate Change Policy (3.0 cr)
• PA 5731 - Emerging Sciences and Technologies: Law, Ethics and Policy (3.0 cr)
• PA 5751 - Urban Infrastructure Systems for Sustainable and Healthy Cities (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Twin Cities Campus
Urban and Regional Planning M.U.R.P.
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Master of Urban and Regional Planning

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of urban and regional planning (MURP) degree is an interdisciplinary program that prepares students to analyze, forecast, design, and implement plans for regions, communities, and neighborhoods. Students develop a comprehensive understanding of the built environment (land use, transportation, housing, regional economies) and the ability to mediate among competing interests. They are prepared for jobs in public, nonprofit, and private sectors. Students can generally complete the MURP degree in two years of full-time study.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A four-year bachelor's degree from an accredited US university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
While no specific experience or academic pathway is required, students with a strong liberal education background and sound quantitative and analytical skills will be best prepared for academic success at the Humphrey School of Public Affairs.

Previous coursework in mathematics, statistics, and economics is recommended. Past applicants needing to strengthen this part of their skill set have found courses in introductory microeconomics, college algebra, and introductory statistics to be helpful preparation.

Special Application Requirements:
A complete application will include a University of Minnesota graduate application, personal statement, resume or C.V., transcripts, GRE scores, TOEFL scores (if applicable), at least three letters of recommendation, and an optional diversity statement.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 38 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan C: Plan C requires 48 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

A 400-hour professional internship is required. MURP students must demonstrate competence with GIS through coursework or work experience. (Students not competent in GIS must take a graduate-level GIS course as part of their 48 credits.)

Required Core Courses

- PA 5004 - Introduction to Planning (3.0 cr)
- PA 5013 - Law and Urban Land Use (1.5 cr)
- PA 5205 - Statistics for Planning (4.0 cr)
- PA 5042 - Urban and Regional Economics (2.0 cr)
- PA 5043 - Economic and Demographic Data Analysis (2.0 cr)
- PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5253 - Designing Planning and Participation Processes (3.0 cr)
- PA 8081 - Capstone Workshop (3.0 cr)

Plan Options

Plan A Requirements
Plan A students must complete at least 38 course credits, which will include the core courses, at least 6 credits from one of four concentration areas, and electives. Plan A students also must take at least 10 master's thesis credits.

Concentration Requirement
Take at least 6 credits from one of the following concentration areas: Environmental Planning; Housing and Community Development; Land Use and Urban Design; or Transportation Planning.

Electives
Take elective courses as needed to meet the 38-credit requirement for coursework.

Thesis Credits
Take 10 master's thesis credits.
- PA 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan C Requirements
Plan C students must complete at least 48 course credits, which will include the core courses, at least 12 credits from one of four concentration areas, and electives.

Concentration Requirement
Take at least 12 credits from one of the following concentration areas: environmental planning; housing and community development; land use and urban design; or transportation planning.

Electives
Take elective courses as needed to meet the 48-credit requirement.

Joint- or Dual-degree Coursework: MURP/JD: 29 credits in common allowed. MURP/MLA: 37 credits in common allowed. MURP/MPH: 26 credits in common allowed. MURP/MSCE: 18 credits in common allowed. MURP/MSW: 21 credits in common allowed for the full program; 15 for the advanced standing program; and 11 for MSW Direct Practice.
Twin Cities Campus
Urban and Regional Planning Minor
HHH Administration
Hubert H. Humphrey School of Public Affairs

Link to a list of faculty for this program.

Contact Information:
Student Services, Hubert H. Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue South, Minneapolis, MN 55455 (612-624-3800; fax: 612-626-0002)
Email: hhhadmit@umn.edu
Website: http://www.hhh.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Planners bring together knowledge and expertise from many diverse disciplines to shape neighborhoods, cities, and regions. The urban and regional planning minor helps students to think across those fields of expertise and act upon links among environmental systems, infrastructure development, and housing and community development. The program teaches technical and analytical skills needed to think strategically about developing and implementing plans at the neighborhood, city, and regional level.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

No more than 3 credits may be taken S/N. All other courses must be completed with grades of B or higher. Students must complete the minor with at least a 3.0 GPA.

PA 5004
- PA 5004 - Introduction to Planning (3.0 cr)

Additional Coursework
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
- PA 5211 - Land Use Planning (3.0 cr)
- PA 5231 - Transit Planning and Management (3.0 cr)
- PA 5242 - Environmental Planning, Policy, and Decision Making (3.0 cr)
- PA 5261 - Housing Policy (3.0 cr)
- PA 8202 - Networks and Places: Transportation, Land Use, and Design (4.0 cr)
- PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.
Masters

Required Coursework
Take additional courses as needed, in consultation with the Urban and Regional Planning director of graduate studies, to meet the 9-credit requirement.
PA 5xxx
PA 8xxx

Doctoral

Required Coursework
Take additional courses as needed, in consultation with the Urban and Regional Planning director of graduate studies, to meet the 12-credit requirement.
PA 5xxx
PA 8xxx
American Indian and Indigenous Studies Minor

American Indian Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of American Indian Studies, 19 Scott Hall, 72 Pleasant Street SE, Minneapolis MN 55455, phone 612-624-1338
Email: obrie002@umn.edu
Website: https://cla.umn.edu/ais

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Grounded by a strong commitment to the worlds, histories, representations, and political struggles of Indigenous peoples locally and globally, the intellectual project of American Indian and Indigenous Studies (AIIS) uses interdisciplinary methods of critical inquiry as a means through which students engage research and scholarship in their major fields of study. An AIIS minor is composed of graduate course work with core and affiliated Indigenous studies faculty in the Department of American Indian Studies and other departments. Students receive foundational training in one of three required courses: Indigenous Critical Theory, Problems in American Indian History, or American Colonialism and Indigenous Histories.

In addition, students choose (in consultation with the director of graduate studies) from graduate courses in a range of disciplines committed to Indigenous studies to tailor their work to their own scholarly needs. The AIIS graduate minor strengthens student work in their major field of study as AIIS minors will learn how to best integrate American Indian and Indigenous Studies into their existing work as well as how to complement their research to include indigenous methodologies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Students are strongly encouraged to take at least one elective course with an AMIN designator, under consultation with the American Indian and Indigenous Studies director of graduate studies.

Required Core Course (3 Credits)
Select one of three core courses, for at least 3 credits, from the following:
Take 3 or more credit(s) from the following:
- AMIN 5920 - Topics in American Indian Studies (3.0 cr)
- HIST 5890 - Readings in American Indian and Indigenous History (3.0 cr)
  or AMIN 5880 - Readings in American Indian and Indigenous History (3.0 cr)
  or AMIN 8890
  or HIST 5910 - Topics in U.S. History (1.0 - 4.0 cr)
  or AMST 5920
  or AMST 5920
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral

Electives (9 Credits)
Take at least 9 credits from the following list. Courses from the core course list not used to meet that requirement can be taken as an elective.
Take 9 or more credit(s) from the following:
- AMIN 4532 - Vine Deloria, Jr.: A Renaissance Indigenous Figure (3.0 cr)
- AMIN 4990 - Topics in American Indian Studies (1.0 - 4.0 cr)
- AMIN 5402 - American Indians and the Cinema [AH, DSJ] (3.0 cr)
- AMIN 5409 - American Indian Women: Ethnographic and Ethnohistorical Perspectives [HIS, DSJ] (3.0 cr)
- AMIN 4xxx
- AMIN 5xxx
- AMIN 8xxx
- ESCI 4602 - Sedimentology and Stratigraphy (3.0 cr)
- CI 8645 - Indigenous Language Revitalization and Activist Research Methods (3.0 cr)
- ANTH 8510 - Topics in Archaeology (3.0 cr)
American Studies M.A.

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of American Studies, 104 Scott Hall, 72 Pleasant Street SE, Minneapolis, MN 55455 (612-624-4190; fax: 612-624-3858)
Email: amstdy@umn.edu
Website: http://americanstudies.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The master's degree in American studies is not designed as a terminal degree; therefore, students are not admitted directly to the MA program. Students may apply for graduate study at the PhD level only. A PhD student may elect to pursue the MA. All PhD coursework is applicable. Current graduate students seeking to obtain the MA should review the information in the current graduate handbook on the website at http://americanstudies.umn.edu/grad/handbook.html.

American studies is an interdisciplinary, interdepartmental program. The American studies graduate faculty consists of American studies core faculty members and graduate faculty members drawn from a wide number of departments. Students develop subfields (understood as a more specific focus of research and teaching) and also pursue broad training in analyzing the development of cultural and historical processes that shaped the nation and its diverse cultures, as well as analyzing contemporary practices.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
An undergraduate major in a field related to American studies or other preparation acceptable to the Admissions Committee for American studies is required.

Special Application Requirements:
American studies admits for graduate study at the PhD level only. PhD students may obtain a MA during the course of their studies; however no students are admitted for a terminal MA. Students entering the PhD program must hold at least a bachelor's level degree from a recognized institution of higher education. The deadline for application to the Department of American Studies is December 1 of the year prior to intended entry. Refer to the department website for application procedures and additional information.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 21 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is written and oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading knowledge of one foreign language

A minimum GPA of 3.50 is required for students to remain in good standing.

The master's degree is not designed as a terminal degree; therefore, students are not admitted directly to the MA program. A PhD student may elect to pursue the MA. All PhD coursework is applicable. Current graduate students seeking to obtain the MA should review the information in the current Graduate Handbook on the program website at http://americanstudies.umn.edu/grad/handbook.html.

All courses are selected in consultation with the student's advisor and the director of Graduate Studies.

"Major" courses are defined as any courses that American Studies deems appropriate to the student's area of study, due to the interdisciplinary nature of the program.

Requirements
The following courses are required for all students:

- AMST 8201 - Historical Foundations of American Studies (3.0 cr)
- AMST 8202 - Theoretical Foundations and Current Practice in American Studies (3.0 cr)

Core Areas
Research Seminars
6 credits (2 courses) worth of research seminars offered by the Department of American Studies or another department related to research area. Requires director of Graduate Studies approval.

Comparative Culture
3 credits (1 course) in a course on comparative cultures, covering international or non-US subjects offered by the Department of American Studies or another department related to research area.

Plans A & B
Students are required to specify a field of concentration. The courses required to fulfill these concentrations are to be selected between the student and the advisor, and approved by the director of Graduate Studies.

Plan A
Field of Concentration
Concentration Area Courses
3 credits (one course) in students field of concentration offered by the Department of American Studies or another department related to research area.

Cultural Pluralism Course
3 credits (one course) in student's field of concentration, focused on cultural pluralism within the United States offered by the Department of American Studies or another department related to research area.

Thesis Credits
Take exactly 10 credit(s) from the following:
- AMST 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
- OR -

Plan B
This plan requires 3 papers in lieu of an MA thesis.

Concentration Area Courses
12 credits (4 courses) in student's field of concentration offered by the Department of American Studies or another department related to research area.

Cultural Pluralism Course
3 credits (one course) in students field of concentration, focused on cultural pluralism within the United States offered by the Department of American Studies or another department related to research area.
Twin Cities Campus
American Studies Minor
College of Liberal Arts

Contact Information:
Department of American Studies, 104 Scott Hall, 72 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4190; fax: 612-624-3858)
Email: amstdy@umn.edu
Website: http://americanstudies.umn.edu

Program Type: Graduate minor related to major
Requirements for this program are current for Fall 2018
Length of program in credits (Masters): 9
Length of program in credits (Doctorate): 12
This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

American studies is an interdisciplinary, interdepartmental program. The American studies graduate faculty consists of American studies core faculty members and graduate faculty members drawn from a wide number of departments. Students develop subfields (understood as a more specific focus of research and teaching) and also pursue broad training in analyzing the development of cultural and historical processes that shaped the nation and its diverse cultures, as well as analyzing contemporary practices.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

For the master's and doctoral minors, students are expected to choose courses consistent with or complementary to their major.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Requirements
AMST 8201 - Historical Foundations of American Studies (3.0 cr)
or AMST 8202 - Theoretical Foundations and Current Practice in American Studies (3.0 cr)

American Studies Electives
Take 6 or more credit(s) from the following:
• AMST 5xxx
• AMST 8xxx

Doctoral
Requirements
AMST 8201 - Historical Foundations of American Studies (3.0 cr)
or AMST 8202 - Theoretical Foundations and Current Practice in American Studies (3.0 cr)
American Studies Electives
Take 9 or more credit(s) from the following:
• AMST 5xxx
• AMST 8xxx
**Twin Cities Campus**  
**American Studies Ph.D.**  
**American Studies**  
**College of Liberal Arts**  

Link to a list of faculty for this program.

**Contact Information:**  
Department of American Studies, 104 Scott Hall, 72 Pleasant Street SE, Minneapolis, MN 55455 (612-624-4190; fax: 612-624-3858).  
Email: amstdy@umn.edu  
Website: [http://americanstudies.umn.edu](http://americanstudies.umn.edu)

- Program Type: Doctorate  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 63 to 69  
- This program does not require summer semesters for timely completion.  
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

American studies is an interdisciplinary, interdepartmental program. The American studies graduate faculty consists of American studies core faculty members and graduate faculty members drawn from a wide number of departments. Students develop subfields (understood as a more specific focus of research and teaching) and also pursue broad training in analyzing the development of cultural and historical processes that shaped the nation and its diverse cultures, as well as analyzing contemporary practices.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
An undergraduate major in a field related to American studies or other preparation acceptable to the Admissions Committee for American studies is required.

**Special Application Requirements:**  
American studies admits students for graduate study at the PhD level only. (PhD students may obtain a MA during the course of their studies, but students are not admitted for a terminal MA.) Students entering the PhD program must hold at least a bachelor's level degree from a recognized institution of higher education. The deadline for application to the Department of American Studies is December 1 of the year prior to intended entry. Refer to the program website for application procedures and additional information.

International applicants must submit score(s) from one of the following tests:

- TOEFL  
  - Internet Based - Total Score: 79  
  - Internet Based - Writing Score: 21  
  - Internet Based - Reading Score: 19  
  - Paper Based - Total Score: 550  
- IELTS  
  - Total Score: 6.5  
- MELAB  
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**  
39 to 45 credits are required in the major.  
0 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading knowledge of one foreign language.

A minimum GPA of 3.50 is required for students to remain in good standing.

Requirements
The following courses are required for all students:

- AMST 8201 - Historical Foundations of American Studies (3.0 cr)
- AMST 8202 - Theoretical Foundations and Current Practice in American Studies (3.0 cr)
- AMST 8401 - Practicum in American Studies (3.0 cr)
- AMST 8801 - Dissertation Seminar (3.0 cr)

Core Areas
Of the 3 core areas below, at least 3 credits must focus on American cultural diversity. Coursework is chosen in consultation with the advisor and director of Graduate Studies.

1. Research Seminars
   A minimum of 3 and maximum of 9 credits (3 courses) worth of research seminars offered by the department of American Studies or another department related to research area. Requires DGS approval.
   
   One of these seminars requires original research.

2. Comparative Culture
   3 credits (1 course) in a course on comparative cultures, covering international or non-US subjects.

3. Electives
   21 credits (7 courses) of American studies courses or courses related to an area of study chosen in consultation with your advisor.

Outside Coursework
Take 12 credits in a declared minor field or supporting program in integration with the research focus.
Twin Cities Campus
Anthropology M.A.
Anthropology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Anthropology, 395 Hubert H. Humphrey Center, 301 19th Ave S, Minneapolis, MN 55455 (612-625-3400; fax: 612-625-3095).
Email: anthgrad@umn.edu
Website: http://anthropology.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The Department of Anthropology admits students for the PhD degree only, although in some cases students admitted to the PhD program complete a master's degree as they work toward the PhD.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 84

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is a demonstration of familiarity with the tools of research or scholarship in the graduate student's area of study, the ability to work independently, and the ability to present the results of their investigation effectively, by completing at least one Plan B project, though advisors may require as many as three such projects. The norm in anthropology is two to three projects. Master's-level projects are often the result of work carried out in a seminar or course (e.g., a paper), and are generally
polished in a directed reading or research course. Plan B project(s) should involve a combined total of approximately 120 hours of work. With the approval of their advisors, graduate students have considerable flexibility in defining the nature of their Plan B project(s).

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Concentrations

Sociocultural Anthropology

Required Core Courses

ANTH 8001 - Ethnography, Theory, History (3.0 cr)
ANTH 8002 - Ethnography: Contemporary Theory and Practice (3.0 cr)
ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)

Major Electives

Take 5 or more credit(s) from the following:
• ANTH 5xxx
• ANTH 8xxx
• or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies.

-OR-

Biological Anthropology

Required Core Courses

ANTH 8111 - Evolutionary Morphology (3.0 cr)
ANTH 8112 - Reconstructing Hominin Behavior (3.0 cr)
ANTH 8114 - Biological Anthropology Graduate Program Seminar: Behavioral Ecology of Primates (3.0 cr)

Major Electives

Take 5 or more credit(s) from the following:
• ANTH 5xxx
• ANTH 8xxx
• or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies.

-OR-

Archaeology

Required Core Courses

ANTH 8002 - Ethnography: Contemporary Theory and Practice (3.0 cr)
ANTH 8004 - Foundations of Anthropological Archaeology (3.0 cr)
ANTH 8230 - Anthropological Research Design (3.0 cr)

Methods Course

Take 3 or more credit(s) from the following:
• ANTH 5269 - Analysis of Stone Tool Technology (4.0 cr)
• ANTH 5444 - Archaeological Ceramics (4.0 cr)
• ANTH 5403 - Quantitative Methods in Biological Anthropology (4.0 cr)
• ANTH 4101 - Archival Analysis for Anthropologists (3.0 cr)
• ANTH 5402 - Zooarchaeology Laboratory (3.0 cr)

Major Electives

Take 2 or more credit(s) from the following:
• ANTH 5xxx
• ANTH 8xxx
• or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies.

-OR-

Cultural Heritage Management

Required Core Courses

ANTH 8004 - Foundations of Anthropological Archaeology (3.0 cr)

Additional Required Course

Take 3 or more credit(s) from the following:
• ANTH 5448 - Applied Heritage Management (3.0 cr)
• MST 5011 - Museum History and Philosophy (3.0 cr)
• ANTH 5601 - Archaeology and Native Americans [DSJ] (3.0 cr)

Major Electives
Take 8 or more credit(s) from the following:
• ANTH 5xxx
• ANTH 8xxx
• or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies.
Twin Cities Campus
Anthropology Minor
Anthropology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Anthropology, 395 Hubert H. Humphrey Center, 301 19th Avenue South, Minneapolis, MN 55455 (612-625-3400; fax: 612-625-3095)
Email: anthgrad@umn.edu
Website: http://anthropology.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor program in anthropology is individually designed by each student in consultation with a faculty advisor at both the master's and Ph.D. level. Consult the director of graduate studies about selecting an advisor.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The master's and doctoral minors are individually designed by the student and a faculty advisor. Consult with the anthropology director of graduate studies about selecting an advisor, and obtaining approval for course choices. Students pursuing the doctoral minor must complete at least one 8xxx-level course.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required
  Take 6 or more credit(s) from the following:
  - ANTH 5xxx
  - ANTH 8xxx

Doctoral
Required
  At least one course must be at the 8xxx-level.
  Take 12 or more credit(s) from the following:
  - ANTH 5xxx
  - ANTH 8xxx
Twin Cities Campus
Anthropology Ph.D.
Anthropology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Anthropology, 395 Hubert H. Humphrey Center, 301 19th Ave S, Minneapolis, MN 55455 (612-625-3400; fax: 612-625-3095)
Email: dgsanth@umn.edu
Website: http://anthropology.umn.edu/graduate

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60 to 61
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Anthropology offers graduate education in sociocultural and linguistic anthropology, archaeology, and biological anthropology. The program admits students only for the PhD, although some students do earn a master's degree as part of their PhD program.

Major areas of faculty research and graduate student training in sociocultural and linguistic anthropology include art and visual culture, critical theory, cultures of capitalism, discourse and power, experimental writing, gender and sexuality, medical anthropology, memory and haunting, multi-species ethnography, new materialisms, philosophical anthropology, science and technology studies, sovereignty and the state, and temporality and futurity. Regional specialisations include Europe, the Pacific, the Middle East, North America, the Caribbean, East Asia and South Asia.

The program in archaeology offers training and research opportunities in the use of anthropological theories and interpretive strategies in the reconstruction of historic and prehistoric pasts based on material culture, the application of faunal and lithic analysis to questions in paleoecology and evolutionary theory, and the application of archaeological science to the reconstruction of site formation. Regional specializations include Europe, Southwest Asia, Central Asia, and North America.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor of arts degree or equivalent is required for admission.

Other requirements to be completed before admission:
Graduate students who enter the PhD program with an MA degree in Anthropology, or a closely related field from another institution, will generally enter the program at the second-year level. Should second-year requirements (e.g., the research paper, preparation for the bibliography) prove overly challenging for the graduate student, the student will, in most cases, be required to continue their second year activities into their third year. In addition, they may be asked to take courses in areas of perceived weakness.

Special Application Requirements:
Three letters of recommendation and scores from the General test of the GRE should be sent to the director of graduate studies. Admission is for fall semester only; the deadline for all materials is December 1.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 21
Program Requirements

24 to 25 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

During the first year, students are required to take at least one graduate-level (8xxx) seminar in the PhD program each semester. Students should consult the Graduate Student Handbook for special requirements for sociocultural anthropology, linguistic anthropology, archaeology, and biological anthropology. Language requirements depend upon student's special area of research.

Concentration Areas

Sociocultural Anthropology

Required Major Core Courses
Take 9 or more credit(s) from the following:
- ANTH 8001 - Ethnography, Theory, History (3.0 cr)
- ANTH 8002 - Ethnography: Contemporary Theory and Practice (3.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)

Major Elective Courses
Take 15 or more credit(s) from the following:
- ANTH 5xxx
- ANTH 8xxx
- or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies

Outside the Major in a Supporting Program
Take 12 credits outside the major in a graduate minor or supporting program.

Thesis Credits
Take 24 or more credit(s) from the following:
- ANTH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
- OR -

Biological Anthropology

Required Major Core Courses
Take 9 or more credit(s) from the following:
- ANTH 8111 - Evolutionary Morphology (3.0 cr)
- ANTH 8112 - Reconstructing Hominin Behavior (3.0 cr)
- ANTH 8114 - Biological Anthropology Graduate Program Seminar: Behavioral Ecology of Primates (3.0 cr)

Major Elective Courses
Take 15 or more credit(s) from the following:
- ANTH 5xxx
- ANTH 8xxx
- or other 5xxx or 8xxx level that is approved by advisor and director of Graduate Studies

Outside the Major in a Supporting Program
Take 12 credits outside the major in a graduate minor or supporting program.
Thesis Credits
Take 24 or more credit(s) from the following:
• ANTH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

-OR-

Archaeology
Required Major Core Courses
Take 9 or more credit(s) from the following:
• ANTH 8004 - Foundations of Anthropological Archaeology (3.0 cr)
• ANTH 8230 - Anthropological Research Design (3.0 cr)
• ANTH 8009 - Prehistoric Pathways to World Civilizations (3.0 cr)

Required Methods Course
ANTH 5402 - Zooarchaeology Laboratory (3.0 cr)
or ANTH 5269 - Analysis of Stone Tool Technology (4.0 cr)
or ANTH 5444 - Archaeological Ceramics (4.0 cr)
or ANTH 4101 - Archival Analysis for Anthropologists (3.0 cr)
or ANTH 5403 - Quantitative Methods in Biological Anthropology (4.0 cr)

Major Electives Courses
Take 12 or more credit(s) from the following:
• ANTH 5xxx
• ANTH 8xxx
• or other 5xxx/8xxx level courses approved by advisor

Outside the Major in a Supporting Program
Take 12 credits outside the major in a graduate minor or supporting program.

Thesis Credits
Take 24 or more credit(s) from the following:
• ANTH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Art History M.A.
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Art History, University of Minnesota, 338 Heller Hall, 271 19th Ave S, Minneapolis, MN 55455 (612-624-4500; fax: 612-626-8679)
Email: arthist@umn.edu
Website: http://www.arthist.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Please note that the MA is not a freestanding program; rather, it is offered as an "in-process" degree along the way to the PhD. Please refer to the "Prerequisites for Admission" section below for more information. Areas of specialization include all current faculty specialties.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Students are not admitted directly to the art history MA degree, nor is a terminal master's degree offered.

Special Application Requirements:
The Art History department accepts students only into the PhD program. For PhD application requirements, please refer to the Art History PhD program information.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 30 major credits and 6 credits outside the major. The final exam is written. A capstone project is required.
Capstone Project: The Plan B capstone project requires two Plan B papers demonstrating the student's mastery of the essential skills of scholarship. One paper is written on a subject in the area of the student's primary concentration. This paper is supervised by the student's academic adviser. The second paper is written on a subject in the area of the student's secondary concentration and is supervised by someone other than the academic adviser. Term papers or seminar reports may serve as the basis for the Plan B papers, or the topic may be the result of independent study. The student and the project supervisor should decide upon the length for the chosen topic. The projects are evaluated and approved by two art history graduate faculty, one of whom is the project supervisor. Both are required to sign the title page of the paper. Upon completion of the Plan B papers, they should be submitted to the Graduate Studies secretary.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Reading Proficiency
A minimum GPA of 3.50 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Reading proficiency in a a modern foreign research language is required. Additional modern or ancient languages may be required by the student's advisor, depending on the field.

**Art History Department Courses**
Within the following concentrations and electives, students must fulfill the following distribution requirements. Courses must be taken in the Art History department.

1. Global Perspectives (one course)
2. Two 8xxx-level Art History seminars in addition to ArtH 8001. ArtH 8975 cannot be used to meet this requirement.

**Art History Concentrations**

**Primary Concentration**
Take 9 or more credits from the following:
- Arth 5xxx
- Arth 8xxx

**Secondary Concentration**
Take 6 or more credits from the following:
- Arth 5xxx
- Arth 8xxx

**Required Art History Courses**
Take at least 3 credits of 5xxx- or 8xxx-level Art History courses in addition to ArtH 8001.

- **ARTH 8001** - Art Historiography: Theory and Methods (3.0 cr)
- ARTH 5xxx
  - or ARTH 8xxx

**Electives**
Take 9 or more credits of electives, in consultation with Director of Graduate Studies. At least 3 credits must be from the following:
- ARTH 5xxx
  - or ARTH 8xxx

**Outside Coursework**
Take at least 6 credits outside the department that do not focus on art history.

**Concentration Areas**

**Examples of potential concentrations include:**
- Ancient Mediterranean/Western Asia
- South Asia
- Islamic
- Early Modern Europe and the Atlantic World
- North American
- Contemporary
- Film/Photography
Twin Cities Campus

Art History Minor

Art History
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Art History, 338 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455 (612-624-4500; fax: 612-626-8679)
Email: arthist@umn.edu
Website: http://www.arthist.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 11
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Areas of specialization in the art history program include: American art and material culture; early modern and Baroque art; East Asian art and archaeology; art and archaeology of ancient Iran, Hellenistic Asia, and the late Roman empire; modern and contemporary art and theory, including film and photography studies as well as 19th- through 21st-century art; pre-Columbian and colonial art of the Americas, and South Asian art and architecture.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Electives
Take 11 or more credit(s) from the following:
- ARTH 5xxx
- ARTH 8xxx

Doctoral
Required Electives
Take 12 or more credit(s) from the following:
- ARTH 5xxx
- ARTH 8xxx
Twin Cities Campus
Art History Ph.D.
Art History
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Art History, 338 Heller Hall, 271 19th Ave S, Minneapolis, MN 55455 (612-624-4500; fax: 612-626-8679)
Email: arthist@umn.edu
Website: http://www.arthist.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 78
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota’s doctoral program in art history trains scholars who go on to careers in universities, colleges, museums, and other arts institutions throughout the nation and the world. The faculty’s unique range of expertise allow us to offer specialized training that only a few other institutions worldwide are able to match. Our current faculty and institutional strengths support specialization in the following overlapping fields: art and archaeology of ancient Persia (including Achaemenid, Seleucid, Parthian, and Sasanian Iran); Islamic art (including the medieval Persianate world and the Ottoman, Safavid, and Mughal empires); art and archaeology of late antiquity; the global early modern in Europe, the Atlantic world, and South Asia; Northern and Italian Renaissance and Baroque art; North American art and visual/material culture; film and photography; and contemporary art and theory.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Applicants with the necessary preparation holding a BA or an MA are equally encouraged to apply and every incoming class normally consists of students with both backgrounds. Although all students apply to, and begin in, the PhD program, students complete the requirements for an ‘in-process’ MA on their way to the PhD degree. In addition to transcripts and test scores, students are required to submit a writing sample, statement of objectives (personal statement) outlining their current and future research interests, and three letters of recommendation. Please refer to the program website and contact the DGS for further information:
https://cla.umn.edu/art-history/graduate/apply

Applicants must submit their test score(s) from the following:
- GRE
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
42 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: See other program requirements below:

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students complete all requirements for an MA degree en route to the PhD. Therefore, all courses in the MA at the University of Minnesota are applied to and part of the the PhD requirements.

Students with a previous MA in art history may be given credit towards some of their in-process MA coursework requirements (up to 40%).

Students may take up to 2 directed study courses to satisfy requirements.

Language requirement: Reading proficiency in two modern foreign research languages. Additional modern or ancient languages may be required by the student's advisor depending on field.

Art History Department Courses
Within this the following concentrations and electives, students must fulfill the following distribution requirements in courses taken in the Art History department:

1) Global Perspectives Requirement (1 course)
2) Art History Seminars at the 8xxx level (2 courses)
   - This requirement is in addition to ARTH 8001, and excluding ARTH 8975.

Primary Concentration
Take 18 or more credit(s) from the following:
• ARTH 5xxx
• ARTH 8xxx

Secondary Concentration
Take 9 or more credit(s) from the following:
• ARTH 5xxx
• ARTH 8xxx

Required Art History Courses
ARTH 8001 - Art Historiography: Theory and Methods (3.0 cr)
Take 3 additional credits from either:
ARTH 5xxx
or ARTH 8xxx

Electives
Take 9 or more elective credits. At least 3 of these credits must be from the following:
ARTH 5xxx
or ARTH 8xxx

Outside Coursework
Doctoral Minor
A doctoral-level minor is comprised of a minimum of 12 credits, with the terms specified by the department housing the minor program.
At least 6 credits of the minor must be taken in a single field outside the Department of Art History. The field must be related to Art History, but cannot be art historical in content.

or Supporting Program
A supporting program consists of 12 credits, which may be from more than one discipline outside the department and which represent a coherent area of work. Such self-designed supporting programs are constructed with input from the adviser.
6 credits may be art historical in content; however, they must be outside the student's primary area of concentration. 6 additional credits of the supporting program must NOT be art historical in content.

**Thesis Credits**
Take 24 or more credit(s) from the following:
• ARTH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

**Areas of Concentration**

**Examples of potential concentrations include:**
- Ancient Mediterranean/Western Asia
- South Asia
- Islamic
- Early Modern Europe and the Atlantic World
- North American
- Contemporary
- Film/Photography

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Information current as of August 31, 2018
Twin Cities Campus
Art M.F.A.
Art Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Art, E201 Regis Center for Art, 405 21st Avenue S, Minneapolis, MN 55455 (612-625-8096; fax: 612-625-7881).
Email: artdept@umn.edu
Website: http://www.art.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- Degree: Master of Fine Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of fine arts program places major emphasis on creative artistic work of high quality. It promotes not only the conceptual and technical education of the professional artist in their artistic practice, encouraging critical inquiry, excellence, and an understanding of the history of art, but also an experimental approach toward each media. The following areas of concentration are available: ceramics, drawing and painting, photography, printmaking, sculpture, and experimental and media arts. The MFA is considered the terminal degree in the field of fine arts and is typically the degree required to teach at the college or university level.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Admission to the M.F.A. program is highly competitive. In addition to meeting the University's application requirements, students applying to the program must demonstrate a high degree of capability and commitment in their artistic portfolio and in their statements of artistic and academic intent. Applicants must submit a portfolio electronically with documentation of artwork completed in the three years prior to admission. Instructions for submitting the portfolio and supplemental materials including three letters of recommendation may be found at the department's website: www.art.umn.edu

Students are admitted for fall semester only.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan B: Plan B requires 58 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Candidates demonstrate their visual research accomplishments through participation in the MFA thesis exhibition in the Katherine E. Nash Gallery, a supporting paper, and a final oral examination.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MFA program requires a total of 64 credits. It is typically a three-year program and studio space is provided for a maximum of three consecutive years for the pursuit of appropriate artistic research. MFA candidates plan programs with their advisors with approval of the director of graduate studies. The program requires all coursework be completed by the end of the second year of the program.

In the third year of the MFA program, candidates are required to register for 8 ARTS 8990 credits per semester and a 3-credit thesis research and writing course in the fall.

Candidates must be reviewed annually for progress through the program. At the end of the final year, candidates demonstrate their artistic research accomplishments through participation in the MFA thesis exhibition held in the Katherine E. Nash Gallery, a supporting paper, and a final oral examination.

Seminar Courses

Take the following courses for a total of 6 credits:
- ARTS 8404 - MFA Thesis Research + Writing (3.0 cr)
- ARTS 8403 - MFA Professional Practices and Teaching Pedagogy (3.0 cr)

MFA Critique Seminar

Take ARTS 8410 in the fall of 1st year, the fall of 2nd year, and the spring of 2nd year, for a total of 9 credits (see below)
Take 9 or more credit(s) from the following:
- ARTS 8410 - MFA Critique Seminar (3.0 cr)

Studio Credits

ARTS 8420 and 8450 can be repeated multiple times for credit.
Take 24 or more credit(s) from the following:
- ARTS 8420 - MFA Studio (1.0 - 6.0 cr)
- ARTS 5110 - Advanced Drawing (4.0 cr)
- ARTS 5120 - Advanced Painting (4.0 cr)
- ARTS 5140 - Advanced Printmaking (4.0 cr)
- ARTS 5710 - Advanced Photography (4.0 cr)
- ARTS 5780 - Advanced Super 8 and 16 MM Filmmaking (4.0 cr)
- ARTS 5810 - Advanced Ceramics (4.0 cr)
- ARTS 5850 - Advanced Foundry and Metal Sculpture (4.0 cr)
- ARTS 5860 - Advanced Sculpture (4.0 cr)
- ARTS 5610 - New Media: Making Art Interactive (4.0 cr)
- ARTS 5650 - Advanced Sound Art (4.0 cr)
- ARTS 5670 - Interdisciplinary Media Collaborations (3.0 cr)
- ARTS 5750 - Advanced Narrative Digital Filmmaking (4.0 cr)
- ARTS 5760 - Experimental Film and Video (4.0 cr)
- ARTS 5770 - Animation (4.0 cr)
- ARTS 5890 - 3D Modeling and Digital Fabrication (4.0 cr)
- GCC 5013 - Making Sense of Climate Change - Science, Art, and Agency [CIV] (3.0 cr)

Take 16 or more credit(s) from the following:
- ARTS 8450 - MFA Creative Thesis (1.0 - 9.0 cr)

Theoretical Constructions of Contemporary Art

ARTS 8402 - Theoretical Constructions in Contemporary Art (3.0 cr)

Art Theory or Art History Electives

Take at least 6 credits from outside art to fulfill the art theory or art history course requirements. Courses can be selected from the following departments, or in consultation with the advisor and director of graduate studies.

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Take 6 or more credit(s) from the following:

- ARTH 5xxx
- ARTH 8xxx
- THE 5xxx
- THE 8xxx
- ADES 5xxx
- ADES 8xxx
- APST 5xxx
- APST 8xxx
- ARCH 5xxx
- ARCH 8xxx
- DES 5xxx
- DES 8xxx
- GDES 5xxx
- GDES 8xxx
- HSG 5xxx
- HSG 8xxx
- IDES 5xxx
- IDES 8xxx
- LA 5xxx
- LA 8xxx
- MST 5xxx
- MST 8xxx
- RM 5xxx
- RM 8xxx
- CSCL 5xxx
- CSCL 8xxx
Twin Cities Campus

Art Minor
Art Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Art, E201 Regis Center for Art, 405 21st Ave S, Minneapolis, MN 55455 (612-625-8096; fax: 612-625-7881)
Email: artdept@umn.edu
Website: http://www.art.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 9
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor program in art places major emphasis on creative artistic work of high quality. It promotes not only the conceptual and technical education of the professional artist in their artistic practice, encouraging critical inquiry, excellence, and an understanding of the history of art, but also an experimental approach toward each media. The following media areas are available: ceramics, drawing and painting, photography, printmaking, sculpture, and experimental and media arts.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Course
ARTS 8402 - Theoretical Constructions in Contemporary Art (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Coursework is chosen in consultation with the art director of graduate studies.

Electives
Take 6 - 9 credit(s) from the following:
• ART 5xxx
• ART 8xxx

Doctoral
Coursework is chosen in consultation with the art director of graduate studies.

Electives
Take at least 9 credits from the following:
Twin Cities Campus
Asian Literatures, Cultures, and Media M.A.
Asian Languages and Literatures
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Asian Languages and Literatures, 220 Folwell Hall, 9 Pleasant St SE, Minneapolis, MN 55455 (612-625-6534; fax: 612-624-5513)
Email: all@umn.edu
Website: http://all.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The Asian Languages and Literatures Department considers applications only from students seeking the PhD degree; it does not admit students directly to the MA. The MA is offered only as an exit degree or interim credential.

The Asian literatures, cultures, and media (ALCM) program enables students to pursue the study of Asian texts and media, broadly understood. The program encourages work that questions the boundaries of traditional area studies, demands proficiency in the language(s) of concentration, and provides opportunities for students to design a flexible program of study. Students must designate a language of concentration on their ALCM program application form. Currently, students may select Arabic, Chinese, Japanese, Korean, or Hindi/Urdu for their language of concentration. However, it is possible to select another South Asian language with permission of the director of graduate studies. For details, see the graduate program website at www.all.umn.edu.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Only applications from students seeking the PhD degree are considered, although applicants are not required to have taken graduate coursework before entering the program. The MA is offered as an exit degree or interim credential. A bachelor’s degree from an accredited US institution (or its foreign equivalent) is required for admission. Students entering with an MA in a related field will have the appropriate number of credits and courses applied to their program of study (as determined by the director of graduate studies).
Applicants are expected to have a strong academic record from a relevant humanities or social science discipline and at least three years of college-level study in the proposed language of concentration, or a demonstration of comparable linguistic proficiency.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit test score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

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Information current as of August 31, 2018
For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Language Requirement:** Advanced knowledge in the chosen language.

A minimum GPA of 3.5 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The MA examination comprises the PhD qualifying examination, which is normally taken at the end of the student's second year in the program. Students entering the program with an MA in a related field can take the qualifying examination after one year of study, with approval of the director of graduate studies.

The final examination consists of the following:
1) written language examination(s), typically an in-room reading/translation examination on materials directly related to study and research interests;
2) an oral presentation and interview discussing the materials that were part of the written examination;
3) submission of two Plan B research papers for evaluation (normally papers from two different classes, revised for submission); and
4) an oral examination (in English) by a faculty committee, based on the submitted papers.

**Required Courses**

- ALL 8001 - Critical Approaches to Asian Literary and Cultural Studies (3.0 cr)
- ALL 8002 - Critical Approaches to Asian Studies (3.0 cr)

**Electives**

- Take 24 or more credit(s) from the following:
- Take 0 - 8 credit(s) from the following:
  - ARAB 4101 - Beginning Arabic I for Graduate Student Research (5.0 cr)
  - ARAB 4102 - Beginning Arabic II for Graduate Student Research (5.0 cr)
  - ARAB 4121 - Intermediate Arabic I for Graduate Student Research (5.0 cr)
  - ARAB 4122 - Intermediate Arabic II for Graduate Student Research (5.0 cr)
  - CHN 4041 - Advanced Readings in Modern Chinese I (4.0 cr)
  - CHN 4042 - Advanced Readings in Modern Chinese II (4.0 cr)
  - CHN 5040 - Readings in Chinese Texts (3.0 cr)

**Seminars and Courses**

Many 8xxx-level CLA seminars can be taken to fulfill the requirements of this degree. Students choose courses in consultation with their advisor. The following list includes frequently taken electives:

- Take 16 - 24 credit(s) from the following:
  - ALL 8xxx
  - ALL 8xxx
  - CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
  - CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
  - MIMS 8001 - Theories of the Moving Image (3.0 cr)
  - MIMS 8003 - Historiography of the Moving Image (3.0 cr)
  - HIST 5940 - Topics in History (1.0 - 4.0 cr)
  - HIST 5960 - Topics in History (1.0 - 4.0 cr)
  - HIST 8960 - Topics in History (1.0 - 4.0 cr)
  - ARTH 5765 - Early Chinese Art (3.0 cr)
  - ARTH 8710 - Seminar: Islamic Art (3.0 cr)
  - ARTH 8720 - Seminar: East Asian Art (3.0 cr)
  - ARTH 8950 - Seminar: Issues in the History of Art (3.0 cr)
  - GWSS 5490 - Topics: Political Economy and Global Studies (3.0 cr)
  - ANTH 5980 - Topics in Anthropology (3.0 cr)
  - ANTH 8810 - Topics in Sociocultural Anthropology (3.0 cr)

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**Twin Cities Campus**

**Asian Literatures, Cultures, and Media Minor**

*Asian Languages and Literatures*

**College of Liberal Arts**

Link to a list of faculty for this program.

**Contact Information:**
Department of Asian Languages and Literatures, 220 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-625-6534; fax: 612-624-5513).
Email: all@umn.edu
Website: [http://all.umn.edu](http://all.umn.edu)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Asian literatures, cultures, and media (ALCM) program enables students to pursue the study of Asian texts and media, broadly understood. The program encourages work that questions the boundaries of traditional area studies, demands proficiency in the language(s) of concentration, and provides opportunities for students to design a flexible program of study. Students must designate a language of concentration on their ALCM program application form. Currently, students may select Arabic, Chinese, Japanese, Korean, or Hindi/Urdu for their language of concentration. However, it is possible to select another South Asian language with permission of the director of graduate Studies. For details, see the graduate program website at [www.all.umn.edu](http://www.all.umn.edu).

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

Students seeking the ALCM minor must consult with the ALCM director of Graduate Studies to select a minor field advisor. Coursework for the minor is approved by the minor field advisor.

In addition to credit requirements, students must take and pass at the terminal MA level the language translation examination section of the ALCM MA qualifying examination.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Doctoral**

**Required Coursework**

- [ALL 8001 - Critical Approaches to Asian Literary and Cultural Studies (3.0 cr)]

**Electives**

Take 9 or more credits from the following:
- ALL 5xxx
- ALL 8xxx
Asian Literatures, Cultures, and Media Ph.D.
Asian Languages and Literatures
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Asian Languages and Literatures, 220 Folwell Hall, 9 Pleasant St SE, Minneapolis, MN 55455 (612-625-6534; fax: 612-624-5513)
Email: all@umn.edu
Website: http://all.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Asian literatures, cultures, and media (ALCM) program enables students to pursue the study of Asian texts and media, broadly understood. The program encourages work that questions the boundaries of traditional area studies, demands proficiency in the language(s) of concentration, and provides opportunities for students to design a flexible program of study. Students must designate a language of concentration on their ALCM program application form. Currently, students may select Arabic, Chinese, Japanese, Korean, or Hindi/Urdu for their language of concentration. However, it is possible to select another South Asian language with permission of the director of graduate studies. For details, see the graduate program website at www.all.umn.edu.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
A bachelor's degree from an accredited U.S. institution (or its foreign equivalent) is required for admission. Students entering with an M.A. in a related field will have the appropriate number of credits and courses applied to their program of study (as determined by the director of graduate studies). Applicants are expected to have a strong academic record from a relevant humanities or social science discipline and at least three years of college-level study in the proposed language of concentration, or a demonstration of comparable linguistic proficiency.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
48 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading and speaking competence in the language.

A minimum GPA of 3.05 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Students must also pass the translation examination component of the ALCM PhD qualifying examination.

Required Courses
ALL 8001 - Critical Approaches to Asian Literary and Cultural Studies (3.0 cr)
ALL 8002 - Critical Approaches to Asian Studies (3.0 cr)

Electives
Take 42 or more credit(s) from the following:

Language Courses
A maximum of 8 language credits can be applied as electives.

Take at most 8 credit(s) from the following:

• ARAB 4101 - Beginning Arabic I for Graduate Student Research (5.0 cr)
• ARAB 4102 - Beginning Arabic II for Graduate Student Research (5.0 cr)
• ARAB 4121 - Intermediate Arabic I for Graduate Student Research (5.0 cr)
• ARAB 4122 - Intermediate Arabic II for Graduate Student Research (5.0 cr)
• CHN 4041 - Advanced Readings in Modern Chinese I (4.0 cr)
• CHN 4042 - Advanced Readings in Modern Chinese II (4.0 cr)
• CHN 5040 - Readings in Chinese Texts (3.0 cr)

Seminars and Courses
Many 8xxx-level CLA seminars can be taken to fulfill the requirements of this degree. Students choose courses in consultation with their advisor. The following list includes frequently taken electives:

Take 34 - 42 credit(s) from the following:

• ALL 5xxx
• ALL 8xxx
• CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
• CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
• MIMS 8001 - Theories of the Moving Image (3.0 cr)
• MIMS 8003 - Historiography of the Moving Image (3.0 cr)
• HIST 5940 - Topics in Asian History (1.0 - 4.0 cr)
• HIST 5960 - Topics in History (1.0 - 4.0 cr)
• HIST 8960 - Topics in History (1.0 - 4.0 cr)
• ARTH 5765 - Early Chinese Art (3.0 cr)
• ARTH 8710 - Seminar: Islamic Art (3.0 cr)
• ARTH 8720 - Seminar: East Asian Art (3.0 cr)
• ARTH 8920 - Seminar: Film History and Criticism (3.0 cr)
• ARTH 8950 - Seminar: Issues in the History of Art (3.0 cr)
• GWSS 5490 - Topics: Political Economy and Global Studies (3.0 cr)
• ANTH 5980 - Topics in Anthropology (3.0 cr)
• ANTH 8810 - Topics in Sociocultural Anthropology (3.0 cr)
Twin Cities Campus
Asian Studies MA
Asian Languages and Literatures
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Asian Languages and Literatures, 220 Folwell Hall, 9 Pleasant St SE, Minneapolis, MN 55455 (612-625-6534; fax: 612-624-5513)
Email: all@umn.edu
Website: https://cla.umn.edu/asian-lang-lit

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MA in Asian studies program is a terminal master's degree designed to accommodate students with a wide range of backgrounds and aspirations. The MA is designed for students who seek to pursue careers in government; nonprofit institutions and social work; law, journalism, business; K-12 and community college education; library and archival work; and translation and interpretation. The degree also prepares students interested in pursuing a doctorate in other graduate programs, including the PhD in Asian literatures, cultures, and media. Completion of the Asian studies MA degree indicates proficiency in one Asian language, and knowledge of the relevant histories, literatures, and cultures of the region.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: See Other Requirements

A minimum GPA of 3.3 is required for students to remain in good standing.

At least 1 semester must be completed before filing a Degree Program Form.

Language requirements for Plan A and Plan B differ. For Plan A: Intermediate-advanced knowledge in the chosen language, indicated by completion of one of the following courses: ARAB5102, CHN4008, HNUR4006, JPN4006, KOR4006. Other evidence of comparable linguistic proficiency will also be considered.

For Plan B: Intermediate knowledge in the chosen language, indicated by completion of one of the following courses: ARAB4122, CHN4004, CHN4006, HNUR4004, JPN4004, KOR4004. Other evidence of comparable linguistic proficiency will also be considered.

Required Course (3 Credits)

All students must take the following course:
ALL 8001 - Critical Approaches to Asian Literary and Cultural Studies (3.0 cr)

Language Courses

Students may take up to 9 credits from the following list. Courses are selected in consultation with the advisor.
ARAB 4101 - Beginning Arabic I for Graduate Student Research (5.0 cr)
ARAB 4102 - Beginning Arabic II for Graduate Student Research (5.0 cr)
ARAB 4121 - Intermediate Arabic I for Graduate Student Research (5.0 cr)
ARAB 4122 - Intermediate Arabic II for Graduate Student Research (5.0 cr)
ARAB 5040 - Readings in Arabic Texts (3.0 cr)
ARAB 5101 - Advanced Arabic I (4.0 cr)
ARAB 5102 - Advanced Arabic II (4.0 cr)
CHN 4001 - Beginning Modern Chinese I for Graduate Student Research (6.0 cr)
CHN 4002 - Beginning Modern Chinese II for Graduate Student Research (6.0 cr)
CHN 4003 - Intermediate Modern Chinese I for Graduate Student Research (5.0 cr)
CHN 4004 - Intermediate Modern Chinese II for Graduate Student Research (5.0 cr)
CHN 4005 - Accelerated Beginning Modern Chinese for Graduate Student Research (5.0 cr)
CHN 4006 - Accelerated Intermediate Modern Chinese for Graduate Student Research (5.0 cr)
CHN 4007 - Advanced Modern Chinese I for Graduate Student Research (4.0 cr)
CHN 4008 - Advanced Modern Chinese II for Graduate Student Research (4.0 cr)
CHN 4041 - Advanced Readings in Modern Chinese I (4.0 cr)
CHN 4042 - Advanced Readings in Modern Chinese II (4.0 cr)
CHN 5040 - Readings in Chinese Texts (3.0 cr)
CHN 5120 - Topics in Chinese Linguistics (4.0 cr)
CHN 5211 - Introductory Classical Chinese I (3.0 cr)
CHN 5212 - Introductory Classical Chinese II (3.0 cr)
HNUR 4001 - Beginning Hindi-Urdu I for Graduate Student Research (5.0 cr)
HNUR 4002 - Beginning Hindi-Urdu II for Graduate Student Research (5.0 cr)
HNUR 4003 - Intermediate Hindi-Urdu I for Graduate Student Research (5.0 cr)
HNUR 4004 - Intermediate Hindi-Urdu II for Graduate Student Research (5.0 cr)
HNUR 4005 - Advanced Hindi-Urdu I for Graduate Student Research (4.0 cr)
HNUR 4006 - Advanced Hindi-Urdu II for Graduate Student Research (4.0 cr)
HNUR 4015 - Accelerated Beginning Hindi-Urdu for Graduate Research (5.0 cr)
JPN 4001 - Beginning Japanese I for Graduate Student Research (5.0 cr)
JPN 4002 - Beginning Japanese II for Graduate Student Research (5.0 cr)
JPN 4003 - Intermediate Japanese I for Graduate Student Research (5.0 cr)
JPN 4004 - Intermediate Japanese II for Graduate Student Research (5.0 cr)
JPN 4005 - Third Year Japanese I for Graduate Student Research (4.0 cr)
JPN 4006 - Third Year Japanese II for Graduate Student Research (4.0 cr)
JPN 4041 - Advanced Japanese Conversation and Composition I (4.0 cr)
JPN 4042 - Advanced Japanese Conversation and Composition II (4.0 cr)
JPN 5040 - Readings in Japanese Texts (3.0 cr)
KOR 4001 - Beginning Korean I for Graduate Student Research (5.0 cr)
KOR 4002 - Beginning Korean II for Graduate Student Research (5.0 cr)
KOR 4003 - Intermediate Korean I for Graduate Student Research (5.0 cr)
KOR 4004 - Intermediate Korean II for Graduate Student Research (5.0 cr)
KOR 4006 - Third Year Korean II for Graduate Student Research (4.0 cr)
KOR 4041 - Advanced Readings in Modern Korean I (4.0 cr)
KOR 4042 - Advanced Readings in Modern Korean II (4.0 cr)
KOR 5040 - Readings in Korean Texts: North Korean Dialect (3.0 cr)
KOR 5140 - Readings in Sino-Korean Texts (3.0 cr)

Electives
Select courses from the following list, in consultation with the advisor, to complete the Plan A 20-credit minimum or the Plan B 30-credit minimum. Other elective courses may be taken with approval of the advisor and director of graduate studies.

ALL 5xxx
ALL 8xxx
CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
CL 8910 - Advanced Topics in Comparative Literature (3.0 cr)
MIMS 8001 - Theories of the Moving Image (3.0 cr)
MIMS 8003 - Historiography of the Moving Image (3.0 cr)
HIST 5940 - Topics in Asian History (1.0 - 4.0 cr)
HIST 5960 - Topics in History (1.0 - 4.0 cr)
HIST 8960 - Topics in History (1.0 - 4.0 cr)
ARTH 8720 - Seminar: East Asian Art (3.0 cr)
ARTH 8810 - Seminar: Issues in the History of Art (3.0 cr)
GWSS 5490 - Topics: Political Economy and Global Studies (3.0 cr)
ANTH 5980 - Topics in Anthropology (3.0 cr)
ANTH 8810 - Topics in Sociocultural Anthropology (3.0 cr)

Plan Options
Plan A

Thesis Credits
Plan A students must take 10 master's thesis credits.
ALL 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated BA Asian Languages and Literatures / MA Asian Studies
The Integrated BA/MA Sub-plan is open to University of Minnesota students majoring in Asian languages and literatures who have a GPA of at least 3.5 and are within 30 credits of completing their undergraduate requirements. Preference will go to students who already have a high degree of proficiency in their language of concentration. Interested undergraduates apply for admission to the program in the Spring semester of their junior year, and admission to the sub-plan is contingent on a formal admissions process. Students admitted to the sub-plan must maintain timely degree progress to ensure all undergraduate degree requirements are completed by the end of their fourth year.

Upon admission, students may opt to complete either Plan A (Thesis option) or Plan B (non-thesis option) of the MA degree. Up to 10 graduate credits (5xxx or 8xxx or 4xxx language courses) may be completed in the senior year of undergraduate study. These credits will count towards the students MA requirements and will not double count to their BA. In their fifth year, students complete all remaining MA coursework requirements as well as the final examination or MA thesis (depending on the students choice of plan).
Twin Cities Campus
Audiology Au.D.
Speech-Language-Hearing Sciences
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Speech-Language-Hearing Sciences, 115 Shevlin Hall, 164 Pillsbury Dr SE, Minneapolis, MN 55455 (612-624-3322; fax: 612-624-7586)
Email: slhs@umn.edu
Website: http://www.slhs.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 102
- This program requires summer semesters for timely completion.
- Degree: Doctor of Audiology

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The emphases in the AuD program focus on meeting the standards for licensure as an audiologist. The program emphasizes outcome-based learning activities that prepare graduates to interpret research findings and incorporate them into clinical practice. Coursework and clinical education focus on diagnostic, rehabilitative techniques, technology counseling approaches, and human development. Note that all offers of admission for the AuD program are contingent upon the results of a criminal background check administered by the Minnesota Department of Human Services which will be conducted during the upcoming fall semester.

The doctoral (AuD) education program in audiology at the University of Minnesota - Twin Cities is accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) of the American Speech-Language-Hearing Association, 2200 Research Boulevard #310, Rockville, Maryland 20850, 800-498-2071 or 301-296-5700.

Accreditation
This program is accredited by the American Speech-Language-Hearing Association (ASHA).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Prerequisite coursework for the Au.D. program includes transcript credit in statistics, social science, and scientific method/inquiry.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
94 credits are required in the major.
8 credits are required outside the major.
This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The AuD is a four-year plan of study for students entering with a background in speech-language-hearing sciences. Students without such a background should expect an additional year of study. In addition to study in the major field, the degree requires 8 related-fields credits. With advisor approval, up to 6 of these outside-major credits may be completed within the department. During the final year, students complete a clinical externship. Summative evaluations will include a written comprehensive examination followed by an oral exam, and a written capstone project that includes an oral presentation and an oral defense of the project.

Audiology Track: Required Courses
SLHS 5401 - Counseling and Professional Issues (3.0 cr)
SLHS 5801 - Advanced Audiologic Assessment (3.0 cr)
SLHS 5802 - Hearing Aids I (3.0 cr)
SLHS 5803 - Pediatric Audiology (3.0 cr)
SLHS 5804 - Cochlear Implants (3.0 cr)
SLHS 5805 - Advanced Rehabilitative Audiology (3.0 cr)
SLHS 5806 - Auditory Processing Disorders (3.0 cr)
SLHS 5807 - Noise and Hearing Conservation (3.0 cr)
SLHS 5808 - Pathophysiology of Hearing Disorders (3.0 cr)
SLHS 8801 - Electrophysiologic Assessment of Auditory Function (3.0 cr)
SLHS 8802 - Hearing Aids II (3.0 cr)
SLHS 8803 - Signals and Systems in Audiology (3.0 cr)
SLHS 8805 - Hearing Science Foundations of Audiology (3.0 cr)
SLHS 8807 - Balance Assessment (3.0 cr)

Audiology Capstone
Take exactly 6 credit(s) from the following:
• SLHS 8806 - Audiology Capstone (1.0 - 6.0 cr)

Clinical Education in Audiology
Take exactly 17 credit(s) from the following:
• SLHS 8820 - Clinical Education in Audiology (1.0 - 8.0 cr)

Audiology Externship
Take exactly 17 credit(s) from the following:
• SLHS 8840 - Audiology Externship (1.0 - 8.0 cr)

Laboratory Module in Audiology
Take exactly 2 credit(s) from the following:
• SLHS 5810 - Laboratory Module in Audiology (1.0 - 2.0 cr)

Clinical Research and Practice: Grand Rounds
Take exactly 4 credit(s) from the following:
• SLHS 5820 - Clinical Research and Practice: Grand Rounds (1.0 - 6.0 cr)

Clinical Foundations in Audiology
Take exactly 2 credit(s) from the following:
• SLHS 5830 - Clinical Foundations in Audiology (1.0 - 8.0 cr)

Directed Research
Take exactly 4 credit(s) from the following:
• SLHS 8994 - Directed Research (1.0 - 12.0 cr)

Related Fields
A minimum of 2 credits must be taken outside of SLHS.
Take 8 or more credit(s) from the following:
• ADDS 5021 - Introduction to Evidence Based Practices and the Helping Relationship (3.0 cr)
• CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
• CPSY 4302 - Infant Development (3.0 cr)
• CPSY 4329 - Biological Foundations of Development (3.0 cr)
• CPSY 4341 - Perceptual Development (3.0 cr)
• CPSY 4343 - Cognitive Development (3.0 cr)
• CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
• CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
• CSPH 5111 - Ways of Thinking about Health (2.0 cr)
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5135 - Human Relations Workshop (4.0 cr)
• EPSY 5400 - Special Topics in Counseling Psychology (1.0 - 4.0 cr)
• EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
• EPSY 5451 - College Students Today (3.0 cr)
• EPSY 5461 - Cross-Cultural Counseling (3.0 cr)
• EPSY 5609 - Family-centered Services (2.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 5625 - Introduction to Behavioral Genetics: Introduction (2.0 cr)
• EPSY 5641 - Foundations of Deaf Education (3.0 cr)
• EPSY 5642 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
• EPSY 5644 - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
• EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
• EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
• EPSY 5668 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
• GER O 5125 - Gerontology Service Learning (3.0 cr)
• HINF 5501 - US Health Care System: Information Challenges in Clinical Care (1.0 cr)
• KIN 8211 - Seminar: Perception and Action (3.0 cr)
• LING 8921 - Seminar in Language and Cognition (3.0 cr)
• NSCI 5101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
• NSCI 5111 - Medical Neuroscience for Graduate Students (5.0 cr)
• OTOL 8234 - Anatomy of the Head and Neck and Temporal Bone Dissection (2.0 cr)
• OTOL 8247 - Anatom y and Physiology of Hearing and Balance (3.0 cr)
• PHAR 5201 - Applied Medical Terminology (2.0 cr)
• PSY 4036 - Perceptual Issues in Visual Impairment (3.0 cr)
• PSY 4960 - Seminar in Psychology (1.0 - 4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5037 - Psychology of Hearing (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
• PSY 8037 - Psychophysics and Audition (3.0 cr)
• PUBH 6370 - Social Epidemiology (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SPAN 5985 - Sociolinguis tics Perspectives on Spanish in the United States (3.0 cr)
• SLHS 5900 - Topic in Speech-Language-Hearing Sciences (1.0 - 3.0 cr)
• SLHS 8530 - Seminar: Speech (3.0 cr)
• BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
• CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
• SLHS 5602 - Speech Sound Disorders: Assessment and Treatment across Languages (3.0 cr)
• SLHS 5603 - Assessment and Intervention of Language Disorders in Children (3.0 cr)
• EPSY 8600 - Special Topics: Special Education Issues (1.0 - 3.0 cr)
• FSOS 5942 - Everyday Experiences of Families (2.0 cr)
• FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
• OLPD 5211 - Introduction to the Undereducated Adult (1.0 cr)
• SOC 4246 - Sociology of Health and Illness (3.0 cr)
• CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
• CI 5642 - Assessing English Learners (3.0 cr)
• CI 5653 - Methods in Teaching English as a Second Language (ESL) in Higher Education (3.0 cr)
• EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
• FSOS 4107 - Traumatic Stress and Resilience in Vulnerable Families Across the Lifespan (3.0 cr)
• OLPD 5356 - Disability Policy and Services (3.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
• PSY 5062 - Cognitive Neuropsychology (3.0 cr)
• PSY 5138 - Adult Development and Aging (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Joint- or Dual-degree Coursework: AuD and PhD in Speech-Language-Hearing Sciences
Student may take a total of 9 credits in common among the academic programs.
Twin Cities Campus
Classical and Near Eastern Studies M.A.
Classical & Near Eastern Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Classical and Near Eastern Studies, 245 Nicholson Hall, 216 Pillsbury Dr. SE, Minneapolis, MN 55455 (612-625-5353; fax: 612-624-4894)
Email: cnes@umn.edu
Website: http://cnes.cla.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34 to 47
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Classical and Near Eastern Studies (CNES) is an interdisciplinary department that brings together faculty and graduate students who might in other settings be dispersed among a wide range of programs. CNES is dedicated to rigorous philological and literary training and to the conviction that the ancient Mediterranean world is best studied as a diverse but richly integrated cultural whole. The various master's and Ph.D. tracks allow students to concentrate in the area and period that most appeal to them, but students are strongly encouraged to take courses across the entire range of the department's offerings and to develop a broad, multidisciplinary approach to research and teaching. Related special facilities include the Center for Medieval Studies, the Center for Jewish Studies, and the Center for Modern Greek Studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

For the major track in classics, students should have sufficient knowledge to begin graduate reading courses in either Greek or Latin and at least intermediate ability in the other language.

Other requirements to be completed before admission:
In addition to the online University application, applicants must complete the Department of Classical and Near Eastern Studies application on the ApplyYourself site (also available for download on the department website); other supporting materials, including recommendations and a writing sample, can be uploaded directly into the University's online application. For non-native speakers of English, a copy of TOEFL results is required. Students may be admitted in any academic term, but financial assistance is normally available only to applicants admitted for fall semester.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Plan A: Plan A requires 28 to 31 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 28 to 31 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: A capstone project is required. Two research papers from departmental seminars (numbered 8190 or 8910), as long as the paper receives a grade of B+ or higher and makes substantive use of at least one modern scholarly language other than English.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Translation proficiency exams offered 1x semester.

A minimum GPA of 3.25 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Required Coursework

CNES 5794 - Introduction to Classical and Near Eastern Studies (1.0 cr)

Plan Options

Plan A Requirements
Take at least 10 master's thesis credits.

CNES 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B Requirements
Complete two master's-level research papers, in consultation with the adviser.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Classics
The Classics track provides broad training in the literature of ancient Greece and Rome in its cultural context. Work in Greek and Latin is supplemented by courses in a related field or area of interest. This track requires nearly equal emphasis on courses and seminars in Greek and in Latin.

Both the Plan A and Plan B options require a minimum of 34 course credits. The Plan A also requires 10 master's thesis credits.

Language Requirements: One modern research language as appropriate (normally French, German, or Italian), and reading proficiency in both Greek and Latin as certified by departmental exam based on a set reading list. Final examinations: the final examinations are written (Greek and Latin reading proficiency) and oral (general).

Required Coursework (27 credits)
Take a minimum of 27 Greek and Latin language credits, with at least 15 credits in one language and 12 credits in the other. One 3-credit prose composition course and two 3-credit seminars (one in each language) are required, and can be applied to the 27-credit minimum with approval of the director of graduate studies. No more than two 51xx or 52xx courses can be used to meet this requirement.

Language Courses

GRK 5xxx
GRK 8xxx
LAT 5xxx
LAT 8xxx

Seminar Courses
Take at least one seminar each in Greek and Latin

GRK 8910 - Seminar (3.0 cr)
LAT 8910 - Seminar (3.0 cr)

Prose Composition Course
Take at least one of the following courses:
GRK 5701 - Prose Composition (3.0 cr)
LAT 5701 - Latin Prose Composition (3.0 cr)

Additional Coursework (6 credits)
Take 6 additional credits, selected in consultation with the adviser.

Greek
A core of advanced work in Greek is supplemented by a related field or area of interest. Both the Plan A and Plan B options require a minimum of 37 course credits. The Plan A also requires 10 master's thesis credits. Language Requirements: One modern research language as appropriate, preferably French, German, or Italian, and reading proficiency in Greek as demonstrated by a departmental examination based on a set reading list. Final examinations: the final examinations are written (Greek reading proficiency) and oral (general).

Required Language Coursework (24 credits)
Take a minimum of 24 Greek language credits. One 3-credit prose composition course and two 3-credit seminars are required, and can be applied to the 24-credit minimum with approval of the director of graduate studies. No more than two 51xx or 52xx courses can be used to meet this requirement.

Language Courses
Take at least 15 credits of Greek.
GRK 5xxx
GRK 8xxx

Seminar Courses
Take two seminars for a total of 6 credits. At least one seminar must be GRK 8910.
GRK 8910 - Seminar (3.0 cr)
CNES 8190 - Seminar: Issues in Ancient Art and Archaeology (3.0 cr)

Prose Composition Course
Take the following course for 3 credits:
GRK 5701 - Prose Composition (3.0 cr)

Electives
Select elective credits as needed, in consultation with the adviser, to complete the 31-credit minimum for the major.

Additional Coursework (6 credits)
Take 6 additional credits, selected in consultation with the adviser.

Latin
A core of advanced work in Latin is supplemented by a related field or area of interest. Both the Plan A and Plan B options require a minimum of 37 course credits. The Plan A also requires 10 master's thesis credits. Language Requirements: One modern research language as appropriate, preferably French, German, or Italian, and reading proficiency in Latin as demonstrated by a departmental examination based on a set reading list. Final examinations: the final examinations are written (Latin reading proficiency) and oral (general).

Required Language Coursework (24 credits)
Take a minimum of 24 Latin language credits. One 3-credit prose composition course and two 3-credit seminars are required, and can be applied to the 24-credit minimum with approval of the director of graduate studies. No more than two 51xx or 52xx courses can be used to meet this requirement.

Language Courses
Take at least 15 credits of Latin.
LAT 5xxx
LAT 8xxx

Seminar Courses
Take two seminars for a total of 6 credits. At least one seminar must be LAT 8910.
LAT 8910 - Seminar (3.0 cr)
CNES 8190 - Seminar: Issues in Ancient Art and Archaeology (3.0 cr)

Prose Composition Course
Take the following course for 3 credits:
LAT 5701 - Latin Prose Composition (3.0 cr)

Electives
Select elective credits as needed, in consultation with the adviser, to complete the 31-credit minimum for the major.

Additional Coursework (6 credits)
Take at least 6 additional credits, selected in consultation with the adviser.

Religions in Antiquity
The religions in antiquity track is comparative in both method and content. Although students may focus on a particular religious tradition, they will nonetheless study several ancient religions. Both the Plan A and Plan B require a minimum of 37 course credits. The
Plan A also requires 10 master's thesis credits. Language Requirements: Proficiency in one modern language (usually German) and master's-level proficiency in classical Hebrew, Greek, or Latin as demonstrated by a departmental examination based on a set reading list. Final examinations: the final examinations are written (ancient language reading proficiency) and oral (general).

**Required Core (6 credits)**
Take the following courses for a total of 6 credits:
- RELS 5001 - Theory and Method in the Study of Religion: Critical Approaches to the Study of Religion (3.0 cr)
- RELS 8190 - Comparative Seminar in Religions in Antiquity (3.0 cr)

**Ancient Art and Archaeology Requirement (3 credits)**
Take at least 3 credits from the following:
- ANTH 8004 - Foundations of Anthropological Archaeology (3.0 cr)
- ANTH 8112 - Reconstructing Hominin Behavior (3.0 cr)
- ANTH 8230 - Anthropological Research Design (3.0 cr)
- ANTH 8244 - Interpreting Ancient Bone (4.0 cr)
- ANTH 8510 - Topics in Archaeology (3.0 cr)
- ANTH 5027W - Archaeology of Prehistoric Europe [HIS, WI] (3.0 cr)
- ANTH 5221 - Anthropology of Material Culture (3.0 cr)
- ANTH 5269 - Analysis of Stone Tool Technology (4.0 cr)
- ANTH 5401 - The Human Fossil Record (3.0 cr)
- ANTH 5402 - Zooarchaeology Laboratory (3.0 cr)
- ANTH 5980 - Topics in Anthropology (3.0 cr)
- ANTH 5448 - Applied Heritage Management (3.0 cr)
- ARTH 5xxx

**Distribution Requirement (21 credits)**
Take a minimum of 21 credits, with at least one 3-credit course from three of the following areas, and with the approval of the director of graduate studies. At least four of the courses must involve substantial primary readings in an ancient language (usually Greek, Hebrew, or Latin).

**Hebrew Bible or Ancient Near East**
- CNES 5513W - Scripture and Interpretation in Israelite Religion and Judaism [WI] (3.0 cr)
- RELS 5513W - Scripture and Interpretation in Israelite Religion and Judaism [WI] (3.0 cr)
- JWST 5513W - Scripture and Interpretation (3.0 cr)
- CNES 8513 - Scripture and Interpretation (3.0 cr)

**Greek and Roman Religions**
- CNES 5071 - Greek and Hellenistic Religions (3.0 cr)
- RELS 5071 - Greek and Hellenistic Religions (3.0 cr)

**Ancient Judaism**
- CNES 5204 - The Dead Sea Scrolls (3.0 cr)
- RELS 5204 - The Dead Sea Scrolls (3.0 cr)
- RELS 5504 - Development of Israelite Religion II (3.0 cr)
- HEBR 5300 - Post-Biblical Hebrew: Second Temple Period (3.0 cr)

**New Testament and Early Christianity**
- RELS 5072 - The Birth of Christianity [AH] (3.0 cr)
- CNES 5072 - The Birth of Christianity [AH] (3.0 cr)
- CNES 5188 [Inactive](3.0 cr)
- RELS 5252 [Inactive](3.0 cr)
- GRK 5200 - Biblical Greek (3.0 cr)
- GRK 8400 - Readings in Patristic Greek (3.0 cr)

**Additional Coursework (6 credits)**
Take at least 6 additional credits, selected in consultation with the adviser.
Twin Cities Campus
Classical and Near Eastern Studies Minor
Classical & Near Eastern Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Classical and Near Eastern Studies, 245 Nicholson Hall, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-5353; fax: 612-624-4894)
Email: cnes@umn.edu
Website: http://cnes.cla.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Classical and Near Eastern Studies (CNES) is an interdisciplinary department that brings together faculty and graduate students who might in other settings be dispersed among a wide range of programs. CNES is dedicated to rigorous philological and literary training, and to the conviction that the ancient Mediterranean world is best studied as a diverse but richly integrated cultural whole. The various MA and PhD tracks allow students to concentrate in the area and period that most appeal to them, but students are strongly encouraged to take courses across the entire range of the department’s offerings and to develop a broad, multidisciplinary approach to research and teaching.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

For the minor track in classics, students should have sufficient knowledge to begin graduate reading courses in either Greek or Latin and at least intermediate ability in the other language.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Reading proficiency in either Greek or Latin.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Language Options

Classics Option (9 Credits)
Greek
Take at least 3 credits of Greek. GRK 5003 and GRK 5004 are not eligible.
- GRK 5xxx
- GRK 8xxx

Latin
Take at least 3 credits of Latin. LAT 5001, LAT 5003, and LAT 5004 are not eligible.
- LAT 5xxx
- LAT 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
- CNES 5xxx
- CNES 8xxx

-OR-

Greek Option (9 Credits)
Greek
Take at least 6 Greek credits. GRK 5003 and GRK 5004 are not eligible.
- GRK 5xxx
- GRK 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
- CNES 5xxx
- CNES 8xxx

-OR-

Latin Option (9 Credits)
Latin
Take at least 6 Latin credits. LAT 5001, LAT 5003, and LAT 5004 are not eligible.
- LAT 5xxx
- LAT 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
- CNES 5xxx
- CNES 8xxx

Doctoral

Language Options

Classics Option (12 Credits)
Greek
Take at least 3 Greek credits. GRK 5003 and GRK 5004 are not eligible.
- GRK 5xxx
- GRK 8xxx

Latin
Take at least 3 Latin credits. LAT 5003 and LAT 5004 are not eligible.
- LAT 5xxx
- LAT 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
- CNES 5xxx
- CNES 8xxx

-OR-

Greek Option (12 Credits)
Greek
Take at least 9 Greek credits. GRK 5003 and GRK 5004 are not eligible.
- GRK 5xxx
- GRK 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
- CNES 5xxx
- CNES 8xxx

-OR-
Latin (12 Credits)

Latin
Take at least 9 Latin credits. LAT 5001, LAT 5003, and LAT 5004 are not eligible.
LAT 5xxx
LAT 8xxx

Classical and Near Eastern Studies
Take at least 3 CNES credits.
CNES 5xxx
CNES 8xxx
Twin Cities Campus
Classical and Near Eastern Studies Ph.D.
Classical & Near Eastern Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Classical and Near Eastern Studies, 245 Nicholson Hall, 216 Pillsbury Dr. SE, Minneapolis, MN 55455 (612-625-5353; fax: 612-624-4894)
Email: cnes@umn.edu
Website: http://cnes.cla.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 70 to 71
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Classical and Near Eastern Studies (CNES) is an interdisciplinary department that brings together faculty and graduate students who might in other settings be dispersed among a wide range of programs. CNES is dedicated to rigorous philological and literary training and to the conviction that the ancient Mediterranean world is best studied as a diverse but richly integrated cultural whole. The various Master's and Ph.D. tracks allow students to concentrate in the area and period that most appeal to them, but students are strongly encouraged to take courses across the entire range of the department's offerings and to develop a broad, multidisciplinary approach to research and teaching. Students entering the PhD program with an master's can usually receive credit for some earlier coursework, subject to the approval of the graduate faculty and University requirements. Related special facilities include the Center for Medieval Studies, the Center for Jewish Studies, and the Consortium for the Study of the Pre-Modern World.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
In addition to the online University application, applicants must complete the Department of Classical and Near Eastern Studies application on the ApplyYourself site (also available for download on the department website); other supporting materials, including recommendations and a writing sample, can be uploaded directly into the University's online application. For nonnative speakers of English, a copy of TOEFL results is required. Students may be admitted in any academic term, but financial assistance is normally available only to applicants admitted for fall semester.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements
34 to 35 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: German and a second modern research language.

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Required Coursework
All students must taken the following 1-credit course:
CNES 5794 - Introduction to Classical and Near Eastern Studies (1.0 cr)

Doctoral Thesis Credits
All students must take at least 24 doctoral thesis credits.
CNES 8888 - Thesis Credits: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Classics
The Classics track requires extensive advanced work in both Latin and Greek, together with some study in a related field or area of interest. The program requires nearly equal emphasis on courses and seminars in Greek and in Latin.

Language Requirements: German, plus another modern language, preferably French or Italian, as well as reading proficiency in both Greek and Latin, as demonstrated by a departmental examination based on a set reading list.

Required Language Coursework (24 credits)
Language Courses (21 credits)
Take at least 9 credits of Greek and 9 credits of Latin for a total of 18 credits. Of the 18 credits, at least half must be from Greek or Latin seminar courses (6 seminar credits from one language and 3 seminar credits from the other). In addition, select at least 3 elective credits to complete the 21-credit language course requirement. 51xx and 52xx courses cannot be applied to this requirement.
GRK 5xxx
GRK 8xxx
GRK 8910 - Seminar (3.0 cr)
LAT 8910 - Seminar (3.0 cr)

Prose Composition Course (3 credits)
Take one of the following composition courses for 3 credits:
GRK 5701 - Prose Composition (3.0 cr)
LAT 5701 - Latin Prose Composition (3.0 cr)

Required Art or Archaeology Coursework (3 credits)
Take at least 3 credits from the following course list, or in consultation with the director of graduate studies:
ANTH 8004 - Foundations of Anthropological Archaeology (3.0 cr)
ANTH 8112 - Reconstructing Hominin Behavior (3.0 cr)
ANTH 8230 - Anthropological Research Design (3.0 cr)
ANTH 8244 - Interpreting Ancient Bone (4.0 cr)
ANTH 8510 - Topics in Archaeology (3.0 cr)
ANTH 5027W - Archaeology of Prehistoric Europe [HIS, WI] (3.0 cr)
ANTH 5221 - Anthropology of Material Culture (3.0 cr)
ANTH 5269 - Analysis of Stone Tool Technology (4.0 cr)
ANTH 5401 - The Human Fossil Record (3.0 cr)
ANTH 5402 - Zooarchaeology Laboratory (3.0 cr)
ANTH 5980 - Topics in Anthropology (3.0 cr)
ANTH 5448 - Applied Heritage Management (3.0 cr)
Required Ancient History Coursework (6 credits)
Take at least 6 credits in Ancient History, in consultation with the director of graduate studies.
CNES 5xxx
CNES 8xxx

Electives
Select at least 3 elective credits as needed, in consultation with the advisor, to complete the 34-credit minimum for the major.

Outside Coursework (12 credits)
Take at least 12 credits, selected in consultation with the advisor, to meet the outside credit requirement.

Religions of Antiquity

Required Coursework (9 credits)
Take the following courses for a total of 9 credits:
RELS 8190 - Comparative Seminar in Religions in Antiquity (3.0 cr)
CNES 8513 - Scripture and Interpretation (3.0 cr)
RELS 5001 - Theory and Method in the Study of Religion: Critical Approaches to the Study of Religion (3.0 cr)

Outside Coursework (12 credits)
All students take at least 12 credits outside the major, in consultation with the adviser. Outside coursework should comprise courses in languages or topics outside the primary concentration area, and can include relevant coursework from Anthropology; Art History; English; Gender, Women, & Sexuality Studies; History; Medieval Studies; or Philosophy.
ANTH 5xxx
ANTH 8xxx
ARTH 5xxx
ARTH 8xxx
ENGL 5xxx
ENGL 8xxx
HIST 5xxx
HIST 8xxx
GWSS 5xxx
GWSS 8xxx
PHIL 5xxx
PHIL 8xxx

Concentration Areas
Select one of the two following concentration areas. In addition, select a primary language of competence, and at least one secondary language of competence.

Ancient Near East and Hebrew Bible
This concentration area focuses on the religions, literatures, and cultures of Mesopotamia, Canaan, and Israel from the 2nd millennium BCE to the arrival of Roman rule in the first century BCE. The required primary language is Hebrew. Secondary language options are Aramaic, Akkadian, Ugaritic, or Greek.

Concentration Area Coursework (24 credits)
Courses are chosen from the following list, or in consultation with the adviser, based on concentration area and comparative themes for doctoral examinations.
CNES 5070 - Topics in Ancient Religion (3.0 cr)
CNES 5080 - New Testament Proseminar (3.0 cr)
CNES 8530 - Religions of the Ancient Mediterranean World (3.0 cr)
CNES 8550 - Gender and Body in Ancient Religion (3.0 cr)
CNES 8570 - Readings in Religious Texts (3.0 cr)
HEBR 5200 - Advanced Classical Hebrew (3.0 cr)
RELS 5013W - Biblical Law and Jewish Ethics [WI] (3.0 cr)
ANTH 4049 - Religion and Culture (3.0 cr)
ANTH 5027W - Archaeology of Prehistoric Europe [HIS, WI] (3.0 cr)
ANTH 5446 - Archaeology of Representation as Communication (3.0 cr)
CNES 5204 - The Dead Sea Scrolls (3.0 cr)
CNES 5502 - Ancient Israel: From Conquest to Exile (3.0 cr)
GRK 5200 - Biblical Greek (3.0 cr)
GRK 8400 - Readings in Patristic Greek (3.0 cr)
HEBR 5300 - Post-Biblical Hebrew: Second Temple Period (3.0 cr)
HIST 5053 - Doing Roman History: Sources, Methods, and Trends (3.0 cr)
HIST 5614 - The Medieval Church (3.0 cr)
HIST 8110 - Medieval History: Research Seminar (3.0 cr)
HIST 8930 - Topics in Ancient History (1.0 - 4.0 cr)
LAT 5200 - Advanced Reading in Later Latin (3.0 cr)
Greek and Roman Relgions, Formative Judaism, and Early Christianity
This concentration area focuses on the religions, literatures, and cultures of Greece, Rome and the Mediterranean world, with potential focal points in Egypt, Asia Minor, or Syria-Palestine. It centers on the period from Alexander the Great to Marcus Aurelius, and encompasses Second Temple Judaism and early Christianity, including New Testament literature. The required primary language is Greek or Latin. Secondary language options are Hebrew, Aramaic, Copic, Greek, or Latin.

Concentration Area Coursework (24 credits)
Courses are chosen from the following list, or in consultation with the advisor, based on concentration area and comparative themes for doctoral examinations.

- CNES 5070 - Topics in Ancient Religion (3.0 cr)
- CNES 5080 - New Testament Proseminar (3.0 cr)
- CNES 8530 - Religions of the Ancient Mediterranean World (3.0 cr)
- CNES 8550 - Gender and Body in Ancient Religion (3.0 cr)
- CNES 8570 - Readings in Religious Texts (3.0 cr)
- HEBR 5200 - Advanced Classical Hebrew (3.0 cr)
- RELS 5013W - Biblical Law and Jewish Ethics [WI] (3.0 cr)
- ANTH 4049 - Religion and Culture (3.0 cr)
- ANTH 5027W - Archaeology of Prehistoric Europe [HIS, WI] (3.0 cr)
- ANTH 5446 - Archaeology of Representation as Communication (3.0 cr)
- CNES 5204 - The Dead Sea Scrolls (3.0 cr)
- CNES 5502 - Ancient Israel: From Conquest to Exile (3.0 cr)
- GRK 5200 - Biblical Greek (3.0 cr)
- GRK 8400 - Readings in Patristic Greek (3.0 cr)
- HEBR 5300 - Post-Biblical Hebrew: Second Temple Period (3.0 cr)
- HIST 5053 - Doing Roman History: Sources, Methods, and Trends (3.0 cr)
- HIST 5614 - The Medieval Church (3.0 cr)
- HIST 8110 - Medieval History: Research Seminar (3.0 cr)
- HIST 8930 - Topics in Ancient History (1.0 - 4.0 cr)
- LAT 5200 - Advanced Reading in Later Latin (3.0 cr)
**Twin Cities Campus**  
**Cognitive Science M.S.**  
**CLA Dean's Office**  
**College of Liberal Arts**

Link to a [list of faculty](#) for this program.

**Contact Information:**  
Center for Cognitive Sciences  
205 Elliott Hall  
75 E. River Parkway  
Minneapolis, MN 55455  
Email: cognsci@umn.edu  
Website: [http://cogsciphd.umn.edu](http://cogsciphd.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The MS Cognitive Science program is structured to allow students the flexibility to pursue a wide variety of research topics, and to integrate methodologies and perspectives from different disciplines. In addition to a course that introduces students to the field of Cognitive Science, at least three course credits from each of the following areas are required: cognitive psychology, computer science/artificial intelligence, linguistics, neuroscience and philosophy.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**  
**Plan A:** Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is written and oral.

**Plan C:** Plan C requires 30 major credits and 0 credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Required Course (3 credits)**  
All students must take the following introductory course, or a substitute approved by the director of graduate studies:  
**CGSC 8000** - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)

**Electives (15 credits)**  
Take at least 3 credits from each of the following areas:  
**Cognitive Psychology (3 credits)**  
**PSY 5014** - Psychology of Human Learning and Memory (3.0 cr)
PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
PSY 5062 - Cognitive Neuropsychology (3.0 cr)
PSY 5064 - Brain and Emotion (3.0 cr)
PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
PSY 8010 - Advanced Topics in Learning (3.0 cr)
PSY 8031 - Seminar: Visual Perception (2.0 cr)
PSY 8036 - Topics in Computational Vision (3.0 cr)
PSY 8055 - Seminar: Cognitive Neuroscience (3.0 cr)
PSY 8056 - Seminar: Psychology of Language (3.0 cr)

Computer Science (3 credits)
CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
CSCI 5511 - Artificial Intelligence I (3.0 cr)
CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
CSCI 5521 - Introduction to Machine Learning (3.0 cr)
CSCI 5525 - Machine Learning (3.0 cr)
CSCI 5561 - Computer Vision (3.0 cr)
CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
CSCI 8211 - Advanced Computer Networks and Their Applications (3.0 cr)
CSCI 8442 - Computational Geometry and Applications (3.0 cr)

Linguistics (3 credits)
LING 5001 - Introduction to Linguistics (4.0 cr)
LING 5201 - Syntactic Theory I (3.0 cr)
LING 5202 - Syntactic Theory II (3.0 cr)
LING 5205 - Semantics (3.0 cr)
LING 5206 - Linguistic Pragmatics (3.0 cr)
LING 5801 - Introduction to Computational Linguistics (3.0 cr)
LING 8200 - Topics in Syntax and Semantics (3.0 cr)
LING 8210 - Seminar in Syntax (3.0 cr)
LING 8900 - Seminar: Topics in Linguistics (3.0 cr)
LING 8921 - Seminar in Language and Cognition (3.0 cr)

Neuroscience (3 credits)
NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
NSC 5561 - Systems Neuroscience (4.0 cr)
NSC 8217 - Systems and Computational Neuroscience (2.0 cr)

Philosophy (3 credits)
PHIL 4616 - Minds, Bodies, and Machines (3.0 cr)
PHIL 8131 - Epistemology Survey (3.0 cr)
PHIL 8180 - Seminar: Philosophy of Language (3.0 cr)
PHIL 8182 - Formal Semantics of Natural Language (3.0 cr)
PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
PHIL 8670 - Seminar: Philosophy of Science (3.0 cr)

Plan Options

Plan A
All Plan A students must take at least 10 master's thesis credits.
CGSC 8777 - Thesis Credit: Masters (1.0 - 10.0 cr)

-OR-

Plan B
All Plan B students must take at least 6 credits of the following:
CGSC 8991 - Independent Study (1.0 - 4.0 cr)
Twin Cities Campus
Cognitive Science Minor
CLA Dean's Office
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Center for Cognitive Sciences, University of Minnesota, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-626-3570; fax: 612-626-7253)
Email: cogsci@umn.edu
Website: http://www.cogsci.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8 to 9
- Length of program in credits (Doctorate): 14 to 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Cognitive science is broadly concerned with integrating contemporary approaches to the study of mind/brain, and with the systems and processes underlying the acquisition and use of knowledge. The coherence of the program lies in its intellectual focus on cognition. This program spans cellular, behavioral, and psychological levels of scientific analysis in the study of cognition in a single unified graduate program. It integrates the diverse content, methods, and perspectives of a number of different disciplines (e.g., anthropology, biology, artificial intelligence, linguistics, neuroscience, philosophy, and psychology), which are concerned with or in some sense inform our understanding of cognition.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Substitutions for required courses are permitted only with prior permission from the director of graduate studies for cognitive science. Elected courses must be taught by faculty in the minor program or be approved in advance by the director of graduate studies for cognitive science. Courses in the student's major department do not count toward the minor.

Introduction to Cognitive Science
CGSC 8000 - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)
or CGSC 8041 - Cognitive Neuroscience (4.0 cr)
or An appropriate substitute approved by the DGS.

Program Sub-plans
Students are required to complete one of the following sub-plans, Students may not complete the program with more than one sub-plan.

Masters
Major Electives
- Take 5 or more credit(s) from the following:
- CGSC 8xxx

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Information current as of August 31, 2018
Cognitive Psychology
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- PSY 5062 - Cognitive Neuropsychology (3.0 cr)
- PSY 5064 - Brain and Emotion (3.0 cr)
- PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
- PSY 8010 - Advanced Topics in Learning (3.0 cr)
- PSY 8031 - Seminar: Visual Perception (2.0 cr)
- PSY 8036 - Topics in Computational Vision (3.0 cr)
- PSY 8055 - Seminar: Cognitive Neuroscience (3.0 cr)
- PSY 8056 - Seminar: Psychology of Language (3.0 cr)
- PSY 8201 - Social Cognition (3.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
- EEB 5322 - Evolution and Animal Cognition (3.0 cr)

Computer Science
- CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
- CSCI 5511 - Artificial Intelligence I (3.0 cr)
- CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5525 - Machine Learning (3.0 cr)
- CSCI 5561 - Computer Vision (3.0 cr)
- CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
- CSCI 8211 - Advanced Computer Networks and Their Applications (3.0 cr)
- CSCI 8442 - Computational Geometry and Applications (3.0 cr)
- CSCI 8551 - Intelligent Agents (3.0 cr)
- CSCI 8725 - Databases for Bioinformatics (3.0 cr)

Linguistics
- LING 5001 - Introduction to Linguistics (4.0 cr)
- LING 5201 - Syntactic Theory I (3.0 cr)
- LING 5202 - Syntactic Theory II (3.0 cr)
- LING 5205 - Semantics (3.0 cr)
- LING 5206 - Linguistic Pragmatics (3.0 cr)
- LING 5801 - Introduction to Computational Linguistics (3.0 cr)
- LING 8200 - Topics in Syntax and Semantics (3.0 cr)
- LING 8210 - Seminar in Syntax (3.0 cr)
- LING 8900 - Seminar: Topics in Linguistics (3.0 cr)
- LING 8921 - Seminar in Language and Cognition (3.0 cr)

Neuroscience
- NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
- NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
- NSC 5561 - Systems Neuroscience (4.0 cr)
- NSC 8217 - Systems and Computational Neuroscience (2.0 cr)

Philosophy
- PHIL 4615 - Minds, Bodies, and Machines (3.0 cr)
- PHIL 8131 - Epistemology Survey (3.0 cr)
- PHIL 8180 - Seminar: Philosophy of Language (3.0 cr)
- PHIL 8182 - Formal Semantics of Natural Language (3.0 cr)
- PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
- PHIL 8670 - Seminar: Philosophy of Science (3.0 cr)

Doctoral Major Electives
Take 11 or more credit(s) from the following:
- CGSC 8xxx
- Cognitive Psychology
  - PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
  - PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
  - PSY 5062 - Cognitive Neuropsychology (3.0 cr)
  - PSY 5064 - Brain and Emotion (3.0 cr)
  - PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
  - PSY 8010 - Advanced Topics in Learning (3.0 cr)
  - PSY 8031 - Seminar: Visual Perception (2.0 cr)
  - PSY 8036 - Topics in Computational Vision (3.0 cr)
or PSY 8055 - Seminar: Cognitive Neuroscience (3.0 cr)
or PSY 8056 - Seminar: Psychology of Language (3.0 cr)
or PSY 8201 - Social Cognition (3.0 cr)
or EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
or EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
or EPSY 8201 - Developmental Psychology: Cognitive Processes (4.0 cr)
or EEB 5322 - Evolution and Animal Cognition (3.0 cr)

• Computer Science
  • CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
or CSCI 5511 - Artificial Intelligence I (3.0 cr)
or CSCI 5515 - User Interface Design, Implementation and Evaluation (3.0 cr)
or CSCI 5521 - Introduction to Machine Learning (3.0 cr)
or CSCI 5525 - Machine Learning (3.0 cr)
or CSCI 5561 - Computer Vision (3.0 cr)
or CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
or CSCI 8211 - Advanced Computer Networks and Their Applications (3.0 cr)
or CSCI 8442 - Computational Geometry and Applications (3.0 cr)
or CSCI 8551 - Intelligent Agents (3.0 cr)
or CSCI 8725 - Databases for Bioinformatics (3.0 cr)

• Linguistics
  • LING 5001 - Introduction to Linguistics (4.0 cr)
or LING 5201 - Syntactic Theory I (3.0 cr)
or LING 5202 - Syntactic Theory II (3.0 cr)
or LING 5205 - Semantics (3.0 cr)
or LING 5206 - Linguistic Pragmatics (3.0 cr)
or LING 5801 - Introduction to Computational Linguistics (3.0 cr)
or LING 8200 - Topics in Syntax and Semantics (3.0 cr)
or LING 8210 - Seminar in Syntax (3.0 cr)
or LING 8900 - Seminar: Topics in Linguistics (3.0 cr)
or LING 8921 - Seminar in Language and Cognition (3.0 cr)

• Neuroscience
  • NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
or NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
or NSC 5561 - Systems Neuroscience (4.0 cr)
or NSC 8217 - Systems and Computational Neuroscience (2.0 cr)

• Philosophy
  • PHIL 4615 - Minds, Bodies, and Machines (3.0 cr)
or PHIL 8131 - Epistemology Survey (3.0 cr)
or PHIL 8180 - Seminar: Philosophy of Language (3.0 cr)
or PHIL 8182 - Formal Semantics of Natural Language (3.0 cr)
or PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
or PHIL 8670 - Seminar: Philosophy of Science (3.0 cr)
Twin Cities Campus
Cognitive Science Ph.D.
CLA Dean's Office
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Center for Cognitive Sciences, University of Minnesota, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-626-3570; fax: 612-626-7253)
Email: cogsci@umn.edu
Website: http://www.cogsci.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 63
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Cognitive science is broadly concerned with integrating contemporary approaches to the study of mind/brain, and with the systems and processes underlying the acquisition and use of knowledge. The coherence of the program lies in its intellectual focus on cognition. This program spans cellular, behavioral, and psychological levels of scientific analysis in the study of cognition in a single unified graduate program. It integrates the diverse content, methods, and perspectives of a number of different disciplines (e.g., anthropology, biology, artificial intelligence, linguistics, neuroscience, philosophy, and psychology), which are concerned with or in some sense inform our understanding of cognition. The PhD program trains cognitive scientists to conduct research integrating methodologies and content knowledge from a variety of approaches. In order to ensure an interdisciplinary approach, each student has two co-advisors from the cognitive science graduate faculty, each representing a different discipline from within the cognitive sciences.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Applicants must apply through the University's online application system. They must submit a completed application, scores from the GRE, and three letters of recommendation. Applicants wishing to be considered for financial support should apply no later than December 1 of the preceding academic year. Entry is usually in fall semester but may be permitted in other semesters in exceptional cases.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
39 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The PhD program requires a minimum of 39 credits, in addition to 24 thesis credits.

Students are required to take two core courses with a CGSC designator, as well as 3 credits of independent study related to research.

Responsible Conduct of Research training is required and is integrated into the two core courses taken by all students. Other course requirements are distributed among component disciplines and fields. Courses are intended to provide a foundation for the student's research program. Students are expected to conduct two research projects prior to taking their preliminary written exams. A report on the first-year research project should be concluded by the first term of the second year. A report on the second-year research project should be completed by the second term of the third year. The preliminary written exams will typically be (but are not necessarily) expansions of the first- and second-year research projects. The two PhD written preliminary projects are expected to be of near publishable quality. As entry into the PhD program assumes no previous graduate work, students who enter the program with an MA or other graduate coursework in a cognitive science-related discipline may apply credits from their previous graduate work towards the required 46 credits.

Introduction to Cognitive Science
  CGSC 8000 - Seminar: Philosophy of the Cognitive Sciences (3.0 cr)
  or CGSC 8041 - Cognitive Neuroscience (4.0 cr)
  or An appropriate substitute approved by the DGS.

Major Electives
Students must take at least 3 credits from each of the 5 disciplines listed below and take a total of at least 30 credits.

Cognitive Psychology
Take 3 or more credit(s) from the following:
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5062 - Cognitive Neuropsychology (3.0 cr)
• PSY 5064 - Brain and Emotion (3.0 cr)
• PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
• PSY 8010 - Advanced Topics in Learning (3.0 cr)
• PSY 8031 - Seminar: Visual Perception (2.0 cr)
• PSY 8036 - Topics in Computational Vision (3.0 cr)
• PSY 8055 - Seminar: Cognitive Neuroscience (3.0 cr)
• PSY 8056 - Seminar: Psychology of Language (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
• EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
• CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• EEB 5322 - Evolution and Animal Cognition (3.0 cr)

Computer Science
Take 3 or more credit(s) from the following:
• CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• CSCI 5561 - Computer Vision (3.0 cr)
• CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
• CSCI 8211 - Advanced Computer Networks and Their Applications (3.0 cr)
• CSCI 8442 - Computational Geometry and Applications (3.0 cr)
• CSCI 8551 - Intelligent Agents (3.0 cr)
• CSCI 8725 - Databases for Bioinformatics (3.0 cr)

Linguistics
Take 3 or more credit(s) from the following:
• LING 5001 - Introduction to Linguistics (4.0 cr)
• LING 5201 - Syntactic Theory I (3.0 cr)
• LING 5202 - Syntactic Theory II (3.0 cr)
• LING 5205 - Semantics (3.0 cr)
• LING 5206 - Linguistic Pragmatics (3.0 cr)
• LING 5801 - Introduction to Computational Linguistics (3.0 cr)
• LING 8200 - Topics in Syntax and Semantics (3.0 cr)
• LING 8210 - Seminar in Syntax (3.0 cr)
• LING 8900 - Seminar: Topics in Linguistics (3.0 cr)
• LING 8921 - Seminar in Language and Cognition (3.0 cr)

Neuroscience
Take 3 or more credit(s) from the following:
• NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
• NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
• NSC 5561 - Systems Neuroscience (4.0 cr)
• NSC 8217 - Systems and Computational Neuroscience (2.0 cr)

Philosophy
Take 3 or more credit(s) from the following:
• PHIL 4615 - Minds, Bodies, and Machines (3.0 cr)
• PHIL 8131 - Epistemology Survey (3.0 cr)
• PHIL 8180 - Seminar: Philosophy of Language (3.0 cr)
• PHIL 8182 - Formal Semantics of Natural Language (3.0 cr)
• PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
• PHIL 8670 - Seminar: Philosophy of Science (3.0 cr)
Twin Cities Campus
Communication Studies M.A.
Communication Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Communication Studies, 225 Ford Hall, 224 Church Street S.E., Minneapolis, MN  55455 (612-624-5800; fax: 612-624-6544).
Website: http://www.comm.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 31 to 33
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Communication studies focuses on the study of communicative dimensions of human experience using humanistic and social scientific methods. This program prepares students to become researchers and teachers, offering three concentrations: interpersonal communication, rhetorical studies, and critical media studies. Coursework in rhetoric and public discourse studies emphasizes humanistic methods and includes argumentation and persuasion, ethics, rhetorical theory and criticism, and political rhetoric. Students may also pursue special interests in rhetorical philosophies, movements and campaigns, or popular culture and critical theory. The program should be supplemented by coursework outside the department. An understanding of history, political science, sociology, or cultural studies is recommended. Coursework in interpersonal communication has a social scientific orientation. Most students focus on a subarea such as small group, intercultural, interpersonal communication, or problems (e.g., decision making, conflict resolution). Coursework outside the department is usually concentrated in one or more of the behavioral sciences. Students are expected to develop a command of research techniques and a thorough knowledge of statistics. Coursework in critical media studies emphasizes qualitative, historical, critical, and empirical methods and includes television studies, feminist media studies, ethnic and racial minorities in media, critical media literacy, political economy of media, popular culture, environmental communication, and music. Coursework outside the department is usually in the fields of American studies, political science, cultural studies, mass communication, or women's studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
All applicants must have completed at least 15 undergraduate credits in speech or communication courses related to their proposed area of emphasis in the department. A brochure detailing prerequisite requirements is available from the department or from the department website. All prerequisites must be completed before admission.

Special Application Requirements:
Applicants must submit scores from the GRE General Test, transcripts of all post-secondary academic work, and a written statement of academic and occupational objectives. Three letters of recommendation and a writing sample are required of all applicants for assistantships or fellowships.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 5

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

**IELTS**
- Total Score: 6.5
**MELAB**
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 15 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 21 to 27 major credits and 6 to 12 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** A publishable, article-length paper consisting of the student's original research.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.50 is required for students to remain in good standing.

It is recommended that students pursue a graduate minor to fulfill the requirement of 6 credits outside the Communication Studies major.

**Plan A**

**Major Concentrations**
Student select two concentrations for their master's degree.
Courses are selected in consultation with the Director of Graduate Studies.
Take 15 or more credit(s) from the following:

**Primary Concentration**
Take 6 - 12 credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

**Secondary Concentration**
Take 3 - 9 credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

**Outside the Major -- Related Fields**
Take 6 credits outside Communication Studies for a master's minor or in related fields.

**Thesis Credits**
Take 10 or more credit(s) from the following:
• COMM 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B**
Take 27 - 33 credit(s) from the following:

**Major Concentrations**
Students select two concentrations for their master's degree.
Courses are selected in consultation with the Director of Graduate Studies.
Take 21 - 27 credit(s) from the following:

**Primary Concentration**
Take 18 or more credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

**Secondary Concentration**
Take 3 or more credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

Outside the Major -- Related Fields
Take 6-12 credits outside Communication Studies for a master's minor or in related fields.
Twin Cities Campus
Communication Studies Minor
Communication Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Communication Studies, 225 Ford Hall, 224 Church Street S.E., Minneapolis, MN  55455
(612-624-5800; fax: 612-624-6544)
Website: http://www.comm.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Communication studies focuses on the study of communicative dimensions of human experience using humanistic and social scientific methods. This program prepares students to become researchers and teachers, offering three concentrations: interpersonal communication, rhetorical studies, and critical media studies. Coursework in rhetoric and public discourse studies emphasizes humanistic methods and includes argumentation and persuasion, ethics, rhetorical theory and criticism, and political rhetoric. Students may also pursue special interests in rhetorical philosophies, movements and campaigns, or popular culture and critical theory. The program should be supplemented by coursework outside the department. An understanding of history, political science, sociology, or cultural studies is recommended. Coursework in interpersonal communication has a social scientific orientation. Most students focus on a subarea such as small group, intercultural, interpersonal communication, or problems (e.g., decision making, conflict resolution). Coursework outside the department is usually concentrated in one or more of the behavioral sciences. Students are expected to develop a command of research techniques and a thorough knowledge of statistics. Coursework in critical media studies emphasizes qualitative, historical, critical, and empirical methods and includes television studies, feminist media studies, ethnic and racial minorities in media, critical media literacy, political economy of media, popular culture, environmental communication, and music. Coursework outside the department is usually in the fields of American studies, political science, cultural studies, mass communication, or women's studies.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Take 6 or more credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

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Information current as of August 31, 2018
Doctoral

Required Courses
Take 12 or more credit(s) from the following:
• COMM 5xx
• COMM 8xx
Twin Cities Campus
Communication Studies Ph.D.
Communication Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Communication Studies, 225 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-624-5800; fax: 612-624-6544).
Website: https://cla.umn.edu/comm-studies/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 75
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Communication studies focuses on the study of communicative dimensions of human experience using humanistic and social scientific methods. This program prepares students to become researchers and teachers, offering three concentrations: interpersonal communication, rhetorical studies, and critical media studies. Coursework in rhetoric and public discourse studies emphasizes humanistic methods and includes argumentation and persuasion, ethics, rhetorical theory and criticism, and political rhetoric. Students may also pursue special interests in rhetorical philosophies, movements and campaigns, or popular culture and critical theory.

The program should be supplemented by coursework outside the department. An understanding of history, political science, sociology, or cultural studies is recommended. Coursework in interpersonal communication has a social scientific orientation. Most students focus on a subarea such as small group, intercultural, interpersonal communication, or problems (e.g., decision making, conflict resolution). Coursework outside the department is usually concentrated in one or more of the behavioral sciences. Students are expected to develop a command of research techniques and a thorough knowledge of statistics. Coursework in critical media studies emphasizes qualitative, historical, critical, and empirical methods and includes television studies, feminist media studies, ethnic and racial minorities in media, critical media literacy, political economy of media, popular culture, environmental communication, and music. Coursework outside the department is usually in the fields of American studies, political science, cultural studies, mass communication, or women's studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
All applicants must have completed at least 15 undergraduate or undergraduate credits in speech or communication courses related to their proposed area of emphasis in the department. A brochure detailing prerequisite requirements is available from the department or from the department website. All prerequisites must be completed before admission.

Applicants must submit scores from the GRE General Test, transcripts of all postsecondary academic work, a written statement of academic and occupational objectives, and a diversity statement. Three letters of recommendation and a writing sample are required of all applicants for assistantships or fellowships.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 5

International applicants must submit score(s) from one of the following tests:
- TOEFL
Program Requirements
33 to 39 credits are required in the major.
12 to 18 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.50 is required for students to remain in good standing.

Major Requirements

Introductory Course
COMM 8101 - Introduction to Graduate Communication Studies (3.0 cr)

Major Coursework
Take 30 - 36 credit(s) from the following:
• COMM 5xxx
• COMM 8xxx

Outside Coursework
Take 12 to 18 credits outside the major.

Thesis Credits
Take 24 or more credit(s) from the following:
• COMM 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Comparative Literature M.A.
Cultural Studies & Comparative Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 235 Nicholson Hall, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://cscl.umn.edu/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are not admitted to work toward the MA degree. In the event that a PhD student decides not to finish the PhD and is in good standing, that student may apply for a terminal MA.

Comparative literature is the oldest field of literary criticism, dating back to the seventeenth century. Among the wide range of studies currently conducted in comparative literature nationally and internationally, this program focuses on theories of literary criticism and its explanatory bases; indeed the program is seen as one of the principal initiators of such fields of study. This program is likewise engaged in pushing the bounds of critical inquiry in related domains of literary studies, directing much of its energies toward the intersection of literature with other media (in various constellations of word, sound, and image) and of literatures of the global North with those of the global South, engaging problems ranging from narrative to post-colonial studies.

The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CL 8001-8002) that develops critical and analytic skills, and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enrolls in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. A major portion of coursework for degrees in Comparative Literature is cross-listed with the literature and language departments. Approval may also be given to take graduate courses in such areas as anthropology, art, architecture, history, music, philosophy, political theory, and sociology. In all cases, students should consult their advisors and the director of Graduate Studies concerning course selections.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Students are not admitted to work toward the MA degree. In the event that a PhD student decides not to finish the PhD and is in good standing, that student may apply for a terminal MA.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

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Information current as of August 31, 2018
- Speaking test score: 0

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan B:** Plan B requires 18 to 24 major credits and 6 to 12 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** One Plan B paper of approximately 40 pages is required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in two languages (other than English)

A minimum GPA of 3.50 is required for students to remain in good standing.

**Required Courses**

- **CL 8001 - Basic Research Seminar in Comparative Literature I (3.0 cr)**
- **CL 8002 - Basic Research Seminar in Comparative Literature II (3.0 cr)**

Take 3 or more credit(s) from the following:

- **•CL 8901 - Intro to the Profession: Critical Methods of Research, Pedagogy, and Creative Work in the Humanities (3.0 cr)**

**Major Electives**

Take 9 or more credit(s) from the following:

- **•CL 5xxx**
- **•CL 8xxx**

**Additional Comparative Literature Courses in the Related Minor Field**

Take 6 or more credit(s) from the following:

- **•CL 5xxx**
- **•CL 8xxx**

**Formal Minor or Supporting Program**

Take 6 or more credits in related fields outside Comparative Literature, or in a formal minor in another program (excluding Comparative Studies in Discourse and Society).
Comparative Literature Minor

Cultural Studies & Comparative Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 235 Nicholson Hall, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://cscl.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Comparative literature is the oldest field of literary criticism, dating back to the seventeenth century. Among the wide range of studies currently conducted in comparative literature nationally and internationally, this program focuses on theories of literary criticism and its explanatory bases; indeed the program is seen as one of the principal initiators of such fields of study.

This program is likewise engaged in pushing the bounds of critical inquiry in related domains of literary studies, directing much of its energies toward the intersection of literature with other media (in various constellations of word, sound, and image) and of literatures of the global North with those of the global South, engaging problems ranging from narrative to postcolonial studies.

The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CL 8001-8002) that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enrolls in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. A major portion of coursework for degrees in comparative literature is cross-listed with the literature and language departments. Approval may also be given to take graduate courses in such areas as anthropology, art, architecture, history, music, philosophy, political theory, and sociology. In all cases, students should consult with their advisors and the director of Graduate Studies concerning course selections.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Required Courses
- CL 8001 - Basic Research Seminar in Comparative Literature I (3.0 cr)
- CL 8002 - Basic Research Seminar in Comparative Literature II (3.0 cr)
Electives
Take 3 or more credit(s) from the following:
- CL 5xxx
- CL 8xxx

Doctoral Required Courses
- CL 8001 - Basic Research Seminar in Comparative Literature I (3.0 cr)
- CL 8002 - Basic Research Seminar in Comparative Literature II (3.0 cr)

Electives
Take 6 or more credit(s) from the following:
- CL 5xxx
- CL 8xxx
Twin Cities Campus
Comparative Literature Ph.D.
Cultural Studies & Comparative Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 235 Nicholson Hall, 216 Pillsbury Dr SE, Minneapolis, MN (612-624-8099; fax: 612-625-4170).
Email: csclgrad@umn.edu
Website: http://cscl.umn.edu/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 71
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Comparative literature is the oldest field of literary criticism, dating back to the seventeenth century. Among the wide range of studies currently conducted in comparative literature nationally and internationally, this program focuses on theories of literary criticism and its explanatory bases; indeed the program is seen as one of the principal initiators of such fields of study. This program is likewise engaged in pushing the bounds of critical inquiry in related domains of literary studies, directing much of its energies toward the intersection of literature with other media (in various constellations of word, sound, and image) and literatures of the global North with those of the global South, engaging problems ranging from narrative to postcolonial studies. The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CL 8001-8002) that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enroll in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. A major portion of coursework for degrees in Comparative Literature is cross-listed with the literature and language departments. Approval may also be given to take graduate courses in such areas as anthropology, art, architecture, history, music, philosophy, political theory, and sociology. In all cases, students should consult their advisors and the director of Graduate Studies concerning course selections.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The BS and/or MA degree in a humanities or a social science discipline, or other relevant field, is required for admission to the PhD.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
35 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in two languages (other than English)

A minimum GPA of 3.50 is required for students to remain in good standing.

Coursework should include a minimum of 12 course credits at the 8xxx-level (excluding CL 8001 and CL 8002).

Required Courses
- **CL 8001** - Basic Research Seminar in Comparative Literature I (3.0 cr)
- **CL 8002** - Basic Research Seminar in Comparative Literature II (3.0 cr)
- **CL 8901** - Intro to the Profession: Critical Methods of Research, Pedagogy, and Creative Work in the Humanities (3.0 cr)

Comparative Literature Electives
With approval of the advisor and the director of Graduate Studies, up to 3 credits of the 15-credit requirement may be taken in the field of the minor or supporting program.

Take 15 or more credit(s) from the following:
- CL 5xxx
- CL 8xxx

Additional Comparative Literature Courses or Courses in a Related Field
Take 11 or more credit(s) from the following:
- CSDS 5xxx
- CSDS 8xxx
- CL 5xxx
- CL 8xxx

Outside the Major in a Supporting Program
Formal Minor Option
Take 12 or more credit(s) from the following:
A formal minor in another graduate program, excluding Comparative Studies in Discourse and Society.

or Supporting Program Option
Take 12 or more credit(s) from the following:
Coursework outside of CSDS, CSCL, or CL courses in a coherent and complementary program to be approved by the advisor and the DGS. This option is for students who do not pursue a formal minor in another program.

Thesis Credits
Take 24 or more credit(s) from the following:
- **CL 8888** - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Comparative Studies in Discourse and Society M.A.
Cultural Studies & Comparative Literature
College of Liberal Arts

Twin Cities Campus

Contact Information:
Department of Cultural Studies and Comparative Literature, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://csds.cla.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are not admitted to work toward the MA degree. In the event that a PhD student decides not to finish the PhD and is in good standing, that student may apply for a terminal MA. While most traditional humanistic disciplines tend to focus either on a given mode of discourse (e.g., art history, musicology) or a specific cultural context (e.g., American studies, European languages and literatures), this program engages broader topics: how discourse and cultural production both shape and are shaped by life in time, space, matter, and society. Drawing on a variety of theoretical positions, close attention is paid to various types of discourse, such as music, film, myth, ritual, architecture, landscape and urban design, painting, sculpture, and literature in elite, popular, folk, and mass culture, understanding these as both a site and an instrument of contestation and negotiation among social forces. More generally, the program seeks to re-associate intellectual and cultural history with social and political history, to set discourse of various sorts within a social context, and to consider specific social formations within the ongoing historical process. In all this, the program encourages work that is interdisciplinary (at times, even anti-disciplinary) as well as cross-cultural. The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CSDS 8001-8002) that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enrolls in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. In all cases, students should consult their advisors and the Director of Graduate Studies concerning course selections.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Students are not admitted to work toward the MA degree. In the event that a PhD student decides not to finish the PhD and is in good standing, that student may apply for a terminal MA.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan B:** Plan B requires 18 to 24 major credits and 6 to 12 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** One Plan B paper of approximately 40 pages is required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in two languages (other than English)

A minimum GPA of 3.50 is required for students to remain in good standing.

MA Plan B degree requirements: students are not admitted to work toward the MA degree. In the event that a PhD student decides not to finish the PhD and is in good standing, that student may apply for a terminal MA.

Students are advised to check the program website indicated above for updated information.

**Required Courses**

Take the following courses for a total of 9 credits:
- **CSDS 8001** - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
- **CSDS 8002** - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
- **CSDS 8901** - Intro to the Profession: Critical Methods of Research, Pedagogy, and Creative Work in the Humanities (3.0 cr)

**Major Electives**

Select major electives in consultation with the advisor.

Take 9 or more credit(s) from the following:
- CSDS 5xxx
- CSDS 8xxx

**Additional Coursework**

Take at least 6 credits, in consultation with advisor, of courses within or outside CSDS.
- CSDS 5xxx
- CSDS 8xxx

**Outside Coursework**

Take at least 6 credits of related fields coursework, either outside of CSDS or as a formal minor (excluding comparative literature).
Twin Cities Campus

Comparative Studies in Discourse and Society Minor

Cultural Studies & Comparative Literature

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 235 Nicholson Hall, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://cscl.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While most traditional humanistic disciplines tend to focus either on a given mode of discourse (e.g., art history, musicology) or a specific cultural context (e.g., American studies, European languages and literatures), this program engages a broader problematic—how discourse and cultural production both shape and are shaped by life in time, space, matter, and society. Drawing on a variety of theoretical positions, close attention is paid to various types of discourse, such as music, film, myth, ritual, architecture, landscape and urban design, painting, sculpture, and literature in elite, popular, folk, and mass culture, understanding these as both a site and an instrument of contestation and negotiation among social forces. More generally, the program seeks to re-associate intellectual and cultural history with social and political history, to set discourse of various sorts within a social context, and to consider specific social formations within the ongoing historical process. In all this, the program encourages work that is interdisciplinary (at times, even anti-disciplinary) as well as cross-cultural. The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CSDS 8001-8002) that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enrolls in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. In all cases, students should consult their advisers and the director of graduate studies concerning course selections.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Required Courses
CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)

Electives

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Take 3 or more credit(s) from the following:
• CSDS 5xxx
• CSDS 8xxx

Doctoral

Required Courses
- CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
- CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)

Electives
Take 6 or more credit(s) from the following:
• CSDS 5xxx
• CSDS 8xxx
Twin Cities Campus
Comparative Studies in Discourse and Society Ph.D.
Cultural Studies & Comparative Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 235 Nicholson Hall, 216 Pillsbury Dr SE, Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://csds.cla.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 71 to 74
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While most traditional humanistic disciplines tend to focus either on a given mode of discourse (e.g., art history, musicology) or a specific cultural context (e.g., American studies, European languages and literatures), this program engages a broader problematic—how discourse and cultural production both shape and are shaped by life in time, space, matter, and society. Drawing on a variety of theoretical positions, close attention is paid to various types of discourse, such as music, film, myth, ritual, architecture, landscape and urban design, painting, sculpture, and literature in elite, popular, folk, and mass culture, understanding these as both a site and an instrument of contestation and negotiation among social forces. More generally, the program seeks to re-associate intellectual and cultural history with social and political history, to set discourse of various sorts within a social context, and to consider specific social formations within the ongoing historical process. In all this, the program encourages work that is interdisciplinary (at times, even anti-disciplinary) as well as cross-cultural. The curriculum emphasizes seminars and directed research. The core requirement is a two-semester Basic Research Seminar (CSDS 8001-8002) that develops critical and analytic skills and introduces current theoretical perspectives with the study of historical problems. Each entering graduate student also enrolls in courses that focus on developing skills and experience in teaching and other professional domains. Apart from core courses, many courses are nonrecurring and closely relate to current faculty research. In all cases, students should consult their advisors and the director of Graduate Studies concerning course selections.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The BA and/or MA degree in a humanities or a social science discipline, or other relevant field, is required for admission to the PhD.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the...
Program Requirements
35 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in two languages (other than English)

A minimum GPA of 3.50 is required for students to remain in good standing.

Coursework should include a minimum of 12 course credits at the 8xxx-level (excluding CL 8001 and CL 8002).

Required Courses
- CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
- CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
- CSDS 8901 - Intro to the Profession: Critical Methods of Research, Pedagogy, and Creative Work in the Humanities (3.0 cr)

CSDS Electives
With approval of the advisor and the director of Graduate Studies, up to 3 credits of the 15-credit requirement may be taken in the field of the minor or supporting program.
Take 15 or more credit(s) from the following:
- CSDS 5xxx
- CSDS 8xxx

Additional CSDS Courses or Courses in a Related Field
Take 11 or more credit(s) from the following:
- CSDS 5xxx
- CSDS 8xxx
- CL 5xxx
- CL 8xxx

Outside the Major in a Supporting Program
Formal Minor Option
Take 12 or more credit(s) from the following:
A formal minor in another graduate program, excluding Comparative Literature.

or Supporting Program Option
Take 12 or more credit(s) from the following:
Coursework outside of CSDS, CSCL, or CL courses in a coherent and complementary program to be approved by the adviser and the DGS. This option is for students who do not pursue a formal minor in another program.

Thesis Credits
Take 24 or more credit(s) from the following:
- CSDS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Creative Writing M.F.A.
English Language & Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of English, 222 Lind Hall, 207 Church Street SE, Minneapolis, MN 55455 (612-625-6366; fax: 612-624-8228)
Email: creawrit@umn.edu
Website: http://cla.umn.edu/creative-writing

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 45
• This program does not require summer semesters for timely completion.
• Degree: Master of Fine Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The creative writing program in the Department of English offers the master of fine arts (MFA) degree for students committed to pursuing the writing life. This three-year degree provides advanced, graduate-level coursework in writing, language, and literature, as well as study in a related field. The third year of the program focuses on the final development of a book-length manuscript suitable for publication. At the heart of the program are writing workshops in poetry, fiction, and literary nonfiction, and courses in the "Reading as Writers" and "Topics in Advanced Writing" series, which enable writers to explore a variety of issues relating to contemporary themes in American and world literature. The program encourages experimentation across genres, fostering the discovery of new and varied forms for a developing voice. Students also have the opportunity to work editorially on "Great River Review," the graduate literary magazine.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The program does not require a graduate degree for admission.

Special Application Requirements:
The MFA in Creative Writing does not require undergraduate work in English literature or an undergraduate degree in literature. Students come from a variety of educational backgrounds and life experiences. Applicants should be aware, however, that graduate coursework in literature and/or language is required once admitted to the program.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Program Requirements

**Plan C:** Plan C requires 42 major credits and 3 credits outside the major. The is no final exam. A capstone project is required.

**Capstone Project:** The capstone project is a publishable thesis manuscript of poetry, fiction, or literary nonfiction. The final exam is an oral defense of the thesis manuscript and literary essay.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MFA requires 45 credits distributed over a three-year period, culminating in a book-length manuscript suitable for publication, an MFA literary essay, and an MFA defense.

**Required Courses**

- **ENGW 8101 - Reading Across Genres (4.0 cr)**
- **ENGW 8180 - Thesis Seminar: Multi-Genre (4.0 cr)**

Take exactly 4 credit(s) from the following:
- **ENGW 8990 - MFA Creative Thesis (2.0 - 8.0 cr)**

**Workshop Electives**

Take at least 12 credits from the following:
- **ENGW 4205 - Screenwriting (3.0 cr)**
- **ENGW 5102 - Graduate Fiction Writing (4.0 cr)**
- **ENGW 5104 - Graduate Poetry Writing (4.0 cr)**
- **ENGW 5106 - Graduate Literary Nonfiction Writing (4.0 cr)**
- **ENGW 5130 - Topics: Graduate Creative Writing (4.0 cr)**
- **TH 4115 - Intermediate Playwriting (3.0 cr)**

**Creative Writing Electives**

Take exactly 4 credit(s) from the following:
- **ENGW 4xxx**
- **ENGW 5xxx**
- **ENGW 8xxx**

**Seminar Elective**

- **ENGW 8110 - Seminar: Writing of Fiction (4.0 cr)**
- **ENGW 8120 - Seminar: Writing of Poetry (4.0 cr)**
- **ENGW 8130 - Seminar: Writing of Literary Nonfiction (4.0 cr)**

**Literature Language Electives**

Take 3 or more credit(s) from the following:
- **ENGL 5xxx**
- **ENGL 8xxx**
- **ENGL 5701 - Great River Review (4.0 cr)**
- **ENGW 5701 - Great River Review (4.0 cr)**

**Other Literature Language Electives**

Take 7 or more credit(s) from the following:
- **ENGW 5310 - Reading as Writers (4.0 cr)**
- **ENGW 5130 - Topics: Graduate Creative Writing (4.0 cr)**
- **ENGW 8110 - Seminar: Writing of Fiction (4.0 cr)**
- **ENGW 8120 - Seminar: Writing of Poetry (4.0 cr)**
- **ENGW 8130 - Seminar: Writing of Literary Nonfiction (4.0 cr)**
- **ENGL 5xxx**
- **ENGL 8xxx**

**Outside the Major or in a Supporting Program**

Any graduate level course for 3 credits outside the English Department (not ENGW or ENGL).
Twin Cities Campus
Developmental Studies and Social Change Minor
CLA Dean's Office
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Interdisciplinary Center for the Study of Global Change, University of Minnesota, 537 Heller Hall, 271 19th Ave S, Minneapolis, MN 55455 (612-624-0832; fax: 612-625-1879)
Email: icgc@umn.edu
Website: http://www.icgc.umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This structured interdisciplinary doctoral minor is offered in conjunction with the Interdisciplinary Center for the Study of Global Change (ICGC). By focusing on the social bases of change in the global south, the program engages a wide range of academic disciplines, including the social sciences, humanities, and biological sciences. The minor focuses on three areas: 1) the relationships between macroscopic processes of political, economic, and social change, and the microscopic conditions of lived experience in the global south; 2) specifically interdisciplinary perspectives (encompassing the social sciences, the biological sciences, and the humanities) on this general thematic concern; and 3) preparation of doctoral students for research on the global south.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission is contingent upon prior admission to a doctoral degree-granting program at the University and upon affiliation with ICGC.

Special Application Requirements:
Students enrolled in a doctoral degree-granting program may apply for the minor at any time during the academic year; acceptance will take effect the following term. Students must be officially in the minor prior to taking their preliminary oral examination.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
Required Courses
DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (3.0 cr)
DSSC 8112 - Scholarship and Public Responsibility (1.0 cr)
DSSC 8211 - Doctoral Research Workshop in Development Studies and Social Change (2.0 cr)
DSSC 8212 - Doctoral Research Workshop in Development Studies and Social Change (1.0 cr)
Take 2 or more credit(s) from the following:
DSSC 8310 - Topics in Development Studies and Social Change (1.0 - 3.0 cr)

Electives
Students are required to take a minimum of 3 credits from outside their own department or program. This list is intended only as a guide; other graduate courses may qualify as electives for the DSSC minor upon approval by the minor program director of Graduate Studies. The program for an individual student will be developed in consultation among the student, the major advisor, and the director or associate director of Graduate Studies in Development Studies and Social Change.

Take 3 or more credit(s) from the following:

**Afro-American Studies**
- AFRO 5101 - Seminar: Introduction to Africa and the African Diaspora (3.0 cr)
- AFRO 5103 - World History and Africa (3.0 cr)
- AFRO 5120 - Social and Intellectual Movements in the African Diaspora (3.0 cr)
- AFRO 5191 - Seminar: The African American Experience in South Africa (3.0 cr)
- AFRO 5876 [Inactive] (3.0 cr)
- AFRO 5910 - Topics in African American and African Studies (2.0 - 4.0 cr)
- AFRO 8202 - Seminar: Intellectual History of Race (3.0 cr)
- AFRO 8554 - Seminar: Gender, Race, Nation, and Policy—Perspectives from Within the African Diaspora (3.0 cr)
- AFRO 8910 - Topics in Studies of Africa and the African Diaspora (3.0 cr)

**American Indian Studies**
- AMIN 5109 [Inactive] (3.0 cr)
- AMIN 5409 - American Indian Women: Ethnographic and Ethnohistorical Perspectives [HIS, DSJ] (3.0 cr)
- AMIN 5890 - Readings in American Indian and Indigenous History (3.0 cr)

**American Studies**
- AMST 8239 - Gender, Race, Class, Ethnicity, and Sexuality in the United States: Readings (3.0 cr)
- AMST 8240 - Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development (3.0 cr)

**Anthropology**
- ANTH 5041 - Ecological Anthropology (3.0 cr)
- ANTH 8001 - Ethnography, Theory, History (3.0 cr)
- ANTH 8002 - Ethnography: Contemporary Theory and Practice (3.0 cr)
- ANTH 8120 - Problems in Culture Change and Applied Anthropology (3.0 - 6.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
- ANTH 8205 - Economic Anthropology (3.0 cr)
- ANTH 8207 - Political and Social Anthropology (3.0 cr)
- ANTH 8213 - Ecological Anthropology (3.0 cr)
- ANTH 8215 - Anthropology of Gender (3.0 cr)

**Apparel Studies**
- APST 8267 - Dress and Culture (3.0 cr)

**Applied Economics**
- APEC 5321 - Regional Economic Analysis (3.0 cr)
- APEC 5511 - Labor Economics (3.0 cr)
- APEC 5651 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- APEC 5731 - Economic Growth and International Development (3.0 cr)
- APEC 5751 - Global Trade and Policy (3.0 cr)
- APEC 8601 - Natural Resource Economics (3.0 cr)
- APEC 8602 - Economics of the Environment (3.0 cr)
- APEC 8701 - Trade and Development I (2.0 cr)
- APEC 8702 - Trade and Development II (2.0 cr)

**Chicano Studies**
- CHIC 5920 - Topics in Chicana(o) Studies (3.0 cr)

**Communication Studies**
- COMM 8211 - Critical Communication Studies: History, Theory, Method (3.0 cr)
- COMM 8451 - Seminar: Intercultural and Diversity Research (3.0 cr)

**Comparative Literature**
- CL 5910 [Inactive] (3.0 - 4.0 cr)
- CL 8001 - Basic Research Seminar in Comparative Literature I (3.0 cr)
- CL 8002 - Basic Research Seminar in Comparative Literature II (3.0 cr)
- CL 8362 - Modernity and Its Others (4.0 cr)
- CL 8910 - Advanced Topics in Comparative Literature (3.0 cr)
- CL 8920 - Advanced Topics in Comparative Literature (3.0 cr)

**Comparative Studies in Discourse and Society**
- CSDS 8001 - Basic Research Seminar: Comparative Studies in Discourse and Society I (3.0 cr)
- CSDS 8002 - Basic Research Seminar in Comparative Studies in Discourse and Society II (3.0 cr)
- CSDS 8910 - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- CSDS 8920 - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)

**Conservation Biology**
- CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
CONS 8095 - Contemporary Problems in Conservation Biology (1.0 cr)
•Curriculum and Instruction
  •CI 5137 - Multicultural Gender-Fair Curriculum (3.0 cr)
  CI 5747 - Global and Environmental Education: Content and Practice (3.0 cr)
•Design
  •DES 5165 - Design and Globalization (3.0 cr)
  DES 8166 - Material Culture and Design (3.0 cr)
•Economics
  •ECON 8311 - Economic Growth and Development (2.0 cr)
  ECON 8312 - Economic Growth and Development (2.0 cr)
  ECON 8313 - Economic Growth and Development (2.0 cr)
  ECON 8381 - Advanced Topics in Economic Development (2.0 cr)
  ECON 8391 - Workshop in Economic Growth and Development (1.0 - 3.0 cr)
  ECON 8401 - International Trade and Payments Theory (2.0 cr)
  ECON 8402 - International Trade and Payments Theory (2.0 cr)
  ECON 8403 - International Trade and Payments Theory (2.0 cr)
  ECON 8404 - International Trade and Payments Theory (2.0 cr)
  ECON 8481 - Advanced Topics in International Trade (2.0 cr)
  ECON 8482 - Advanced Topics in International Trade (2.0 cr)
  ECON 8491 - Workshop in Trade and Development (1.0 - 3.0 cr)
  ECON 8492 - Workshop in Trade and Development (1.0 - 3.0 cr)
•English Literature
  •ENGL 5510 - Readings in Criticism and Theory (3.0 cr)
  ENGL 8190 - Seminar in 20th-Century Anglophone Literatures and Cultures (3.0 cr)
  ENGL 8400 - Seminar in Post-Colonial Literature, Culture, and Theory (3.0 cr)
  ENGL 8510 - Studies in Criticism and Theory (3.0 cr)
  ENGL 8520 - Seminar: Cultural Theory and Practice (3.0 cr)
  ENGL 8530 - Seminar in Feminist Criticism (3.0 cr)
•Environmental Sciences, Policy and Management
  •ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
  ESPM 5101 - Conservation of Plant Biodiversity (3.0 cr)
  ESPM 5241 - Natural Resource and Environmental Policy (3.0 cr)
  ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
  ESPM 5261 - Economics and Natural Resources Management (4.0 cr)
  ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
•Fisheries and Wildlife
  •FW 5003 - Human Dimensions of Biological Conservation (3.0 cr)
  FW 8452 - Conservation Biology (3.0 cr)
•French
  •FREN 5470 - Post/Colonial Francophone Literatures (3.0 cr)
•Geography
  •GEOG 5385 - Globalization and Development: Political Economy (4.0 cr)
  GEOG 5565 - (Inactive) (3.0 cr)
  GEOG 8005 - Proseminar: Population Geography (3.0 cr)
  GEOG 8007 - Proseminar: Theories of Development and Change (3.0 cr)
  GEOG 8101 - Proseminar: Nature and Society (3.0 cr)
  GEOG 8212 - Africa (3.0 cr)
  GEOG 8213 - East Asia and China (3.0 cr)
  GEOG 8214 - South Asia (3.0 cr)
  GEOG 8220 - Agrarian Change and Rural Development (3.0 cr)
  GEOG 8240 - Medical Geography (3.0 cr)
  GEOG 8336 - Development Theory and the State (3.0 cr)
•Gender, Women, and Sexuality Studies
  •GWSS 5104 - Transnational Feminist Theory (3.0 cr)
  GWSS 5290 - Topics: Biology, Health, and Environmental Studies (3.0 cr)
  GWSS 5390 - Topics: Visual, Cultural, and Literary Studies (3.0 cr)
  GWSS 5490 - Topics: Political Economy and Global Studies (3.0 cr)
  GWSS 8101 - Intellectual History of Feminism (3.0 cr)
  GWSS 8102 - Advanced Studies in Sexuality (3.0 cr)
  GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)
  GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
  GWSS 8109 - Feminist Knowledge Production (3.0 cr)
  GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)
  GWSS 8301 - Feminist Literary Criticism (3.0 cr)
•Global Studies
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLOS 5602</td>
<td>Other Worlds: Globality and Culture (3.0 cr)</td>
</tr>
<tr>
<td>GLOS 5900</td>
<td>Topics in Global Studies (1.0 - 4.0 cr)</td>
</tr>
</tbody>
</table>

### History

- **HIST 5439** - Environment and Society in Africa (3.0 cr)
- **HIST 5468** - Social Change in Modern China (3.0 cr)
- **HIST 5479** - History of Chinese Cities and Urban Life (3.0 cr)
- **HIST 5547** - Empire and Nations in the Middle East (3.0 cr)
- **HIST 5633** - Socio-Economic History of China (3.0 cr)
- **HIST 5881** - American Foreign Relations to 1895 (3.0 cr)
- **HIST 5890** - Readings in American Indian and Indigenous History (3.0 cr)
- **HIST 5901** - Latin America Proseminar: Colonial (3.0 cr)
- **HIST 5902** - Latin America Proseminar: Modern (3.0 cr)
- **HIST 5920** - Topics in African History (3.0 cr)
- **HIST 5932** - The Production of Knowledge, Negotiating the Past, and the Writing of African Histories (3.0 cr)
- **HIST 5940** - Topics in Asian History (1.0 - 4.0 cr)
- **HIST 5950** - Topics in Latin American History (1.0 - 4.0 cr)
- **HIST 5962** - Bell Library Research Seminar in Comparative World History, ca. 1000-1800 CE (3.0 cr)
- **HIST 5964** - Comparative Economic History (3.0 cr)
- **HIST 5980** - Topics in Comparative Women's History (3.0 - 4.0 cr)
- **HIST 5990** - Readings in Comparative History (3.0 cr)
- **HIST 8239** - Readings in Gender, Race, Class, and/or Ethnicity in the United States (3.0 cr)
- **HIST 8240** - Topics in Research in Gender, Race, Class, or Ethnicity in the United States (3.0 cr)
- **HIST 8245** - Human Rights and Crimes Against Humanity: A Global History (3.0 cr)
- **HIST 8390** - Research in American Indian History (3.0 cr)
- **HIST 8464** - Research in Yuan, Ming, and Qing History (3.0 cr)
- **HIST 8465** - Research in Yuan, Ming, and Qing History (3.0 cr)
- **HIST 8630** - Seminar in World History (3.0 cr)
- **HIST 8709** - Seminar: History of Sexuality (3.0 cr)
- **HIST 8920** - Topics in African History (1.0 - 4.0 cr)
- **HIST 8940** - Topics in Asian History (1.0 - 4.0 cr)
- **HIST 8944** - Research Seminar: New Directions in African Social History I (3.0 cr)
- **HIST 8945** - Research Seminar: New Directions in African Social History II (3.0 cr)
- **HIST 8950** - Topics in Latin American History (1.0 - 4.0 cr)
- **HIST 8990** - Topics in Comparative History-Research (3.0 cr)

### History of Science and Technology

- **HSCI 5244** - Nature's History: Science, Humans, and the Environment (3.0 cr)
- **HSCI 5331** - Technology and American Culture (3.0 cr)
- **HSCI 5332** - Science in the Shaping of America (3.0 cr)
- **HSCI 8441** - Women in Science: Historical Perspectives (3.0 cr)
- **HSCI 8940** - Seminar: History of Science and Technology in the Americas (3.0 cr)
- **HSCI 8950** - Seminar: Science and Technology in Cultural Settings (3.0 cr)

### Housing Studies

- **HSG 8463** - Housing: Race and Class (3.0 cr)

### Journalism and Mass Communication

- **JOUR 8513** - Seminar: Ethnographic Methods in Mass Communication Research (3.0 cr)
- **JOUR 8681** - Seminar: International Media Perspectives (3.0 cr)
- **JOUR 8721** - Seminar: Communication Agencies as Social Institutions (3.0 cr)
- **JOUR 8801** - Seminar: Comparative Research in Mass Communication, a Cross-National Approach (3.0 cr)

### Music

- **MUS 8864** - Current Issues in Ethnomusicology (3.0 cr)

### Organizational Leadership, Policy and Development

- **OLPD 5103** - Comparative Education (3.0 cr)
- **OLPD 5104** - Strategies for International Development of Education Systems (3.0 cr)
- **OLPD 5121** - Educational Reform in International Context (3.0 cr)
- **OLPD 5124** - Critical Issues in International Education and Educational Exchange (3.0 cr)
- **OLPD 5128** - Anthropology of Education (3.0 cr)
- **OLPD 5132** - Intercultural Education and Training: Theory and Application (3.0 cr)
- **OLPD 8121** - Doctoral Seminar: Comparative and International Development Education (1.0 - 6.0 cr)

### Philosophy

- **PHIL 8600** - Workshop in the Philosophy of Science (1.0 cr)
- **PHIL 8660** - Seminar: Social and Cultural Studies of Science (3.0 cr)
- **PHIL 8670** - Seminar: Philosophy of Science (3.0 cr)

### Political Science

- **POL 5410** - Topics in Comparative Politics (1.0 - 3.0 cr)
- **POL 5477** - Struggles and Issues in the Middle East (4.0 cr)
POL 5485 - Human Rights Policy: Issues and Actors (3.0 cr)
POL 5525 - Federal Indian Policy (3.0 cr)
POL 5833 - The United States in the Global EconomyUS For Econ Policy (3.0 - 4.0 cr)
POL 5885 - International Conflict and Security (3.0 cr)
POL 8235 - Democratic Theory (3.0 cr)
POL 8275 - Contemporary Political Thought (3.0 cr)
POLS 8401 - International Relations (3.0 cr)
POLS 8402 - International Security (3.0 cr)
POLS 8403 - International Norms and Institutions (3.0 cr)
POLS 8404 - International Hierarchy (3.0 cr)
POLS 8405 - International Political Economy (3.0 cr)
POLS 8406 - Politics of International Finance (3.0 cr)
POLS 8407 - Morality in World Politics (3.0 cr)
POLS 8408 - International Relations of the Environment (3.0 cr)
POLS 8411 - Political Psychology and Foreign Policy (3.0 cr)
POLS 8412 - American Foreign Policy (3.0 cr)
POLS 8460 - Topics in International Relations (3.0 cr)
POLS 8601 - Introduction to Comparative Politics (3.0 cr)
POLS 8605 - Government and Politics in Africa (3.0 cr)
POLS 8608 - Government and Politics of Russia and the Commonwealth of Independent States (3.0 cr)
POLS 8611 - Chinese Politics (3.0 cr)
POLS 8619 - Latin American Politics (3.0 cr)
POLS 8633 - Comparative Sociopolitical Change (3.0 cr)
POLS 8637 - Comparative Political Economy (3.0 cr)
POLS 8641 - Comparative Mass Political Behavior (3.0 cr)
POLS 8643 - Comparative Political Institutions (3.0 cr)
POLS 8660 - Topics in Comparative Politics (3.0 cr)

• Portuguese
  • PORT 5530 - Brazilian Literary and Cultural Studies (3.0 cr)
  PORT 5540 - Literatures and Cultures of Lusophone Africa (3.0 cr)
  PORT 5910 - Topics in Lusophone Cultures and Literatures (3.0 cr)

• Public Affairs
  • PA 5301 - Population Methods & Issues for the United States & Global South (3.0 cr)
  PA 5421 - Racial Inequality and Public Policy (3.0 cr)
  PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
  PA 5460 - Topics in Race, Ethnicity, and Public Policy (1.0 - 3.0 cr)
  PA 5501 - Theories and Policies of Development (3.0 cr)
  PA 5511 - Community Economic Development (3.0 cr)
  PA 5521 - Development Planning and Policy Analysis (4.0 cr)
  PA 5522 - International Development Policy, Families, and Health (3.0 cr)
  PA 5590 - Topics in Economic and Community Development (1.0 - 3.0 cr)
  PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)
  PA 5690 - Topics in Women, Gender and Public Policy (1.0 - 3.0 cr)
  PA 5701 - Science and State (3.0 cr)
  PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
  PA 5721 - Energy and Environmental Policy (3.0 cr)
  PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
  PA 5801 - Global Public Policy (3.0 cr)
  PA 5890 - Topics in Foreign Policy and International Affairs (1.0 - 5.0 cr)
  PA 5952 [Inactive] (2.0 cr)
  PA 6866 - Feminist Organizations (3.0 cr)
  PA 8690 - Advanced Topics in Women, Gender and Public Policy (1.0 - 3.0 cr)
  PA 8811 - Strategic Issues in International Economic Policy (3.0 cr)
  PA 8821 - National Security Policy (3.0 cr)
  PA 8890 - Advanced Topics in Foreign Policy and International Affairs (1.0 - 3.0 cr)

• Public Health
  • PUBH 6055 - Social Inequalities in Health (2.0 cr)
  PUBH 6131 - Working in Global Health (2.0 cr)
  PUBH 6281 - Immigrant Health Issues (3.0 - 4.0 cr)

• Sociology
  • SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
  SOC 8221 - Sociology of Gender (3.0 cr)
  SOC 8290 - Topics in Social Stratification (3.0 cr)
  SOC 8311 - Political Sociology (3.0 cr)
  SOC 8701 - Sociological Theory (4.0 cr)
SOC 8790 - Advanced Topics in Sociological Theory (3.0 cr)

• Spanish
  • SPAN 5531 - Hispanic Literature of the United States (3.0 cr)
  • SPAN 5985 - Sociolinguistic Perspectives on Spanish in the United States (3.0 cr)
  • SPAN 8960 - Workshop: Research in Hispanic Cultural Issues (3.0 cr)
  • SPAN 8990 - Advanced Comparative Research of Caribbean Genres (3.0 cr)
  • SPPT 5930 - Selected Topics in Hispanic and Lusophone Cultural Discourse (1.0 - 3.0 cr)

• Studies in Cinema and Media Culture
  • SCMC 5001 - Critical Debates in the Study of Cinema and Media Culture (4.0 cr)

• Studies of Science and Technology
  • SST 8400 - Seminar: Science, Technology, and Society (3.0 cr)
  • SST 8420 - Seminar: Social and Cultural Studies of Science (3.0 cr)

• Sustainable Agriculture
  • SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
  • SAGR 8020 - Field Experience in Sustainable Agriculture (1.0 - 4.0 cr)

• Theatre Arts
  • TH 5117 - Performance and Social Change (3.0 cr)
Early Modern Studies Minor

History Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Email: emsdbgs@umn.edu
Website: http://www.cemh.umn.edu/minor

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The early modern studies (EMS) minor is available to master's and doctoral students. The program encourages inquiry into the early modern period, roughly 1300 to 1800 A.C.E., using insights and perspectives from multiple disciplines. The minor provides graduate students with solid grounding in the theories and multi-disciplinary methods used by scholars studying the early modern period, particularly through the required core seminar (EMS 8250 - Seminar in EMS: Current Research and Methodologies), which is co-taught by professors from two distinct departments.

The minor also offers an opportunity to interact with the current research of visiting scholars and University of Minnesota faculty and graduate students through EMS 8100 - Workshop in Early Modern Studies, in which students share written responses to workshops and lectures on campus. Finally, the minor draws electives from existing courses in departments across the College of Liberal Arts, as well as those in the History of Science, Technology, and Medicine. The University of Minnesota has numerous library collections and research centers which include a focus on the early modern period. For more information on the minor, visit www.cemh.umn.edu/minor.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Admission to the early modern studies graduate minor is contingent upon prior admission to a master's or doctoral degree-granting program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Courses
EMS 8250 - Seminar in Early Modern Studies (3.0 cr)
Students are required to enroll in EMS 8100 for 1 credit worth of workshop experience.
Take 1 or more credit(s) from the following:
- EMS 8100 - Workshop in Early Modern Studies (1.0 - 3.0 cr)
Elective Credits
Take 3 or more credit(s) from the following:

- EMS 5500 - Topics in Early Modern Studies (3.0 cr)
- EMS 8500 - Topics in Early Modern Studies (3.0 cr)
- EMS 8993 - Directed Study (1.0 - 6.0 cr)

*These electives can apply towards the minor. Not all courses are offered every semester.

- ARTH 5301 - Visual Culture of the Atlantic World (3.0 cr)
  or ARTH 5302 (Inactive) (3.0 cr)
  or ARTH 5324 - 15th-Century Painting (3.0 cr)
  or ARTH 5335 - Baroque Rome: Art and Politics in the Papal Capital (3.0 cr)
  or ARTH 5777 - The Diversity of Traditions: Indian Art 1200 to Present (3.0 cr)
  or ARTH 5781 - Age of Empire: The Mughals, Safavids, and Ottomans (3.0 cr)

Doctoral

Required Courses
EMS 8250 - Seminar in Early Modern Studies (3.0 cr)

Students are required to enroll in the following course for 3 credits, either all at once, or split between separate semesters:

Take 3 or more credit(s) from the following:

- EMS 8100 - Workshop in Early Modern Studies (1.0 - 3.0 cr)

Elective Credits
Take 6 or more credit(s) from the following:

- EMS 5500 - Topics in Early Modern Studies (3.0 cr)
- EMS 8500 - Topics in Early Modern Studies (3.0 cr)
- EMS 8993 - Directed Study (1.0 - 6.0 cr)

*These electives can apply towards the minor. Not all courses are offered every semester.

- ARTH 5301 - Visual Culture of the Atlantic World (3.0 cr)
  or ARTH 5302 (Inactive) (3.0 cr)
  or ARTH 5324 - 15th-Century Painting (3.0 cr)
  or ARTH 5335 - Baroque Rome: Art and Politics in the Papal Capital (3.0 cr)
  or ARTH 5777 - The Diversity of Traditions: Indian Art 1200 to Present (3.0 cr)
  or ARTH 5781 - Age of Empire: The Mughals, Safavids, and Ottomans (3.0 cr)
  or ARTH 5785 - Art of Islamic Iran (3.0 cr)
or ARTH 8320 - Seminar: Issues in Early Modern Visual Culture (3.0 cr)
or ARTH 8340 - Seminar: Baroque Art (3.0 cr)
or ENGL 5121 - Readings in Early Modern Literature and Culture (3.0 cr)
or ENGL 8120 - Seminar in Early Modern Literature and Culture (3.0 cr)
or FREN 8371 - The Rule of Reason, The Reign of Madness: Readings in Early Modern France (3.0 cr)
or FREN 8271 - The Novel of the Ancien Regime (3.0 cr)
or GER 8210 - Seminar in Early Modern German Literature and Culture (3.0 cr)
or HIST 5379 - Problems in Early American History (3.0 cr)
or HIST 5547 - Empire and Nations in the Middle East (3.0 cr)
or HIST 5469 - Historiographies of China, 1000-1700 (3.0 cr)
or HIST 5612 - New Directions in the Middle Ages, ca. 1100-1500 (3.0 cr)
or HIST 5715 - Readings in European Women's History: 1450-1750 (3.0 cr)
or HIST 5801 - Seminar in Early American History (3.0 cr)
or HIST 5901 - Latin America Proseminar: Colonial (3.0 cr)
or HIST 5962 - Bell Library Research Seminar in Comparative World History, ca. 1000-1800 CE (3.0 cr)
or HIST 5964 - Comparative Economic History (3.0 cr)
or HMED 8001 - Foundations in the History of Early Medicine (3.0 cr)
or HSCI 8125 - Foundations for Research in the Scientific Revolution (3.0 cr)
or MUS 5624 - Music of J. S. Bach (3.0 cr)
or PHIL 8085 - Seminar: History of Philosophy--Modern Philosophers (3.0 cr)
or PHIL 8090 - Seminar: History of Modern Philosophy (3.0 cr)
or PORT 5520 - Portuguese Literary and Cultural Studies (3.0 cr)
or PORT 5530 - Brazilian Literary and Cultural Studies (3.0 cr)
or SPAN 5316 - Spanish Picaresque Narratives (3.0 cr)
or SPAN 8212 - Spanish Theater of the 16th Century: Drama up to Lope (3.0 cr)
or SPAN 8223 - The Poetry of the Spanish Golden Age (3.0 cr)
or SPAN 8312 - Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina] (3.0 cr)
or SPPT 8400 - Topics in Modern Hispanic and Lusophone Culture (3.0 cr)
or TH 8112 - History and Theory of Western Theatre: Medieval Through Renaissance (3.0 cr)
or TH 8113 - History and Theory of Western Theatre: National Theatres to the French Revolution (3.0 cr)
or PHIL 4055 - Kant (3.0 cr)

with PHIL 8010 - Workshop in History of Philosophy (1.0 cr)
Twin Cities Campus
Economics M.A.
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Economics, 4-101 Hanson Hall, 1925 4th Street South, Minneapolis MN 55455 (612-625-6833; fax: 612-624-0209)
Email: econgrads@umn.edu
Website: http://www.econ.umn.edu/graduate/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are admitted only for the PhD in economics; the MA is an optional part of the PhD program.

The economics graduate program offers degree work in both theoretical and applied fields of economics. It is possible to pursue thesis research in microeconomic or macroeconomic theory. In addition, the following fields of specialization are offered: econometrics, economic growth and development, financial economics, game theory, industrial organization, international economics, labor economics, mathematical economics, monetary economics, and public economics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written. A capstone project is required.
Capstone Project: Two Plan B projects consisting of research papers or literature reviews are required; the PhD written preliminary exams required in two fields outside of economic theory ("field exams") may be used to satisfy either or both of the Plan B projects. Because the standards used to judge whether a preliminary exam has satisfied the requirement for the MA are less rigorous than those for the PhD, students may qualify for the master's Plan B without having satisfied all requirements for the PhD written preliminary exams.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Director of graduate studies approval is required for inclusion of any 4xxx-level coursework.

Required Core Courses (16 Credits)
Take the following courses for 16 credits:
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)
ECON 8105 - Macroeconomic Theory (2.0 cr)
ECON 8106 - Macroeconomic Theory (2.0 cr)
ECON 8107 - Macroeconomic Theory (2.0 cr)
ECON 8108 - Macroeconomic Theory (2.0 cr)

**Economics Electives (8 Credits)**
Select at least 8 credits of electives in consultation with the director of graduate studies.
ECON 5xxx
ECON 8xxx

**Outside Coursework (6 Credits)**
Take at least 6 credits outside the major. Courses are selected in consultation with the director of graduate studies.
Twin Cities Campus
Economics Minor
Economics
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Economics, 4-101 Hanson Hall, 1925 4th Street South, Minneapolis MN 55455 (612-625-6833; fax: 612-624-0209)
Email: econgrads@umn.edu
Website: http://www.econ.umn.edu/graduate/index.html

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The economics graduate program offers degree work in both theoretical and applied fields of economics. It is possible to pursue thesis research in microeconomic or macroeconomic theory. In addition, the following fields of specialization are offered: econometrics, economic growth and development, financial economics, game theory, industrial organization, international economics, labor economics, mathematical economics, monetary economics, and public economics.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Coursework must be selected in consultation with the Economics director of graduate studies. All courses must be taken A-F and completed with grades of B or better (one 8xxx-level course may carry a grade of C). Option 2 is for master's-level students whose previous work in economics courses, in the judgement of the Economics director of graduate studies, has included coursework equivalent to the 4xxx-level economic theory courses.

Advanced Economic Theory Requirement
Option 1
Take 4 or more credits from the following (or from the 8-xxx theory sequences in the doctoral minor):

Microeconomic Analysis Sequence
ECON 4161 - Microeconomic Analysis I (2.0 cr)
ECON 4162 - Microeconomic Analysis II (2.0 cr)
ECON 4163 - Microeconomic Analysis (2.0 cr)
ECON 4164 - Microeconomic Analysis (2.0 cr)
Macroeconomic Analysis Sequence
- ECON 4165 - Macroeconomic Theory (2.0 cr)
- ECON 4166 - Macroeconomic Theory (2.0 cr)
- ECON 4167 - Macroeconomic Theory (2.0 cr)
- ECON 4168 - Macroeconomic Theory (2.0 cr)

Additional Electives
Take 2 or more credit(s) from the following:
- ECON 4xxx
- ECON 5xxx
- ECON 8xxx

or Option 2
For students whose previous work in economic theory, in the judgement of the Economics director of graduate studies, satisfies the theory sequence requirement. Option 2 students instead take economics electives chosen in consultation with the director of graduate studies.
Take 6 or more credit(s) from the following:
- ECON 4xxx
- ECON 5xxx
- ECON 8xxx

Doctoral
All courses must be selected in consultation with the Economics director of graduate studies.

Sequence Requirement
Take 8 credits from the following:

Microeconomic Theory Sequence
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)

Macroeconomic Theory Sequence
- ECON 8105 - Macroeconomic Theory (2.0 cr)
- ECON 8106 - Macroeconomic Theory (2.0 cr)
- ECON 8107 - Macroeconomic Theory (2.0 cr)
- ECON 8108 - Macroeconomic Theory (2.0 cr)

Electives
Take 4 or more credit(s) from the following:
- ECON 8xxx
Twin Cities Campus
Economics Ph.D.
Economics
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Economics, 4-101 Hanson Hall, 1925 4th Street South, Minneapolis MN 55455 (612-625-6833; fax: 612-624-0209)
Email: econqas@umn.edu
Website: http://www.econ.umn.edu/graduate/index.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 62
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The economics graduate program offers degree work in both theoretical and applied fields of economics. It is possible to pursue thesis research in microeconomic or macroeconomic theory. In addition, the following fields of specialization are offered: econometrics, economic growth and development, financial economics, game theory, industrial organization, international economics, labor economics, mathematical economics, monetary economics, and public economics.

Students are admitted only for the PhD; the MA is an optional part of the PhD program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Special Application Requirements:
Coursework in linear algebra and multivariate calculus is required for admission to the Ph.D. program.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Quantitative Reasoning: 159

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Speaking Score: 23
- IELTS
  - Total Score: 7
- MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
16 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.
This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.20 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Emphasis in all aspects of the program is on careful development of the theoretical basis for the work, whether the work is theoretical or applied, and whether the relevant theory is drawn from economics, econometrics, mathematics, statistics, or other related disciplines.

Before undertaking research for a doctoral thesis, the student must pass written preliminary exams in micro- and macroeconomic theory, plus in two of the fields listed under the curriculum section above. The number of courses taken to help students prepare for the preliminary examinations is determined through consultation with the student's advisor.

**Required Core Courses**
Take the following courses for 16 credits:
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)
- ECON 8105 - Macroeconomic Theory (2.0 cr)
- ECON 8106 - Macroeconomic Theory (2.0 cr)
- ECON 8107 - Macroeconomic Theory (2.0 cr)
- ECON 8108 - Macroeconomic Theory (2.0 cr)

**Economics Electives**
These courses are optional
Take 0 or more credit(s) from the following:
- ECON 8xxx

**Outside Coursework**
Take at least 12 credits outside the major. Courses are chosen in consultation with the director of graduate studies.

**Thesis Credits**
Take exactly 24 credit(s) from the following:
- ECON 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
English M.A.
English Language & Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of English Language and Literature, Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-625-3882; fax: 612-624-8228).
Email: gradeng@umn.edu
Website: http://english.cla.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Over the past 20 years, the field of English studies has changed dramatically from a discipline concerned with studying the literary works produced by English speakers in Britain and the United States to encompass writings in English from around the globe. The concerns of literary scholars have broadened to include not only textual analyses but also cultural, social, political, and economic contexts. The field of literature itself now encompasses not only the traditional genres of poetry, prose (fiction and belles-lettres), and drama, but also extra-literary discourses: popular culture, film, television, legal documents, conduct books, and manifestos. The Department of English has been in the forefront of interdisciplinary projects, thanks to the efforts of a faculty committed to research in American studies, medieval studies, feminist studies, film studies, and cultural studies. At the same time, the department maintains the core concerns of the discipline—the traditional study of the literatures and languages in English—as well as develops writers for the present and future through the master of fine arts in creative writing degree. The department is engaged in two simultaneous projects: to preserve the core curriculum and to re-imagine its future shape.

The department offers a master of arts in English language and literature. The MA offers training in the areas of literary history, literary theory and interpretation, language, linguistics, rhetoric, and composition. Students in the MA can develop specific concentrations through consultation with the director of graduate studies.

Course requirements for the MA program are broadly defined, allowing the student to shape a personal program of study. The English program encourages and supports interdisciplinary work.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
A minimum of four courses in English, three of which must be at the upper-division level, is required for degree program admission. The courses should be widely distributed.

Special Application Requirements:
Required admission materials include three letters of recommendation; scores from the General Test of the GRE; a short essay explaining scholarly, professional, and personal goals and reason(s) for choosing the University of Minnesota; and a writing sample, such as a course paper. Candidates for all degrees are admitted fall semester only; all materials must be received by December 1st.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 164

International applicants must submit score(s) from one of the following tests:

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Information current as of August 31, 2018
• TOEFL
  - Internet Based - Total Score: 105
  - Paper Based - Total Score: 620
• IELTS
  - Total Score: 7.5
• MELAB
  - Final score: 88

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is made up of three Plan B papers. Each is a tightly argued essay of about 5,000 words, usually a reworking of a paper done originally for a course.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: A reading knowledge of one language.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Courses

ENGL 5001 - Ph.D. Colloquium: Introduction to Literary Theory and Literary Studies in the Modern University (3.0 cr)

Major Electives

Emphases are chosen in consultation with the student's advisor and the Director of Graduate Studies.

Take 21 or more credit(s) from the following:

Emphasis One
Take 9 - 12 credit(s) from the following:
• ENGL 5xxx
• ENGL 8xxx

Emphasis Two
Take 9 - 12 credit(s) from the following:
• ENGL 5xxx
• ENGL 8xxx

Outside the Major -- Related Fields

Take 6 or more credits outside the program, in consultation with the Director of Graduate Studies.
**Twin Cities Campus**

**English Minor**

*English Language & Literature*

**College of Liberal Arts**

Link to a list of faculty for this program.

**Contact Information:**
Department of English Language and Literature, 207 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-625-3882; fax: 612-624-8228)
Email: gradeng@umn.edu
Website: http://english.cla.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

During the past 20 years, the field of English studies has changed dramatically from a discipline concerned with studying the literary works produced by English speakers in Britain and the United States to encompass writings in English from around the globe. The concerns of literary scholars have broadened to include not only textual analyses but also cultural, social, political, and economic contexts. The field of literature itself now encompasses not only the traditional genres of poetry, prose (fiction and belles-lettres), and drama, but also extra-literary discourses: popular culture, film, television, legal documents, conduct books, and manifestos. The Department of English has been in the forefront of interdisciplinary projects, thanks to the efforts of a faculty committed to research in American studies, medieval studies, feminist studies, film studies, and cultural studies. At the same time, the department maintains the core concerns of the disciplinethe traditional study of the literatures and languages in Englishas well as develops writers for the present and future through the master of fine arts in creative writing degree. The department is engaged in two simultaneous projects: to preserve the core curriculum and to reimagine its future shape.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**
Students interested in pursuing a minor in English should obtain approval from the director of graduate studies.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

- **Masters**
  Course selection is determined in consultation with the director of graduate studies.

**Required Courses**
Take 9 or more credit(s) from the following:
Doctoral
Course selection is determined in consultation with the director of graduate studies.

Required Courses
Take 12 or more credit(s) from the following:
• ENGL 5xxx
• ENGL 8xxx
Twin Cities Campus
English Ph.D.
English Language & Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of English Language and Literature, 207 Lind Hall, 207 Church Street S.E., Minneapolis, MN 55455 (612-625-3882; fax: 612-624-8228)
Email: gradeng@umn.edu
Website: http://english.cla.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 63
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Over the past 20 years, the field of English studies has changed dramatically from a discipline concerned with studying the literary works produced by English speakers in Britain and the United States to encompass writings in English from around the globe. The concerns of literary scholars have broadened to include not only textual analyses but also cultural, social, political, and economic contexts. The field of literature itself now encompasses not only the traditional genres of poetry, prose (fiction and belles-lettres), and drama, but also extra-literary discourses: popular culture, film, television, legal documents, conduct books, and manifestos. The Department of English has been in the forefront of interdisciplinary projects, thanks to the efforts of a faculty committed to research in American studies, medieval studies, feminist studies, film studies, and cultural studies. At the same time, the department maintains the core concerns of the disciplinethe traditional study of the literatures and languages in Englishas well as develops writers for the present and future through the master of fine arts in creative writing degree. The department is engaged in two simultaneous projects: to preserve the core curriculum and to re-imagine its future shape.

Course requirements for the PhD program are broadly defined, allowing the student to shape a personal program of study. The English program encourages and supports interdisciplinary work.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
A minimum of four courses in English, three of which must be at the upper division level, is required. The courses should be widely distributed.

Special Application Requirements:
Students with a bachelor’s degree may apply either to the master's program or the doctoral program. An M.A. degree, but not an M.F.A. degree, can be gained en route to the Ph.D. program. M.A. candidates who wish to continue their studies must formally apply for admission to the Ph.D. program. Required application materials include three letters of recommendation; a short essay explaining scholarly, professional, and personal goals and reason(s) for choosing the University of Minnesota; and a writing sample, such as a course paper. Candidates for all degrees are admitted fall semester only; all materials must be received by December 1st.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 164

International applicants must submit score(s) from one of the following tests:
• TOEFL

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Information current as of August 31, 2018
Program Requirements
27 to 33 credits are required in the major.
6 to 12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading knowledge of two languages.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Course requirements for the PhD program are broadly defined, allowing students to shape a personal program of study.

Required Courses (6 Credits)
Take ENGL 5800 for 3 credits.
ENGL 5001 - Ph.D. Colloquium: Introduction to Literary Theory and Literary Studies in the Modern University (3.0 cr)
ENGL 5800 - Practicum in the Teaching of English (1.0 - 3.0 cr)

Emphasis Area (12 Credits)
Take exactly 12 credit(s) from the following:
•ENGL 5xxx
•ENGL 8xxx

Distribution Requirement (9 Credits)
Take exactly 9 credit(s) from the following:
1 course in 3 of the following areas, but NOT in the students area of emphasis.
•ENGL 5xxx
ENGL 8xxx
Medieval
Early modern, to 1800
19th century
20th and 21st century
Creative writing
Rhetoric, literacy, language
Criticism, theory

Outside Coursework (6 Credits)
Take at least 6 credits of coursework outside coursework.

Thesis Credits
Take exactly 24 credit(s) from the following:
•ENGL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Feminist and Critical Sexuality Studies Minor
Gender, Women and Sexuality
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Gender, Women, and Sexuality Studies, 425 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-624-6006)
Email: gwss@umn.edu
Website: http://www.gwss.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate minor program in Feminist and Critical Sexuality Studies is located in the Department of Gender, Women, and Sexuality Studies (GWSS). The feminist and critical sexuality studies minor is a supplementary program for graduate students already admitted to the University of Minnesota and enrolled in another graduate program. The minor is designed for students with widely flexible interests and academic aims looking for advanced graduate academic training in feminist and critical sexuality studies. The program is also designed to provide an interdisciplinary graduate program in GLBTQ studies. Students must apply for special admission through the program. Application instructions and materials are available at https://cla.umn.edu/gwss/graduate/degree-programs/graduate-minor-feminist-and-critical-sexuality-studies

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students must apply to the feminist and critical sexuality studies minor for admission by submitting a letter of interest to the director of graduate studies that demonstrates a clear relationship between the focus and objectives of their doctoral research and the goals, curriculum, and scholarly resources of the minor.
Since the emphasis of the graduate minor is interdisciplinary, a focus or strong interest in such work is preferred.
A prerequisite undergraduate major or minor in gender, women and/or GLBTQ/sexuality studies is not required for admission, but preferable. Applicants are expected to demonstrate general knowledge of this relevant scholarship in some combination of previous coursework, research and writing, and/or organizational activity/experience.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
Feminist Theories and Methods
GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
or GWSS 8109 - Feminist Knowledge Production (3.0 cr)
Electives
Graduate minors must take four elective courses approved for FCSS minor, which may include 5000-8000 level courses in Gender, Women, and Sexuality Studies or 5000-8000 level courses in other departments. At least one of these graduate level courses must be taken inside the GWSS Department and at least one of these graduate courses must be taken outside the GWSS Department, preferably in the students home department. Consult the director of graduate studies to see if your courses qualify.
Twin Cities Campus
Feminist Studies M.A.
Gender, Women and Sexuality
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Gender, Women, and Sexuality Studies, 425 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-624-6006; fax: 612-624-3573)
Email: gwss@umn.edu
Website: http://www.gwss.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The MA is available only to students admitted to the feminist studies PhD program who wish to secure a Plan B MA along the way to obtaining a PhD. This credential is helpful for ABD employment purposes or for students who must exit the program. It is similar to the PhD milestones but does not require a dissertation.

The PhD program in feminist studies is designed to help students develop a high level of competence in feminist theories, research methods, interdisciplinarity, and pedagogies. The program is especially strong on feminist theory and issues related to women’s diversity, nationally and globally. To guarantee a high level of interdisciplinary exchange, the program is designed to bring feminist studies doctoral students together with graduate minor students who are pursuing a disciplinary specialty in their own home department. The program’s interdisciplinary curriculum emphasizes the interaction of social conditions such as class, ethnicity, race, sexualities, and national identity with gender. These interactions and their effects are examined in cultural productions such as media representations or colonialist paradigms in social systems and relations of power; in aspects of science such as genetics and new technologies; in epistemologies and philosophy; in professional areas such as health care to public policy; and in social, political, and environmental justice studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 28 major credits and 6 credits outside the major. The final exam is written and oral.
This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

**Required Core Courses and Colloquia**

**Required Core**
- GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
- GWSS 8109 - Feminist Knowledge Production (3.0 cr)
- GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)

**Colloquia Credits**
- Take 4 or more credit(s) from the following:
  - GWSS 8996 - Feminist Studies Colloquium (1.0 cr)

**GWSS Seminars**
- Take 6 or more credit(s) from the following:
  - GWSS 8210 - Seminar: Feminist Theory & Praxis (3.0 cr)
  - GWSS 8220 - Seminar: Science, Technology & Environmental Justice (3.0 cr)
  - GWSS 8230 - Seminar: Cultural Criticism and Media Studies (3.0 cr)
  - GWSS 8490 - Seminar: Transnational, Postcolonial, Diaspora (3.0 cr)
  - GWSS 8250 - Seminar: Nation, State, and Citizenship (1.0 - 3.0 cr)
  - GWSS 8260 - Seminar: Race, Representation and Resistance (3.0 cr)
  - GWSS 8270 - Seminar: Theories of Body (3.0 cr)
  - GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)
  - GWSS 5104 - Transnational Feminist Theory (3.0 cr)
  - GWSS 5406 - Black Feminist Thought in the American and African Diasporas (3.0 cr)

**Research Methods & Tools**
- Take at least 6 research methods & tools credits from the list below, or chosen in consultation with the director of graduate studies. Up to 6 of these credits can be applied to the 6-credit requirement for outside coursework.
- Take 0 - 6 credit(s) from the following:
  - GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)

**GWSS Electives**
- Take additional GWSS courses as necessary to meet the 28-credit minimum for the major.
- Take 0 - 6 credit(s) from the following:
  - GWSS 5xxx
  - GWSS 8xxx

**Outside Coursework**
- Take at least 6 credits outside the major.
Twin Cities Campus
Feminist Studies Ph.D.
Gender, Women and Sexuality
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Gender, Women, and Sexuality Studies, 425 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-624-6006; fax: 612-624-3573)
Email: gwss@umn.edu
Website: http://www.gwss.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 56 to 58
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD program in feminist studies is designed to help students develop a high level of competence in feminist theories, research methods, interdisciplinarity, and pedagogies. The program is especially strong on feminist theory and issues related to women's diversity, nationally and globally. To guarantee a high level of interdisciplinary exchange, the program is designed to bring feminist studies doctoral students together with graduate minor students who are pursuing a disciplinary specialty in their own home department. The program's interdisciplinary curriculum emphasizes the interaction of social conditions such as class, ethnicity, race, sexualities, and national identity with gender. These interactions and their effects are examined in cultural productions such as media representations or colonialist paradigms in social systems and relations of power; in aspects of science such as genetics and new technologies; in epistemologies and philosophy; in professional areas such as health care to public policy; and in social, political, and environmental justice studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

A MA in gender, women, and/or sexuality studies or a related field will be considered important, but is not required.

Other requirements to be completed before admission:
Preference is given to students with academic training or an undergraduate degree in gender, women, and/or sexuality studies or a related field. Extensive political work in these areas will also be considered important but not required.

Special Application Requirements:
Applicants for the Ph.D. program must submit scores from the General (Aptitude) Test of the GRE, three letters of recommendation, a writing sample, a current curriculum vitae, and a clearly written statement of career interests, goals, and objectives by electronic application through the Graduate Office (Apply Yourself). Graduate study in the program begins in the fall semester following admission. The application deadline is December 1; all applications are evaluated once each year in December.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

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The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
20 to 22 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

The course and credit requirements for the PhD fall into roughly two categories: interdisciplinary courses satisfying core requirements, and courses constituting or enhancing a concentration.

Students are expected to participate in the department colloquium series of faculty, student, and guest lecturer presentations.

Interdisciplinary Core and Required Courses

Required Core
GWSS 8108 - Genealogies of Feminist Theory (3.0 cr)
GWSS 8109 - Feminist Knowledge Production (3.0 cr)
GWSS 8107 - Feminist Pedagogies (3.0 cr)
GWSS 8997 - Dissertation Seminar (1.0 - 3.0 cr)

Colloquia Credits
Take 4 or more credit(s) from the following:
• GWSS 8996 - Feminist Studies Colloquium (1.0 cr)

GWSS Seminars
Take 6 or more credit(s) from the following:
• GWSS 8210 - Seminar: Feminist Theory & Praxis (3.0 cr)
• GWSS 8220 - Seminar: Science, Technology & Environmental Justice (3.0 cr)
• GWSS 8230 - Seminar: Cultural Criticism and Media Studies (3.0 cr)
• GWSS 8490 - Seminar: Transnational, Postcolonial, Diaspora (3.0 cr)
• GWSS 8250 - Seminar: Nation, State, and Citizenship (1.0 - 3.0 cr)
• GWSS 8260 - Seminar: Race, Representation and Resistance (3.0 cr)
• GWSS 8270 - Seminar: Theories of Body (3.0 cr)
• GWSS 8103 - Feminist Theories of Knowledge (3.0 cr)
• GWSS 5104 - Transnational Feminist Theory (3.0 cr)
• GWSS 5406 - Black Feminist Thought in the American and African Diasporas (3.0 cr)

Research Methods & Tools
Take at least 6 Research Methods & Tools credits from the list below, or chosen in consultation with the director of graduate studies. Up to 6 of these credits can be applied to the 12-credit requirement for outside coursework.
Take 0 - 6 credit(s) from the following:
• GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)

Outside Coursework
Take at least 12 credits outside the major. Courses are chosen in consultation with the director of graduate studies.

Thesis Credits
Take 24 or more credit(s) from the following:
• GWSS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
French M.A.
French & Italian
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of French and Italian, 314 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-626-0418, fax: 612-624-6021)
Email: frit@umn.edu
Website: http://www.frit.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The French program, which offers MA and PhD degrees, covers all areas of French literature and culture from the Middle Ages to the present. Traditional areas of study and scholarship are inflected by the faculty's interests, expertise, and research in areas that are shaping the discipline of French studies. The program, which fosters interdisciplinary research, has particular strengths in literary and cultural studies, critical theory, feminist studies, medieval studies, cinema studies, and francophone studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Applicants must submit three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, a sample of their academic writing, evidence of spoken French proficiency (audio sample or phone interview), and a written statement of research interests and goals. International student applicants should also submit scores for the TOEFL or equivalent English proficiency testing program. The program offers funding packages of five years for those admitted at the MA level. Submission of all application materials by January 10 ensures consideration for other fellowships and graduate instructorships for the next academic year. New teaching assistants and fellowship recipients are only admitted for fall semester; others may be admitted in mid-year.

Special Application Requirements:
A B.A. in French (or equivalent), with a literary emphasis, is required for the M.A. programs. Applicants have generally completed at least 18 credits in French literature and culture. Prospective students whose undergraduate degree is in another field, but who have taken substantial coursework in French and are strongly motivated to pursue literary studies, are invited to contact the director of graduate studies in French.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Plan A: Plan A requires 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in foreign language other than French

Required Courses

FRIT 5999 - Teaching of French and Italian: Theory and Practice (3.0 cr)
Take 1 or more credit(s) from the following:
• FREN 5995 - Directed Teaching (1.0 cr)

Plan Options

Plan A
Major Electives
Take 12 or more credit(s) from the following:
• FREN 5xxx
• FREN 8xxx
• FRIT 5xxx
• FRIT 8xxx
Outside the Major -- Related Fields
Students take at least 6 credits outside the major or in a master's-level minor.
Thesis Credits
Take exactly 10 credit(s) from the following:
• FREN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Major Electives
Take 18 or more credit(s) from the following:
• FREN 5xxx
• FREN 8xxx
• FRIT 5xxx
• FRIT 8xxx
Outside the Major -- Related Fields
Students take at least 9 credits outside the major or in a master's-level minor.
Twin Cities Campus
French Minor
French & Italian
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of French and Italian, 314 Folwell Hall, 9 Pleasant Street S.E., Minneapolis, MN 55455 (612-624-4308; fax: 612-624-6021)
Email: frit@umn.edu
Website: http://www.frit.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The French program, which offers MA and PhD degrees, covers all areas of French literature and culture from the Middle Ages to the present. Traditional areas of study and scholarship are inflected by the faculty’s interests, expertise, and research in areas that are shaping the discipline of French studies. The program, which fosters interdisciplinary research, has particular strengths in literary and cultural studies, critical theory, feminist studies, medieval studies, and francophone studies.

Program Delivery
This program is available:

- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Note: Neither FREN 5995 nor FRIT 5999 can be used to meet the master's minor requirement.
Take 9 or more credit(s) from the following:
- FREN 5xxx
- FREN 8xxx
- FRIT 5xxx
- FRIT 8xxx

Doctoral
Required Courses
Note: Neither FREN 5995 nor FRIT 5999 can be used to meet the doctoral minor requirement.
Take 12 or more credit(s) from the following:
- FREN 5xxx
- FREN 8xxx
- FRIT 5xxx
Twin Cities Campus
French Ph.D.
French & Italian
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of French and Italian, 314 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-626-0418; fax: 612-624-6021).
Email: frit@umn.edu
Website: http://www.frit.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 82
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The French program, which offers MA and PhD degrees, covers all areas of French literature and culture from the Middle Ages to the present. Traditional areas of study and scholarship are inflected by the faculty's interests, expertise, and research in areas that are shaping the discipline of French studies. The program, which fosters interdisciplinary research, has particular strengths in literary and cultural studies, critical theory, feminist studies, medieval studies, cinema studies, and francophone studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For the PhD program, an MA in French (or equivalent) is required.

Other requirements to be completed before admission:
A bachelor of arts in French (or equivalent), with a literary emphasis, is required for the MA programs. Applicants have generally completed at least 18 credits in French literature and culture. Prospective students whose undergraduate degree is in another field, but who have taken substantial coursework in French and are strongly motivated to pursue literary studies, are invited to contact the director of graduate studies in French.

Special Application Requirements:
Applicants must submit three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, a sample of their academic writing, evidence of spoken French proficiency (audio sample or phone interview), and a written statement of research interests and goals. International student applicants should also submit scores for the TOEFL or equivalent English proficiency testing program. The program offers funding packages of five years for those admitted at the M.A. level. Submission of all application materials submission by January 10 ensures consideration for other fellowships and graduate instructorships for the next academic year. New teaching assistants and fellowship recipients are only admitted for fall semester; others may be admitted in mid-year.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
46 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Proficiency in foreign language other than French

Required Courses
- FRIT 5999 - Teaching of French and Italian: Theory and Practice (3.0 cr)
- Take exactly 1 credit(s) from the following:
  - FREN 5995 - Directed Teaching (1.0 cr)

Major Electives
- Take 42 or more credit(s) from the following:
  - FREN 5xxx
  - FREN 8xxx
  - FRIT 5xxx
  - FRIT 8xxx

Outside Coursework
- Take at least 12 credits outside the major, not including foreign language credits.

Thesis Credits
- Take exactly 24 credit(s) from the following:
  - FREN 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Optional Emphases

Medieval Emphasis
The medieval emphasis comprises coursework in Old French and Latin. With the exception of LAT courses, credits can be applied toward the emphasis and the 42-credit major electives requirement.
Students may be exempt from coursework by passing a department-specific examination. Confer with the adviser and director of graduate studies regarding options for completing the emphasis.

Successful completion of the emphasis satisfies the foreign language requirement.

-OR-

Early Modern (Pre-1600) Emphasis
The early modern emphasis requires the demonstration of intermediate knowledge of Latin. LAT courses cannot be applied toward both the emphasis and the 42-credit major electives requirement. Students may be exempt from coursework by passing a department-specific examination. Confer with the advisor and director of graduate studies regarding options for completing the emphasis.

Successful completion of the emphasis satisfies the foreign language requirement.
French Studies Postbaccalaureate Certificate
French & Italian
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of French and Italian, 314 Folwell Hall, 9 Pleasant St SE, Minneapolis, MN 55455 (612-624-4308; fax: 612-624-6021)
Email: frit@umn.edu
Website: http://www.frit.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: French Studies PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This 15-credit graduate program is primarily for secondary teachers of French, but welcomes any prospective students wishing to enhance their knowledge of diverse areas of French and francophone studies, including linguistics, culture, literature, and film. Consisting of coursework only, the certificate provides the opportunity to explore in-depth aspects of French and francophone literature, culture, and language, while also sharpening language skills. An additional benefit is the potential for professional advancement.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have a BA in French or equivalent (BA/BS in another field, but relevant professional experience or academic preparation in French language and culture) with a preferred GPA of 3.0.

Special Application Requirements:
Applicants must submit the following materials: transcripts, a personal statement (in English) explaining how this certificate meets their personal or professional goals, a writing sample in French (a 500-1,000 word essay on applicant's topic of choice), and two letters of recommendation from individuals who can comment knowledgeably on applicant's interest and abilities in French studies. Applications must be received by April 15 for fall semester and by October 15 for spring semester.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework

Linguistics
  Take at least one course from the following:
  FREN 5531 - Sociolinguistics of French (3.0 cr)
  or FREN 5541 - Oral Discourse of French (3.0 cr)
  or FREN 4510

French or Francophone Literature or Culture
  Take at least one course from the following list. Note that neither FRIT 5999 nor FREN 5995 can be used to meet this requirement.
  FREN 4510
  or FREN 5xxx
  or FREN 8xxx
  or FRIT 5xxx
  or FRIT 8xxx

Electives
  A maximum of 3 elective credits can be taken in a French-culture related area outside French studies, such as linguistics, second language and cultures, history, english, art history, theatre arts, and music. Course selection is subject to advisor approval. Note that neither FRIT 5999 nor FREN 5995 can be used to meet this requirement.
  Take 9 or more credit(s) from the following:
  • FREN 5xxx
  • FREN 8xxx
  • FRIT 5xxx
  • FRIT 8xxx
Twin Cities Campus
Geographic Information Science M.G.I.S.
Geography, Environment, Society
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Geography, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-1498; fax: 612-624-1044)
Email: mgis@umn.edu
Website: http://cla.umn.edu/mgis

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 35
- This program does not require summer semesters for timely completion.
- Degree: Master of Geographic Information Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The professional master of geographic information science (MGIS), administered by the Department of Geography, provides graduate-level work in the theory, applications, and technology of geographic information science (GIS). Courses for the program are divided into three broad categories. Core courses provide the conceptual and theoretical underpinnings for a comprehensive, well-rounded knowledge of GIS, including an introductory seminar for entering students (GIS 8501). A set of technology courses focuses on specific software and techniques of GIS. Elective courses provide additional breadth to the program by allowing students to take courses related to their area of interest.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Applicants must submit an application form; a M.G.I.S. supplemental application form; transcripts; a clearly written personal statement of career interests and goals; and three letters of recommendation from persons familiar with their academic and/or employment background. The GRE is not required. All materials must be submitted by January 30 for fall semester entrance and by September 1 for spring semester entrance.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
- IELTS
  - Total Score: 7.5
- MELAB
  - Final score: 84

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 29 major credits and 6 credits outside the major. There is no final exam.
This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must complete a professional portfolio, and a set of concluding experiences including a public presentation, an exit survey, and a final meeting with an advisor.

**Required Courses**

- **GEOG 5561 - Principles of Geographic Information Science (4.0 cr)**
- **or** **FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)**
- **GIS 8501 - GIS Project Management and Professional Development (3.0 cr)**
- **GIS 5571 - ArcGIS I (3.0 cr)**
- **GIS 5572 - ArcGIS II (3.0 cr)**

**Advanced GIS Focus Courses**

**5xxx-level Requirement**

Take 3 credits from the following:

- **GEOG 5562 - GIS Development Practicum (3.0 cr)**
- **GEOG 5563 - Advanced Geographic Information Science (3.0 cr)**
- **ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)**
- **FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)**
- **GIS 5577 - Spatial Database Design and Administration (3.0 cr)**
- **GIS 5574 - Web GIS and Services (3.0 cr)**
- **GIS 5578 - GIS Programming (3.0 cr)**
- **CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)**

**8xxx-Level Requirement**

Take 3 credits from the following:

- **GEOG 8290 - Seminar in GIS and Cartography (3.0 cr)**
- **GEOG 8291 - Seminar in GIS, Technology, and Society (3.0 cr)**
- **GEOG 8292 - Seminar in GIS: Spatial Analysis and Modeling (3.0 cr)**
- **GIS 8990 - Research Problems in GIS (1.0 - 6.0 cr)**
- **FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)**
- **CSCI 8715 - Spatial Data Science Research (3.0 cr)**

**Electives**

Take remaining credits from the following list to meet the 35-credit minimum. At least 6 elective credits must be other than those with GEOG or GIS course designators.

Take 16 or more credit(s) from the following:

- **GEOG 5361 - Geography and Real Estate (4.0 cr)**
- **GEOG 5511 - Principles of Cartography (4.0 cr)**
- **GEOG 5531 - Numerical Spatial Analysis (4.0 cr)**
- **GEOG 5562 - GIS Development Practicum (3.0 cr)**
- **GEOG 5563 - Advanced Geographic Information Science (3.0 cr)**
- **GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)**
- **GEOG 8280 - Biogeography (3.0 cr)**
- **GEOG 8290 - Seminar in GIS and Cartography (3.0 cr)**
- **GEOG 8291 - Seminar in GIS, Technology, and Society (3.0 cr)**
- **GEOG 8292 - Seminar in GIS: Spatial Analysis and Modeling (3.0 cr)**
- **GIS 5530 - GIS Internship (1.0 - 3.0 cr)**
- **GIS 5555 - Basic Spatial Analysis (3.0 cr)**
- **GIS 5573 - Introduction to Digital Mapping: ArcGIS Basics (2.0 cr)**
- **GIS 5574 - Web GIS and Services (3.0 cr)**
- **GIS 5577 - Spatial Database Design and Administration (3.0 cr)**
- **GIS 5578 - GIS Programming (3.0 cr)**
- **GIS 5590 - Special Topics in GIS (3.0 cr)**
- **GIS 8990 - Research Problems in GIS (1.0 - 6.0 cr)**
- **CSCI 4041 - Algorithms and Data Structures (4.0 cr)**
- **CSCI 4131 - Internet Programming (3.0 cr)**
- **CSCI 4707 - Practice of Database Systems (3.0 cr)**
- **CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)**
- **CSCI 8715 - Spatial Data Science Research (3.0 cr)**
• ESPM 5031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
• ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5228 - Advanced Topics in Assessment and Modeling of Forests (3.0 cr)
• FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
• FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
• FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
• PA 5231 - Transit Planning and Management (3.0 cr)
• VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)
Twin Cities Campus
Geographic Information Science Minor

Geography, Environment, Society
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Geography, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-1498; fax: 612-624-1044).
Email: mgis@umn.edu
Website: http://cla.umn.edu/mgis

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The professional master of geographic information science (MGIS), administered by the Department of Geography, offers a master's and doctoral minor.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A graduate minor is developed in consultation with the M.G.I.S. director of graduate studies.

Required Course (4 credits)
All students pursuing the minor must take one of the following courses:
- GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
- FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Electives (5 Credits)
In addition to the required course, master's students must take at least 5 credits from the following to complete the 9-credit minimum:
- CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
- CSCI 8715 - Spatial Data Science Research (3.0 cr)
- ESPM 5031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
- ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
- FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
- FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
- FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
GEOG 5511 - Principles of Cartography (4.0 cr)
GEOG 5562 - GIS Development Practicum (3.0 cr)
GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
GEOG 8290 - Seminar in GIS and Cartography (3.0 cr)
GEOG 8291 - Seminar in GIS, Technology, and Society (3.0 cr)
GEOG 8292 - Seminar in GIS: Spatial Analysis and Modeling (3.0 cr)
GIS 5555 - Basic Spatial Analysis (3.0 cr)
GIS 5571 - ArcGIS I (3.0 cr)
GIS 5572 - ArcGIS II (3.0 cr)
GIS 5574 - Web GIS and Services (3.0 cr)
GIS 5577 - Spatial Database Design and Administration (3.0 cr)
GIS 5578 - GIS Programming (3.0 cr)
VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)

Doctoral
Electives (8 Credits)
In addition to the required course, doctoral students must take at least 8 credits from the following to complete the 12-credit minimum:
CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
CSCI 8715 - Spatial Data Science Research (3.0 cr)
ESPM 5031 - Applied Global Positioning Systems for Geographic Information Systems (3.0 cr)
ESPM 5295 - GIS in Environmental Science and Management (4.0 cr)
FNRM 5262 - Remote Sensing and Geospatial Analysis of Natural Resources and Environment (3.0 cr)
FNRM 5412 - Advanced Remote Sensing and Geospatial Analysis (3.0 cr)
FNRM 8205 - Research Problems: Spatial Data Analysis (1.0 - 5.0 cr)
GEOG 5511 - Principles of Cartography (4.0 cr)
GEOG 5562 - GIS Development Practicum (3.0 cr)
GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
GEOG 8290 - Seminar in GIS and Cartography (3.0 cr)
GEOG 8291 - Seminar in GIS, Technology, and Society (3.0 cr)
GEOG 8292 - Seminar in GIS: Spatial Analysis and Modeling (3.0 cr)
GIS 5555 - Basic Spatial Analysis (3.0 cr)
GIS 5571 - ArcGIS I (3.0 cr)
GIS 5572 - ArcGIS II (3.0 cr)
GIS 5574 - Web GIS and Services (3.0 cr)
GIS 5577 - Spatial Database Design and Administration (3.0 cr)
GIS 5578 - GIS Programming (3.0 cr)
VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)
Twin Cities Campus
Geography M.A.
Geography, Environment, Society
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Geography, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-625-6080; fax: 612-624-1044)
Email: geog-dgs@umn.edu
Website: http://www.geog.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The geography graduate program at the University of Minnesota reflects the intellectual breadth of the discipline by maintaining strengths in the broad areas of human geography, physical geography, nature-society relationships, and geographic information science. Faculty and students are engaged in teaching and research both within and across these broad areas as evidenced by prominent research themes within the program: culture, place, and flow; environmental change; geographies of the information society; geovisualization; globalization and uneven development; governance, citizenship, and justice; metropolis and world; and nature and society. To support students in gaining both depth and breadth within the discipline, the program is highly individualized with a limited number of requirements. Students work with their advisers to design individual programs suited to their educational and professional goals.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Undergraduate degrees need not be from a program in geography. However, students whose previous work is not in geography may be asked to complete specific courses that do not provide graduate credit.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 158
  - General Test - Quantitative Reasoning: 158
  - General Test - Analytical Writing: 4.5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 84

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** Three Plan B papers are required. These papers have the quality but not the scope of a master's thesis, and usually are enhanced versions of research papers done in connection with coursework and seminars.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Competency in a foreign language.

A minimum GPA of 2.80 is required for students to remain in good standing.

**Required Coursework**
- GEOG 8001 - Problems in Geographic Thought (3.0 cr)
- GEOG 8405 - Seminar: Graduate Student Professional Development (1.0 cr)

**Additional Geography Coursework**
- Take exactly 6 credit(s) from the following:
  - GEOG 8xxx

**Methods Coursework Requirement**
- Take at least 4 credits of methods coursework, chosen in consultation with the advisor.

**Outside Coursework**
- Take at least 6 credits outside the major.

**Plan Options**

**Plan A**

**Thesis Credits**
- Take 10 or more credit(s) from the following:
  - GEOG 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
  - OR-

**Plan B**

**Additional Major Elective Credits**
- Take 10 or more credit(s) from the following:
  - GEOG 5xxx
  - GEOG 8xxx
Twin Cities Campus
Geography Minor
Geography, Environment, Society
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Geography, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-625-6080; fax: 612-624-1044)
Email: geog-dgs@umn.edu
Website: http://www.geog.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The geography graduate program at Minnesota reflects the intellectual breadth of the discipline by maintaining strengths in the broad areas of human geography, physical geography, nature-society relationships, and geographic information science. Faculty and students are engaged in teaching and research both within and across these broad areas as evidenced by prominent research themes within the program: culture, place, and flow; environmental change; geographies of the information society; geovisualization; globalization and uneven development; governance, citizenship, and justice; metropolis and world; and nature and society. To support students in gaining both depth and breadth within the discipline, the program is highly individualized with a limited number of requirements. Students work with their advisors to design individual programs suited to their educational and professional goals.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minor must be developed in consultation with a faculty advisor. Consult the director of graduate studies about selecting an advisor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Take 6 or more credit(s) from the following:
• GEOG 5xxx
• GEOG 6xxx

Doctoral
Required Courses
Take 12 or more credit(s) from the following:
• GEOG 5xxx

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Information current as of August 31, 2018
Twin Cities Campus

Geography Ph.D.

Geography, Environment, Society

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Geography, 414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-625-6080; fax: 612-624-1044)
Email: geog-dgs@umn.edu
Website: http://www.geog.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 52
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The geography graduate program at Minnesota reflects the intellectual breadth of the discipline by maintaining strengths in the broad areas of human geography, physical geography, nature-society relationships, and geographic information science. Faculty and students are engaged in teaching and research both within and across these broad areas as evidenced by prominent research themes within the program: culture, place, and flow; environmental change; geographies of the information society; geovisualization; globalization and uneven development; governance, citizenship, and justice; metropolis and world; and nature and society. To support students in gaining both depth and breadth within the discipline, the program is highly individualized with a limited number of requirements. Students work with their advisers to design individual programs suited to their educational and professional goals.

Program Delivery

This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.50.

Undergraduate degrees need not be from a program in geography. However, students whose previous work is not in geography may be asked to complete specific courses that do not provide graduate credit.

Graduate degrees need not be from a program in geography. However, students whose previous work is not in geography may be asked to complete specific courses that do not provide graduate credit.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 158
  - General Test - Quantitative Reasoning: 158
  - General Test - Analytical Writing: 4.5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 84

The preferred English language test is Test of English as Foreign Language.
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
16 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students must earn certification of expertise in language(s), techniques(s) or both as determined by the advising committee. The committee must verify completion of the requirements prior to scheduling of the PhD final examination.

Required Courses
GEOG 8001 and 8405 should be taken within the first year of study.
GEOG 8001 - Problems in Geographic Thought (3.0 cr)
GEOG 8405 - Seminar: Graduate Student Professional Development (1.0 cr)
Take 6 credits of GEOG 81xx and/or GEOG 82xx coursework, with at least 3 credits of GEOG 82xx. With advisor approval, GEOG 8970 and GEOG 8980 may be used for GEOG 81xx or GEOG 82xx courses.
Take exactly 6 credit(s) from the following:
• GEOG 8xxx

Methods Course Requirement
Take at least 3 credits of methods coursework, which can be from outside the Geography, Environment & Society department. Course selection must be done in consultation with the Geography director of graduate studies.

Proposal-Writing Course Requirement
Take GEOG 8302 or at least 3 credits of coursework from outside the Geography, Environment & Society department. Course selection must be done in consultation with the Geography director of graduate studies.
GEOG 8302 - Research Development (3.0 cr)

Supporting Program Coursework
Take at least 12 credits from outside the department.

Thesis Credits
Take 24 or more credit(s) from the following:
• GEOG 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
**Twin Cities Campus**

**Germanic Studies M.A.**

**German, Nordic, Slavic & Dutch**

**College of Liberal Arts**

Link to a list of faculty for this program.

**Contact Information:**

Department of German, Scandinavian & Dutch, 320 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-625-2080; fax: 612-624-8297)

Email: gradgsd@umn.edu

Website: [http://gsd.umn.edu](http://gsd.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Germanic studies program in the Department of German, Scandinavian, and Dutch (GSD) is distinguished for its interdisciplinary approach to the study of literature and culture. The program equips students to be creative scholars and skillful teachers through research and teaching programs covering the literature and culture of German-speaking and Nordic countries. Students work closely with faculty dedicated to scholarly innovation, teaching excellence, and interdisciplinary collaboration.

The Germanic studies program offers both MA and PhD degrees and allows students to tailor their programs to their individual needs and interdisciplinary interests. Students have the option to pursue a emphasis in German (MA, PhD), Germanic Medieval Studies (MA, PhD) or Scandinavian Studies (MA) by completing a specified number of courses in one of those areas.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:

- BA or equivalent in German, Scandinavian, or related field. Students are usually admitted to the PhD program, but the MA must be completed first. Applicants must have fluency in German or a Scandinavian language.

**Special Application Requirements:**

In addition to the University's application requirements, the department requires the following: the department's Supplemental Application Information form (download from the department's website); a copy of one or more papers representative of the applicant's level of scholarly development (not to exceed 25 total pages); three letters of recommendation; the General (Aptitude) Test of the GRE (required for master's program applicants, but optional for those whose native language is not English). Students are admitted for fall semester only. All application materials may be uploaded into the online application and must be submitted by December 15.

For an online application or for more information about graduate education admissions, see the General Information section of this website.

Applicants must submit their test score(s) from the following:

- GRE

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

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The University of Minnesota is an equal opportunity educator and employer.

Information current as of August 31, 2018
- Internet Based - Speaking Score: 27
- Paper Based - Total Score: 550
  - IELTS
    - Total Score: 6.5
  - MELAB
    - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan B**: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project**: The Plan B paper is usually an improved, reworked seminar paper written for a specific course in the major.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students must demonstrate oral and written proficiency in German or one Scandinavian language.

**Required Core**

- GSD 8001 - Approaches to Textual Analysis (3.0 cr)
- GSD 5103 - Teaching of Germanic Languages (3.0 cr)

**Outside the Major in a Supporting Program**

Take 6 credits outside the major in supporting program.

**Germanic Studies - No Emphasis**

**Electives for Germanic Studies - No Emphasis**

Students who elect not to to pursue a formal track can choose from any of the department's course offerings to complete remaining credit requirements.

Take 18 or more credit(s) from the following:

- DTCH 5xxx
- FIN 5xxx
- GER 5xxx
- GER 8xxx
- GSD 5xxx
- GSD 8xxx
- SCAN 5xxx
- SCAN 8xxx

**Program Sub-plans**

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

**German**

The Plan B paper must reflect the emphasis.

**German Emphasis Electives**

- GER 5011 cannot count towards credit requirements.

Take 15 or more credit(s) from the following:

- GER 5xxx
- GER 8xxx
• GSD 8xxx

**Additional Elective**

Take 3 or more credit(s) from the following:

• DTCH 5xxx
• FIN 5xxx
• GER 5xxx
• GER 8xxx
• GSD 5xxx
• GSD 8xxx
• SCAN 5xxx
• SCAN 8xxx

**Germanic Medieval Studies**

The Plan B paper must reflect the emphasis.

**Germanic Medieval Studies Emphasis Electives**

Take 15 or more credit(s) from the following:

• GER 5711 - History of the German Language I (3.0 cr)
• GER 5721 - Introduction to Middle High German (3.0 cr)
• GER 5734 - Old Saxon (3.0 cr)
• GER 5740 - Topics in Germanic Medieval Studies (3.0 cr)
• GER 8200 - Seminar in Medieval German Literature and Culture (3.0 cr)
• GER 8210 - Seminar in Early Modern German Literature and Culture (3.0 cr)
• SCAN 5502 - The Icelandic Saga (3.0 cr)
• SCAN 5701 - Old Norse Language and Literature (3.0 cr)
• SCAN 5703 - Old Norse Poetry (3.0 cr)
• SCAN 5710 - Topics in Old Norse Literature (3.0 cr)
• SCAN 8500 - Seminar in Medieval Scandinavian Languages and Literature (3.0 cr)
• ENGL 4612 - Old English I (3.0 cr)
• ENGL 4613 - Old English II (3.0 cr)

**Additional Elective**

Take 3 or more credit(s) from the following:

• DTCH 5xxx
• FIN 5xxx
• GER 5xxx
• GER 8xxx
• GSD 5xxx
• GSD 8xxx
• SCAN 5xxx
• SCAN 8xxx

**Scandinavian Studies**

The Plan B paper must reflect the emphasis.

**Scandinavian Emphasis Electives**

Take 15 or more credit(s) from the following:

• SCAN 5xxx
• SCAN 8xxx
• FIN 5xxx

**Additional Elective**

Take 3 or more credit(s) from the following:

• DTCH 5xxx
• FIN 5xxx
• GER 5xxx
• GER 8xxx
• GSD 5xxx
• GSD 8xxx
• SCAN 5xxx
• SCAN 8xxx
Twin Cities Campus

Germanic Studies Minor

German, Nordic, Slavic & Dutch

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of German, Scandinavian & Dutch, 320 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-625-2080; fax: 612-624-8297).
Email: gradgsd@umn.edu
Website: http://gsd.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Germanic studies program in the Department of German, Scandinavian, and Dutch (GSD) is distinguished for its interdisciplinary approach to the study of literature and culture. The program equips students to be creative scholars and skillful teachers through research and teaching programs covering the literature and culture of German-speaking and Nordic countries. Students work closely with faculty dedicated to scholarly innovation, teaching excellence, and interdisciplinary collaboration. GSD faculty represent all historical areas of specialization from the medieval to the contemporary periods.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

MA minors are required to take GSD 8001 - Approaches to Textual Analysis and two other courses, for at least 9 credits. PhD minors who have not completed GSD 8001 at the MA level must fulfill this requirement at the PhD level. In addition, PhD minors must complete at least four other courses for a total of at least 15 credits (usually five courses).

Required Core
- GSD 8001 - Approaches to Textual Analysis (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Electives
- Take 6 or more credit(s) from the following:
  - DTCH 5xxx
  - FIN 5xxx
  - GSD 5xxx
• GSD 8xxx
• GER 5xxx
• GER 8xxx
• SCAN 5xxx
• SCAN 8xxx

**Doctoral Electives**
Take 12 or more credit(s) from the following:
• DTCH 5xxx
• FIN 5xxx
• GSD 5xxx
• GSD 8xxx
• GER 5xxx
• GER 8xxx
• SCAN 5xxx
• SCAN 8xxx
**Twin Cities Campus**

**Germanic Studies Ph.D.**

*German, Nordic, Slavic & Dutch*

**College of Liberal Arts**

Link to a list of faculty for this program.

**Contact Information:**

Department of German, Scandinavian & Dutch, 320 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-625-2080; fax: 612-624-8297)

Email: gradgsd@umn.edu

Website: http://gsd.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 54 to 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Germanic studies program in the Department of German, Scandinavian, and Dutch (GSD) is distinguished for its interdisciplinary approach to the study of literature and culture. The program equips students to be creative scholars and skillful teachers through research and teaching programs covering the literature and culture of German-speaking and Nordic countries. Students work closely with faculty dedicated to scholarly innovation, teaching excellence, and interdisciplinary collaboration.

The Germanic studies program offers both MA and PhD degrees and allows students to tailor their programs to their individual needs and interdisciplinary interests. Students have the option to pursue a track in German (MA, PhD), Germanic Medieval studies (MA, PhD) or Scandinavian studies (MA) by completing a specified number of courses in one of those areas.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.50.

MA or equivalent from another institution in German or a related field.

Other requirements to be completed before admission:

Students with a BA only are usually admitted to the PhD program, but the MA must be completed first. Those applying with an MA must have fluency in German

**Special Application Requirements:**

In addition to the University's application requirements, the department requires the following: the department's Supplemental Application Information form (download from the department's website); a copy of one or more papers representative of the applicant's level of scholarly development (not to exceed 25 total pages); three letters of recommendation; the General (Aptitude) Test of the GRE (recommended but not required for applicants who already have an M.A.). Students are admitted for fall semester only. All application materials may be uploaded into the online application and must be submitted by December 15. For an online application or for more information about graduate education admissions, see the General Information section of this website.

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 27
  - Paper Based - Total Score: 550
- IELTS
- Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
18 to 24 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: See requirements listed below.

A minimum GPA of 3.00 is required for students to remain in good standing.

Reading competence in at least two languages or a high degree of proficiency in one language other than English or German.

Students with an MA from another institution must also take one theory course and a pedagogy seminar.

Required Core
- GSD 8001 - Approaches to Textual Analysis (3.0 cr)
- GSD 5103 - Teaching of Germanic Languages (3.0 cr)

Outside the Major in a Supporting Program
Take 12 credits outside the major in supporting program.

Thesis Credits
Take 24 or more credit(s) from the following:
- GSD 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Germanic Studies - No Emphasis
Take 15 or more credit(s) from the following:
- DTCH 5xxx
- FIN 5xxx
- GER 5xxx
- GER 8xxx
- GSD 5xxx
- GSD 8xxx
- SCAN 5xxx
- SCAN 8xxx

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

German Emphasis
The dissertation must reflect the German track.

German Emphasis Electives
Take 12 or more credit(s) from the following:
•GER 5xxx
•GER 8xxx
•GSD 8xxx

Additional Elective
Take 3 or more credit(s) from the following:
•DTCH 5xxx
•FIN 5xxx
•GER 5xxx
•GER 8xxx
•GSD 5xxx
•GSD 8xxx
•SCAN 5xxx
•SCAN 8xxx

Germanic Medieval Studies Emphasis
The dissertation must reflect the Germanic medieval studies track.

Germanic Medieval Studies Emphasis Electives
Take 12 or more credit(s) from the following:
• GER 5711 - History of the German Language I (3.0 cr)
• GER 5721 - Introduction to Middle High German (3.0 cr)
• GER 8210 - Seminar in Early Modern German Literature and Culture (3.0 cr)
• GER 5734 - Old Saxon (3.0 cr)
• GER 5740 - Topics in Germanic Medieval Studies (3.0 cr)
• GER 8200 - Seminar in Medieval German Literature and Culture (3.0 cr)
• SCAN 5502 - The Icelandic Saga (3.0 cr)
• DTCH 5701 - Old Norse Language and Literature (3.0 cr)
• SCAN 5703 - Old Norse Poetry (3.0 cr)
• SCAN 5710 - Topics in Old Norse Literature (3.0 cr)
• SCAN 8500 - Seminar in Medieval Scandinavian Languages and Literature (3.0 cr)
• ENGL 4612 - Old English I (3.0 cr)
• ENGL 4613 - Old English II (3.0 cr)

Additional Elective
Take 3 or more credit(s) from the following:
•DTCH 5xxx
•FIN 5xxx
•GER 5xxx
•GER 8xxx
•GSD 5xxx
•GSD 8xxx
•SCAN 5xxx
•SCAN 8xxx
Twin Cities Campus
Health Communication M.A.
School of Journalism & Mass Communication
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
111 Murphy Hall
206 Church Street
Minneapolis, MN 55455
612/625-0120
Email: sjmcho@umn.edu
Website: http://sjmc.umn.edu/grad

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Journalism & Mass Communication's (SJMC) MA health communication (integrated BA/MA track) program prepares students for healthcare careers that rely on the strategic use of health information to communicate with patient and nonpatient publics, care providers, administrators and other public health stakeholders. The program is designed around a curriculum of academic and professional skills courses from strategic communication, public health and other relevant disciplines.

The curriculum includes a summer practicum experience in a health media or health care organization. The program's balance of conceptual prowess and practical skills prepares its graduates to be expert health communication professionals in a variety of health care positions. Students who complete this program will have a combination of specific message strategy/content development skills and the subject knowledge demanded by the healthcare workplace. Every workplace now requires professionals who can communicate clearly and strategically about their subject matter with multiple audiences and using a variety of communication channels. This is especially true in the arena of health care.

This program provides an Integrated BA/MA option for eligible University of Minnesota journalism/strategic communication track BA students also interested in completing the school's health communication MA degree. The integrated BA journalism/MA health communication sub-plan enables students to complete both degrees in five years.

The combination of skills and context courses at the undergraduate level, and the sophisticated academic and practice-based courses at the graduate level will ensure that graduates of this program are fully prepared to contribute to their workplaces from day one.

Students who complete this program will have a combination of specific message strategy/content development skills and the subject knowledge demanded by the healthcare workplace. Every workplace now requires professionals who can communicate clearly and strategically about their subject matter with multiple audiences and using a variety of communication channels. This is especially true in the arena of health care. The combination of skills and context courses at the undergraduate level, and the sophisticated academic and practice-based courses at the graduate level will ensure that graduates of this program are fully prepared to contribute to their workplaces from day one.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
Students must be enrolled in the BA in journalism/strategic communication track to apply for Integrated BA journalism/MA health communication sub-plan admission. Admission is considered for summer term only; the application deadline is February 15.
Special Application Requirements:
Applicants must submit a department application; a statement of objectives articulating interest and readiness for the program; a complete set of transcripts; an academic and professional work sample; a resume or curriculum vita; and scores from the General Test of the GRE.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 155
  - General Test - Analytical Writing: 4.5

Key to test abbreviations (GRE).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is written. A capstone project is required.

Capstone Project: JOUR 8193, Health Communication Capstone, allows you to focus on different aspects of health communication relevant to your interests. Students will prepare a final project a publishable article, a multimedia projection, an original research paper or other options aimed at a particular audience. This project is completed during the second semester of the MA program.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 0 semesters must be completed before filing a Degree Program Form.

Core Courses
- JOUR 5541 - Mass Communication and Public Health (3.0 cr)
- JOUR 5542 - Theory-based Health Message Design (3.0 cr)
- JOUR 5543 - Public Health Campaign Evaluation (3.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)

Electives
Take 12 or more credit(s) from the following:
- JOUR 5501 - Communication, Public Opinion, and Social Media (3.0 cr)
- JOUR 8650 - Seminar: Psychology of Media Effects (3.0 cr)
- JOUR 8720 - Seminar: Mass Media and Health (3.0 cr)
- PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)
- PUBH 6055 - Social Inequalities in Health (2.0 cr)
- PUBH 6085 - Alcohol and Tobacco: Ongoing Threats to Global Health (2.0 cr)
- PUBH 7214 - Principles of Risk Communication (1.0 cr)
- PUBH 7226 - Media Relations Practicum (1.0 cr)
- PSY 5205 - Applied Social Psychology (3.0 cr)
- WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)
- WRIT 5112 - Information Design: Theory and Practice (3.0 cr)
- WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)
- WRIT 8550 - Seminar in Technology, Culture, and Communication (3.0 cr)
- WRIT 5561 - Editing and Style for Technical Communicators (3.0 cr)

Capstone
- JOUR 8193 - Health Communication Capstone (3.0 cr)

Practicum
- JOUR 8194 - Health Communication Practicum (3.0 cr)
Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated BA Journalism/ MA Health Communication
This sub-plan is limited to students completing the program under Plan B.

The SJMC offers an early-admission opportunity for eligible University of Minnesota journalism/strategic communication BA students also interested in completing the health communication MA degree. The integrated BA journalism/MA health communication sub-plan enables journalism/strategic communication majors to take 9 credits during their senior (fourth) year, and to complete the MA after a fifth year of full-time graduate study plus one summer. Interested journalism/strategic communication undergraduates should contact the SJMC advisor for more information. The integrated BA journalism/MA health communication sub-plan application deadline is February 15 of the student's junior year, and admission to the sub-plan is contingent on a formal admissions process. Students admitted to the sub-plan must maintain timely degree progress to ensure all undergraduate degree requirements are completed by the end of their fourth year. The sub-plan is open to journalism/strategic communication track undergraduates only. Double majors may apply, but only if they choose to complete the senior project requirement in journalism.
Twin Cities Campus
Hispanic and Lusophone Literatures, Cultures, and Linguistics M.A.
Spanish & Portuguese Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Spanish and Portuguese Studies, 214 Folwell Hall, 9 Pleasant Street SE, Minneapolis, Minnesota, 55455 (612-625-5858; fax: 612-625-3549)
Email: spptgrad@umn.edu
Website: http://spanport.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 36
• This program does not require summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students entering the Hispanic and Lusophone Literatures, Cultures, and Linguistics PhD program without an MA from another institution, or with an unrelated graduate degree may elect, but are not required to, earn the MA at the University of Minnesota.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Prospective students generally have completed an undergraduate degree or substantial coursework in the fields of Hispanic literatures and cultures, Lusophone literatures and cultures, or Hispanic linguistics, although individuals with other backgrounds may be admitted.

Students admitted to the program are required to be fluent in Spanish or Portuguese. The Graduate Studies Committee may require completion of background coursework, without graduate degree credit, for admitted students with insufficient preparation.

Special Application Requirements:
All application materials must be submitted electronically through the ApplyYourself application system by December 15. Applicants are accepted for admission for fall semester only. Please refer to the Application Checklist for important details. The following is required for the application: the Departmental Application; a personal statement; a writing sample representative of the applicant's level of scholarly development; three letters of recommendation; five-minute voice sample; a Curriculum Vitae; GRE or TOEFL (or MELAB or IELTS) test scores; and transcripts. For more information, see the Department of Spanish & Portuguese Studies Applying page: http://spanport.umn.edu/grad/applying.html

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Part 1 (Composition) score: 80
Program Requirements

Plan B: Plan B requires 30 major credits and 6 credits outside the major. The final exam is written and oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.50 is required for students to remain in good standing.

Required Courses (6 Credits)
All students must take the following teacher-training courses for a total of 6 credits.
- SPPT 5999 - The Teaching of College-Level Spanish: Theory and Practice (3.0 cr)
- SPPT 5995 - Directed Teaching (1.0 cr)
- SPPT 8920 - Introduction to Hispanic and Lusophone Literatures, Cultures, and Languages (2.0 cr)

Outside Coursework (6 Credits)
All students must take at least 6 credits of outside coursework, selected in consultation with the advisor.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Hispanic Literatures and Cultures
This sub-plan is limited to students completing the program under Plan B.

Students receive a solid intellectual and professional preparation in Iberian and Latin American literatures and cultures. Works and intellectual movements are studied in their historical, social, and cultural contexts, combining the approaches of literary and cultural criticism with those of intellectual history, sociology, gender and sexuality studies, among others.

Spanish Peninsular and/or Spanish American Literatures and Cultures (24 Credits)
Take 24 or more credit(s) from the following:
- SPAN 5160 - Medieval Iberian Literatures and Cultures (3.0 cr)
- SPAN 5170 - The Literature of the Spanish Empire and Its Decline (3.0 cr)
- SPAN 5180 - Don Quixote (3.0 cr)
- SPAN 5190 - The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism (3.0 cr)
- SPAN 5150 - Contemporary Spanish Literature (3.0 cr)
- SPAN 5550 - Caribbean Literature: An Integral Approach (3.0 cr)
- SPAN 5560 - Global Colonial Studies in the Hispanic World (3.0 cr)
- SPAN 5570 - Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse (3.0 cr)
- SPAN 5580 - Latin American Cultural Integration in the Neocolonial Order (3.0 cr)
- SPAN 5590 - The Impact of Globalization in Latin American Discourses (3.0 cr)

Hispanic Linguistics
This sub-plan is limited to students completing the program under Plan B.

This track is centered on the relation between language and its context of use, encompassing social, pragmatic, and discourse factors. It provides students with a strong background in the following areas of Hispanic linguistics: phonetics, phonology, syntax, pragmatics and discourse, historical linguistics, language variation, and second language acquisition.

Required Linguistics Courses (12 Credits)

Phonology
Take 6 or more credit(s) from the following:
• SPAN 5711 - The Structure of Modern Spanish: Phonology (3.0 cr)
• SPAN 5721 - Spanish Laboratory Phonology (3.0 cr)
• LING 5302 - Phonological Theory I (3.0 cr)

Syntax/Pragmatics
Take 6 or more credit(s) from the following:
• SPAN 5716 - Structure of Modern Spanish: Pragmatics (3.0 cr)
• SPAN 5714 - Theoretical Foundations of Spanish Syntax (3.0 cr)
• LING 5201 - Syntactic Theory I (3.0 cr)
• LING 5206 - Linguistic Pragmatics (3.0 cr)

Electives (12 Credits)
• SPAN 5701 - History of Ibero-Romance (3.0 cr)
• SPAN 5711 - The Structure of Modern Spanish: Phonology (3.0 cr)
• SPAN 5714 - Theoretical Foundations of Spanish Syntax (3.0 cr)
• SPAN 5716 - Structure of Modern Spanish: Pragmatics (3.0 cr)
• SPAN 5717 - Spanish Sociolinguistics (3.0 cr)
• SPAN 5718 - Spanish Language Contact (3.0 cr)
• SPAN 5721 - Spanish Laboratory Phonology (3.0 cr)
• SPAN 5930 - Topics in Ibero-Romance Linguistics (3.0 cr)
• SPAN 5985 - Sociolinguistic Perspectives on Spanish in the United States (3.0 cr)

Lusophone Literatures and Cultures
This sub-plan is limited to students completing the program under Plan B.

This track prepares students in Portuguese studies, understood as an interdisciplinary critical formation through which the cultures and literatures of Portugal, Brazil, and Lusophone Africa are approached. Students are trained in the main historical periods, cultural movements, and social issues pertaining to the Portuguese-speaking world, both nationally and transnationally, within relevant comparative frameworks.

Required Courses (24 Credits)
Lusophone Literatures and Culture
Take 12 or more credit(s) from the following:
• PORT 5520 - Portuguese Literary and Cultural Studies (3.0 cr)
• PORT 5530 - Brazilian Literary and Cultural Studies (3.0 cr)
• PORT 5540 - Literatures and Cultures of Lusophone Africa (3.0 cr)
• PORT 5910 - Topics in Lusophone Cultures and Literatures (3.0 cr)
• PORT 5930 - Topics in Brazilian Literature (3.0 cr)

Spanish Peninsular or Spanish-American Literatures & Cultures
Take 12 or more credit(s) from the following:
• SPAN 5160 - Medieval Iberian Literatures and Cultures (3.0 cr)
• SPAN 5170 - The Literature of the Spanish Empire and Its Decline (3.0 cr)
• SPAN 5180 - Don Quixote (3.0 cr)
• SPAN 5190 - The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism (3.0 cr)
• SPAN 5150 - Contemporary Spanish Literature (3.0 cr)
• SPAN 5550 - Caribbean Literature: An Integral Approach (3.0 cr)
• SPAN 5560 - Global Colonial Studies in the Hispanic World (3.0 cr)
• SPAN 5570 - Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse (3.0 cr)
• SPAN 5580 - Latin American Cultural Integration in the Neocolonial Order (3.0 cr)
• SPAN 5590 - The Impact of Globalization in Latin American Discourses (3.0 cr)


**Twin Cities Campus**

**Hispanic and Lusophone Literatures, Cultures, and Linguistics Minor**

*Spanish & Portuguese Studies*

*College of Liberal Arts*

Link to a list of faculty for this program.

**Contact Information:**

Department of Spanish and Portuguese Studies, 214 Folwell Hall, 9 Pleasant Street SE, Minneapolis, Minnesota, 55455 (612-625-5858; fax: 612-625-3549)

Email: spptgrad@umn.edu

Website: [http://spanport.umn.edu](http://spanport.umn.edu)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 18
- Length of program in credits (Doctorate): 18
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The graduate minor in Hispanic and Lusophone literatures, cultures, and linguistics allows students in related fields to pursue research with graduate faculty in the department. Faculty have specialties in a variety of fields such as cultural studies, linguistics, political science, law, textual analysis, etc., and research contacts and visibility in Latin America and Europe.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

Minor field coursework is determined in consultation with the Hispanic and Lusophone Literatures, Cultures, and Linguistics director of Graduate Studies.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Master's**

**Course List**

Take 18 or more credit(s) from the following:

- SPAN 5xxx
- SPAN 8xxx
- PORT 5xxx
- PORT 8xxx

**Doctoral**

**Course List**

Take 18 or more credit(s) from the following:

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Information current as of August 31, 2018
• SPAN 5xxx
• SPAN 8xxx
• PORT 5xxx
• PORT 8xxx
Twin Cities Campus
Hispanic and Lusophone Literatures, Cultures, and Linguistics Ph.D.
Spanish & Portuguese Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Spanish and Portuguese Studies, 214 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN, 55455 (612-625-5858; fax 612-625-3549)
Email: spptgrad@umn.edu
Website: http://spanport.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 78
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD program in Hispanic and Lusophone literatures, cultures, and linguistics is a four-year program (post MA) that provides students with a focused and rigorous formation in the literatures, languages, and cultures of Spain and Latin America. PhD students choose one of four areas of emphasis: Iberian (peninsular), Latin America, Lusophone literatures and cultures, and Hispanic linguistics.

In addition to establishing a specialization in one or more areas of Hispanic studies, the program allows and encourages students to pursue comparative or interdisciplinary work. Students complement their work in the department with coursework in other disciplines such as history; cultural studies and comparative literature; gender, women, and sexuality studies; medieval and early modern studies; and linguistics, among others. In addition to the requirements for the MA degree, PhD students must complete additional coursework.

The department's faculty is committed to preparing students and giving them the tools to become scholars and teachers of the highest quality. The department has a strong tradition of fostering socio-historical perspectives on literatures, languages, and cultures. The graduate faculty is committed to comparative and interdisciplinary research and engages a variety of contemporary theoretical approaches, with strengths in postcolonial theory, social justice and human rights, memory studies, critical race theory, diasporic studies, and gender and sexuality studies. Members of the Hispanic linguistics faculty are specialists in the fields of sociolinguistics, second language acquisition, syntax, pragmatics, and phonology.

The department offers students in the program faculty mentoring, a seminar, and workshops on professional development, including publishing, teaching, and interviewing. In addition, graduate student workshops in both literatures and cultures and in linguistics foster student-faculty relations and allow graduate students to ready themselves for conference participation. Travel funds are available through the department to allow students to present their papers at conferences in the US or abroad.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must first apply to, or hold, a master of arts degree (or its equivalent) before applying to the PhD program. A graduate GPA of 3.50 is preferred.

Other requirements to be completed before admission:
Prospective students generally have completed an undergraduate degree or substantial coursework in the fields of Hispanic literatures and cultures, Lusophone literatures and cultures, or Hispanic linguistics, although individuals with other backgrounds may be admitted.

The Graduate Studies Committee may require completion of background coursework, without graduate degree credit, for admitted students with insufficient preparation.

Special Application Requirements:
Students admitted to the program are required to be fluent in Spanish or Portuguese. The Graduate Studies Committee may require completion of background coursework, without graduate degree credit, for admitted students with insufficient preparation.

All application materials must be submitted electronically through the ApplyYourself application system by December 15. Applicants are accepted for admission for fall semester only. Please refer to the Application Checklist for important details. The following is required for the application: the Departmental Application; a personal statement; a writing sample representative of the applicant's level of scholarly development; three letters of recommendation; a five-minute voice sample; a Curriculum Vitae; GRE or TOEFL test scores; and transcripts. For more information see the Department of Spanish and Portuguese Studies Apply page: http://spanport.umn.edu/grad/applying.html.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
42 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Fluency in Spanish and/or Portuguese.

A minimum GPA of 3.50 is required for students to remain in good standing.

Students entering the program with an MA from other institutions must take a minimum of 7 graduate courses (21 credits) in this department.

Required Coursework
All students must take the following 3-credit course:

SPPT 5999 - The Teaching of College-Level Spanish: Theory and Practice (3.0 cr)

Outside Coursework
Take 12 credits, selected in consultation with the advisor, from outside the major.

Thesis Credits
Take exactly 24 credit(s) from the following:

• SPAN 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Emphasis Options

Hispanic Literatures & Cultures
Spanish Peninsular Literature Electives
Take exactly 12 credit(s) from the following:
• SPAN 5110 - Discursive Formations at the Threshold of 20th-Century Spain (3.0 cr)
• SPAN 5150 - Contemporary Spanish Literature (3.0 cr)
• SPAN 5160 - Medieval Iberian Literatures and Cultures (3.0 cr)
• SPAN 5170 - The Literature of the Spanish Empire and Its Decline (3.0 cr)
• SPAN 5180 - Don Quixote (3.0 cr)
• SPAN 5190 - The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism (3.0 cr)

**Spanish American Literature**

Take exactly 12 credit(s) from the following:
- SPAN 5550 - Caribbean Literature: An Integral Approach (3.0 cr)
- SPAN 5560 - Global Colonial Studies in the Hispanic World (3.0 cr)
- SPAN 5570 - Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse (3.0 cr)
- SPAN 5580 - Latin American Cultural Integration in the Neocolonial Order (3.0 cr)
- SPAN 5590 - The Impact of Globalization in Latin American Discourses (3.0 cr)

**Portuguese Literature**

Take exactly 6 credit(s) from the following:
- PORT 5530 - Brazilian Literary and Cultural Studies (3.0 cr)
- PORT 5540 - Literatures and Cultures of Lusophone Africa (3.0 cr)
- PORT 5910 - Topics in Lusophone Cultures and Literatures (3.0 cr)
- PORT 5520 - Portuguese Literary and Cultural Studies (3.0 cr)

**Major Electives**

Take three additional courses (9 credits) at 5xxx or 8xxx level in order to strengthen and further define the student's area of concentration. This can include credits from the student's minor field.

Take 9 or more credit(s) from the following:
- SPAN 5316 - Spanish Picaresque Narratives (3.0 cr)
- SPAN 5531 - Hispanic Literature of the United States (3.0 cr)
- SPAN 5920 - Topics in Spanish-American Studies (3.0 cr)
- SPAN 8100 - Research in Sociohistorical Approaches to Spanish Literature (3.0 cr)
- SPAN 8200 - Spanish Literary Texts: Theories of Formal Structures (3.0 cr)
- SPAN 8212 - Spanish Theater of the 16th Century: Drama up to Lope (3.0 cr)
- SPAN 8223 - The Poetry of the Spanish Golden Age (3.0 cr)
- SPAN 8300 - The Construction of Spanish Literary History (3.0 cr)
- SPAN 8312 - Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina] (3.0 cr)
- SPAN 8960 - Workshop: Research in Hispanic Cultural Issues (3.0 cr)
- SPAN 8990 - Advanced Comparative Research of Caribbean Genres (3.0 cr)
- SPAN 5930 - Topics in Ibero-Romance Linguistics (3.0 cr)

-OR-

**Lusophone Literatures & Cultures**

*Portuguese and Lusophone Literature*

Take exactly 12 credit(s) from the following:
- PORT 5520 - Portuguese Literary and Cultural Studies (3.0 cr)
- PORT 5530 - Brazilian Literary and Cultural Studies (3.0 cr)
- PORT 5540 - Literatures and Cultures of Lusophone Africa (3.0 cr)
- PORT 5910 - Topics in Lusophone Cultures and Literatures (3.0 cr)

**Spanish Peninsular OR Spanish-American Literatures & Cultures**

Students can petition out of one of the four required Spanish courses if the advisor and student consider it appropriate in accordance to the student's intellectual needs with regard to his/her dissertation project.

Take exactly 12 credit(s) from the following:
- SPAN 5160 - Medieval Iberian Literatures and Cultures (3.0 cr)
- SPAN 5170 - The Literature of the Spanish Empire and Its Decline (3.0 cr)
- SPAN 5180 - Don Quixote (3.0 cr)
- SPAN 5190 - The Crisis of the Old Regime: Spanish Literature of the Enlightenment and Romanticism (3.0 cr)
- SPAN 5110 - Discursive Formations at the Threshold of 20th-Century Spain (3.0 cr)
- SPAN 5150 - Contemporary Spanish Literature (3.0 cr)
- SPAN 5550 - Caribbean Literature: An Integral Approach (3.0 cr)
- SPAN 5560 - Global Colonial Studies in the Hispanic World (3.0 cr)
- SPAN 5570 - Nineteenth Century Latin America: Enlightened Thought, Nation Building, Literacy, Cultural Discourse (3.0 cr)
- SPAN 5580 - Latin American Cultural Integration in the Neocolonial Order (3.0 cr)
- SPAN 5590 - The Impact of Globalization in Latin American Discourses (3.0 cr)

**Electives**

Take five additional courses (15 credits) at the 5xxx or 8xxx level in order to strengthen and further define the student's area of concentration. This can include credits from the student's minor field.

Take exactly 15 credit(s) from the following:
- PORT 5930 - Topics in Brazilian Literature (3.0 cr)
- SPAN 5316 - Spanish Picaresque Narratives (3.0 cr)
- SPAN 5531 - Hispanic Literature of the United States (3.0 cr)
- SPAN 5920 - Topics in Spanish-American Studies (3.0 cr)
- SPAN 8100 - Research in Sociohistorical Approaches to Spanish Literature (3.0 cr)

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Information current as of August 31, 2018
• SPAN 8200 - Spanish Literary Texts: Theories of Formal Structures (3.0 cr)
• SPAN 8212 - Spanish Theater of the 16th Century: Drama up to Lope (3.0 cr)
• SPAN 8223 - The Poetry of the Spanish Golden Age (3.0 cr)
• SPAN 8300 - The Construction of Spanish Literary History (3.0 cr)
• SPAN 8312 - Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina] (3.0 cr)
• SPAN 8960 - Workshop: Research in Hispanic Cultural Issues (3.0 cr)
• SPAN 8990 - Advanced Comparative Research of CaribbeanGenres (3.0 cr)

-OR-

Hispanic Linguistics

Linguistic Core Areas
Take at least one course from each of the five core areas, for a total of 21 credits.
Take exactly 21 credit(s) from the following:

Phonology
Take 3 or more credit(s) from the following:
• SPAN 5711 - The Structure of Modern Spanish: Phonology (3.0 cr)
• SPAN 5721 - Spanish Laboratory Phonology (3.0 cr)

Syntax/Pragmatics
Take 3 or more credit(s) from the following:
• SPAN 5714 - Theoretical Foundations of Spanish Syntax (3.0 cr)
• SPAN 5716 - Structure of Modern Spanish: Pragmatics (3.0 cr)

Language Variation
Take 3 or more credit(s) from the following:
• SPAN 5718 - Spanish Language Contact (3.0 cr)
• SPAN 5717 - Spanish Sociolinguistics (3.0 cr)
• SPAN 5985 - Sociolinguistic Perspectives on Spanish in the United States (3.0 cr)

History of Language
• SPAN 5701 - History of Ibero-Romance (3.0 cr)

Second Language Acquisition
• SPAN 5991 - The Acquisition of Spanish as a First and Second Language (3.0 cr)

Hispanic Linguistics Electives
Take at least three 5xxx or 8xxx level courses (9 credits) from within or outside the department with linguistics content.
Take 9 or more credit(s) from the following:
• SPAN 5xxx
• SPAN 8xxx
• PORT 5xxx
• PORT 8xxx
• LING 5xxx
• LING 8xxx
• STAT 5xxx
• STAT 8xxx
• CI 5xxx
• CI 8xxx

Spanish & Portuguese Electives
Select three 5xxx or 8xxx level courses (9 credits) from the following list in order to strengthen and further define the student's area of concentration. This can include credits from the student's minor field.
Take 9 or more credit(s) from the following:
• SPAN 5xxx
• SPAN 8xxx
• PORT 5xxx
• PORT 8xxx
Twin Cities Campus
History M.A.
History Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Email: histdgs@umn.edu
Website: http://www.hist.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The Department of History does not currently admit students to the master's degree; however, PhD students often earn their MA on the way to the doctoral degree. The MA is normally completed by the end of the second year of the PhD program.

Areas of concentration include Africa; ancient history; East and South Asia; late antiquity and the middle ages; medieval, early modern, and modern Europe; the early modern world; Middle East; Latin America; and the United States and its colonial background. Scholarly resources include Center for Austrian Studies, Center for German and European Studies, Center for Medieval Studies, Immigration History Research Center, Minnesota Population Center, Modern Greek Studies, Center for Early Modern History, Institute for Advanced Study, and Consortium for the Study of the Premodern World.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
The Department of History does not currently admit master's students; however, PhD students often earn their MA on the way to the doctoral degree.

Special Application Requirements:
GRE scores above the 90% percentile in verbal (usually over 600) are preferred.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 15 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project requires students to substitute three expanded seminar papers for the thesis.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Varies by area of concentration (see below).

A minimum GPA of 3.00 is required for students to remain in good standing.

Students are only admitted to the PhD program. They may complete an MA while studying for the PhD.

Reading proficiency in one language other than English is required. Some areas of concentration require more than one. In some cases, competence in quantitative methods may replace one of the foreign languages.

Plan Options

Plan A

Major History Credits
Take 15 or more credit(s) from the following:
Courses in the department of history, or those offered by another department related to historical or thematic area of study. Courses are chosen in consultation with the student's advisor.

Outside Coursework
Take 6 additional credits of coursework outside the major.

Thesis Credits
Take 10 or more credit(s) from the following:

- HIST 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

- OR -

Plan B

Major History Credits
Take 24 or more credit(s) from the following:
Courses in the department of history, or those offered by another department related to historical or thematic area of study. Courses are chosen in consultation with the student's advisor.

Outside Coursework
Take 6 additional credits of coursework outside the major.
Twin Cities Campus
History Minor
History Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of History, 1110 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455 (612-624-5840); fax: (612-624-7096)
Email: histdgs@umn.edu
Website: http://www.grad.hist.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Areas of concentration in the history minor include Africa; ancient history; East and South Asia; late antiquity and the middle ages; medieval, early modern, and modern Europe; the early modern world; Middle East; Latin America; and the United States and its colonial background. Scholarly resources include Center for Austrian Studies, Center for German and European Studies, Center for Medieval Studies, Immigration History Research Center, Minnesota Population Center, Modern Greek Studies, Center for Early Modern History, Institute for Advanced Study, and Consortium for the Study of the Premodern World.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Master’s Minor Requirements
Courses are determined in consultation with the History director of graduate studies.
Take 6 or more credit(s) from the following:
• HIST 5xxx
• HIST 8xxx

Doctoral
Doctoral Minor Requirements
HIST 8015 - Scope and Methods of Historical Studies (3.0 cr)
Courses are determined in consultation with the History director of graduate studies.
Take 9 or more credit(s) from the following:
• HIST 5xxx
• HIST 8xxx
Twin Cities Campus
History Ph.D.
History Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of History, 1110 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455 (612-624-5840; fax: 612-624-7096)
Email: histdgs@umn.edu
Website: http://www.grad.hist.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 63
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Areas of concentration include Africa; ancient history; East and South Asia; late antiquity and the middle ages; medieval, early modern, and modern Europe; the early modern world; Middle East; Latin America; and the United States and its colonial background. Scholarly resources include Center for Austrian Studies, Center for German and European Studies, Center for Medieval Studies, Immigration History Research Center, Minnesota Population Center, Modern Greek Studies, Center for Early Modern History, Institute for Advanced Study, and Consortium for the Study of the Premodern World.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
About half of incoming students have master's degrees.

Special Application Requirements:
The average GPA of incoming students is approximately A-/B+, with more weight placed on history classes, where students are expected to have earned mostly A or A- grades.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 600

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
27 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Varies by area of concentration (see below).

A minimum GPA of 3.50 is required for students to remain in good standing.

Reading proficiency in one language other than English is required. Some areas of concentration may require more than one. The language requirement is required before admission to the preliminary oral examination. In some cases, competence in quantitative methods may replace one of the foreign languages.

Courses used to satisfy MA requirements can be counted in these totals.

History Courses
First Year Requirement
HIST 8015 - Scope and Methods of Historical Studies (3.0 cr)
HIST 8021 - History Research Seminar (3.0 cr)

Major Electives
Take 15 or more credit(s) from the following:
• HIST 5xxx
• HIST 8xxx

Comparative Area
Take 6 or more credit(s) from the following:
Courses are chosen in consultation with the student's advisor.
• HIST 5xxx
• HIST 8xxx

Outside Coursework
Take 12 course credits outside the major.

Thesis Credits
Take 24 or more credit(s) from the following:
• HIST 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Human Rights Minor
Global Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Institute for Global Studies, 232 Social Sciences Building, 267 19th Ave S, Minneapolis, MN 55455 (612-626-1879; fax: 612-626-2242)
Email: hrminor@umn.edu
Website: http://www.hrp.cla.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The human rights minor, available to master's, doctoral, and law students, provides an interdisciplinary foundation in human rights studies and practical experience in human rights work. To satisfy the core requirements, students must complete two of the four core courses, each of which is 3 credits (GLOS 5403/LAW 6058 - Human Rights Advocacy; LAW 6886 - International Human Rights Law; POL 5485 - Human Rights and Democracy in the World; SOC 8090 - Topics: Cross-Disciplinary Perspectives on Human Rights), and one 200-hour internship (no coursework is associated with the internship). Master's students must complete one additional elective course (3 credits), while doctoral and law students select at least two additional elective courses (totaling 6 credits) outside their major field from a designated course list. Other courses may be taken with the approval of the program director. Qualifying courses taken prior to approval of the minor will be applied retroactively.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Admission to the minor is limited to enrolled graduate or professional students with a minimum GPA of 3.0. Doctoral students must declare their minor before taking their preliminary oral examination.

Other requirements to be completed before admission:
Students should submit a letter of application describing their background and motivation for applying to the minor program to the director of Graduate Studies. The director may request further information.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

In addition to the required course credits, all students pursuing the human rights minor must complete one six-week internship that is approved by the program director.

Core Courses
Take 6 or more credit(s) from the following:
- LAW 6886 - International Human Rights Law (3.0 cr)
- POL 5485 - Human Rights Policy: Issues and Actors (3.0 cr)
- LAW 6058 - Human Rights Advocacy (3.0 cr)
  or GLOS 5403 - Human Rights Advocacy (3.0 cr)
- SOC 8090 - Topics in Sociology (1.5 - 3.0 cr)
- Take with the topic: "Topics in Sociology: Cross-Disciplinary Perspectives on Human Rights"

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Electives
Take 3 or more credits from the following:

- AFEE 5361 - World Development Problems (3.0 cr)
- AFRO 5866 - The Civil Rights and Black Power Movement, 1954-1984 (3.0 cr)
- AFRO 8202 - Seminar: Intellectual History of Race (3.0 cr)
- AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
- AMIN 5890 - Readings in American Indian and Indigenous History (3.0 cr)
- ANTH 8810 - Topics in Sociocultural Anthropology (3.0 cr)
- BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
- BTHX 5220 - Standards for Research with Human Participants: A Lecture Series for Researchers (1.0 cr)
- CHIC 5374 - Migrant Farmworkers in the United States: Families, Work, and Advocacy [CIV] (4.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)
- EPSY 5135 - Human Relations Workshop (4.0 cr)
- ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
- GLOS 5403 - Human Rights Advocacy (3.0 cr)
- HRIR 5252 - Employment and Labor Law for the HRIR Professional (2.0 cr)
- KIN 5371 - Sport and Society (3.0 cr)
- LAW 6030 - Contemporary Problems in Freedom of Speech and Press (3.0 cr)
- LAW 6046 - Human Trafficking (2.0 cr)
- LAW 6058 - Human Rights Advocacy (3.0 cr)
- LAW 6602 (Inactive) (3.0 cr)
- LAW 6621 - Civil Rights: Citizenship and Human Rights (3.0 cr)
- LAW 6827 - Women's International Human Rights (2.0 cr)
- LAW 6889 - Laws of War (3.0 cr)
- LAW 7400 - CL: Human Rights Litigation and International Legal Advocacy (3.0 - 4.0 cr)
- LAW 7842 - CL: Immigration and Human Rights (3.0 - 4.0 cr)
- OLDP 5104 - Strategies for International Development of Education Systems (3.0 cr)
- OLDP 8121 - Doctoral Seminar: Comparative and International Development Education (1.0 - 6.0 cr)
- PA 5151 - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
- PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
- PA 5414 - Child Human Rights: Work and Education (3.0 cr)
- PA 5421 - Racial Inequality and Public Policy (3.0 cr)
- PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
- PA 5452 - Immigration and Public Policy (3.0 cr)
- PA 5490 - Topics in Social Policy (1.0 - 4.0 cr)
- PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)
- PA 5690 - Topics in Women, Gender and Public Policy (1.0 - 3.0 cr)
- PA 5801 - Global Public Policy (3.0 cr)
- PA 5823 - Managing Humanitarian and Refugee Crises: Challenges for Policymakers & Practitioners (1.0 cr)
- PA 5885 - Human Rights Policy: Issues and Actors (3.0 cr)
- PA 5890 - Topics in Foreign Policy and International Affairs (1.0 - 5.0 cr)
- POL 5485 - Human Rights Policy: Issues and Actors (3.0 cr)
- POL 8260 - Topics in Political Theory (3.0 cr)
- POL 8403 - International Norms and Institutions (3.0 cr)
- POL 8460 - Topics in International Relations (3.0 cr)
- PSY 8210 - Law, Race, and Social Psychology (3.0 cr)
- PUBH 6055 - Social Inequalities in Health (2.0 cr)
- PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
- PUBH 6115 - Worker Protection Law (1.0 cr)
- PUBH 6131 - Working in Global Health (2.0 cr)
- PUBH 6281 - Immigrant Health Issues (3.0 - 4.0 cr)
- PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
- PUBH 6801 - Health and Human Rights (3.0 cr)
- PUBH 6807 (Inactive) (3.0 cr)
SOC 8190 - Topics in Law, Crime, and Deviance (3.0 cr)
SW 8505 - Advanced Community Organization and Advocacy (3.0 cr)
SW 8525 {Inactive}(3.0 cr)

Doctoral Electives

Take 6 or more credit(s) from the following:

• AFEE 5361 - World Development Problems (3.0 cr)
• AFRO 5866 - The Civil Rights and Black Power Movement, 1954-1984 (3.0 cr)
• AFRO 8202 - Seminar: Intellectual History of Race (3.0 cr)
• AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
• AMIN 5890 - Readings in American Indian and Indigenous History (3.0 cr)
• ANTH 8810 - Topics in Sociocultural Anthropology (3.0 cr)
• BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
• BTHX 5220 - Standards for Research with Human Participants: A Lecture Series for Researchers (1.0 cr)
• CHIC 5374 - Migrant Farmworkers in the United States: Families, Work, and Advocacy [CIV] (4.0 cr)
• CSPH 5111 - Ways of Thinking about Health (2.0 cr)
• CSPH 5211 - Peacemaking and Spirituality: A Journey Toward Healing and Strength (2.0 - 3.0 cr)
• EPSY 5135 - Human Relations Workshop (4.0 cr)
• ESPM 5251 - Natural Resources in Sustainable International Development (3.0 cr)
• GLOS 5403 - Human Rights Advocacy (3.0 cr)
• HRIR 5252 - Employment and Labor Law for the HRIR Professional (2.0 cr)
• KIN 5371 - Sport and Society (3.0 cr)
• LAW 6030 - Contemporary Problems in Freedom of Speech and Press (3.0 cr)
• LAW 6046 - Human Trafficking (2.0 cr)
• LAW 6058 - Human Rights Advocacy (3.0 cr)
• LAW 6602 [Inactive](3.0 cr)
• LAW 6621 - Civil Rights: Citizenship and Human Rights (3.0 cr)
• LAW 6827 - Women's International Human Rights (2.0 cr)
• LAW 6899 - Laws of War (3.0 cr)
• LAW 7400 - CL: Human Rights Litigation and International Legal Advocacy (3.0 - 4.0 cr)
• LAW 7842 - CL: Immigration and Human Rights (3.0 - 4.0 cr)
• OLPD 5104 - Strategies for International Development of Education Systems (3.0 cr)
• OLPD 8121 - Doctoral Seminar: Comparative and International Development Education (1.0 - 6.0 cr)
• PA 5151 - Organizational Perspectives on Global Development & Humanitarian Assistance (3.0 cr)
• PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
• PA 5414 - Child Human Rights: Work and Education (3.0 cr)
• PA 5421 - Racial Inequality and Public Policy (3.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
• PA 5452 - Immigration and Public Policy (3.0 cr)
• PA 5490 - Topics in Social Policy (1.0 - 4.0 cr)
• PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)
• PA 5690 - Topics in Women, Gender and Public Policy (1.0 - 3.0 cr)
• PA 5801 - Global Public Policy (3.0 cr)
• PA 5823 - Managing Humanitarian and Refugee Crises: Challenges for Policymakers & Practitioners (1.0 cr)
• PA 5885 - Human Rights Policy: Issues and Actors (3.0 cr)
• PA 5890 - Topics in Foreign Policy and International Affairs (1.0 - 5.0 cr)
• POL 5485 - Human Rights Policy: Issues and Actors (3.0 cr)
• POL 8260 - Topics in Political Theory (3.0 cr)
• POL 8403 - International Norms and Institutions (3.0 cr)
• POL 8460 - Topics in International Relations (3.0 cr)
• PSY 8210 - Law, Race, and Social Psychology (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
• PUBH 6115 - Worker Protection Law (1.0 cr)
• PUBH 6131 - Working in Global Health (2.0 cr)
• PUBH 6281 - Immigrant Health Issues (3.0 - 4.0 cr)
• PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
• PUBH 6801 - Health and Human Rights (3.0 cr)
• PUBH 6807 [Inactive](3.0 cr)
• SOC 8190 - Topics in Law, Crime, and Deviance (3.0 cr)
• SW 8505 - Advanced Community Organization and Advocacy (3.0 cr)
• SW 8525 [Inactive](3.0 cr)
Twin Cities Campus

Italian Studies Minor
French & Italian
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of French and Italian, 260 Folwell Hall, 9 Pleasant Street SE, Minneapolis, MN 55455 (612-624-4308; fax: 612-624-6021)
Website: http://frit.umn.edu/grad/italianminor.php

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A minor in Italian studies is available for University students enrolled in master's and doctoral programs in such relevant fields as art history, architecture, French, comparative literature, history, English, and music. The graduate minor in Italian studies is under the general direction of the graduate faculty in Italian studies, all of whom hold membership in other fields of study within the University of Minnesota. The minor program is shaped to suit the particular research needs and interests of the student. Courses are selected in consultation with the director of Graduate Studies from a list of existing 4xxx and 5xxx courses, as well as appropriate 8xxx courses. Students may also elect to do a directed readings course with faculty affiliated with Italian studies to satisfy minor program requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 2.80.

Other requirements to be completed before admission:
Admission to the Italian studies graduate minor is contingent on enrollment in good standing in a relevant University master's or doctoral degree-granting program. Interested students should consult with the director of Graduate Studies.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

With the approval of the director of Graduate Studies, one of the courses used to meet minor field requirements may be a 4xxx course, and one may be a directed readings course. Coursework from the major field may not be applied to satisfy minor field requirements.

Certification of proficiency in Italian language is required. Proficiency can be demonstrated in one of the following ways: by successfully completing an undergraduate literature/culture course in Italian, by having an undergraduate major or minor in Italian, or through a translation examination devised, administered, and assessed by the director of Graduate Studies. The proficiency requirement will be monitored by the director of Graduate Studies.

FRIT 5999 cannot be applied toward the minor field requirement.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Master's Required Courses**
Take 6 or more credit(s) from the following:
• ITAL 5xxx
• ITAL 8xxx
• FRIT 5xxx
• FRIT 8xxx

**Doctoral Required Courses**
Take 12 or more credit(s) from the following:
• ITAL 5xxx
• ITAL 8xxx
• FRIT 5xxx
• FRIT 8xxx
Twin Cities Campus
Linguistics M.A.
Linguistics, Institute of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Institute of Linguistics, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-3331; fax: 612-624-4579)
Email: ling@umn.edu
Website: http://www.linguistics.umn.edu/grad/index.htm

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 32 to 36
• This program does not require summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Our program's goal is to train students in the scientific study of the human mental capacity for language. Successful study in this area investigates the syntactic, phonological and semantic/pragmatic properties of the language systems that humans naturally acquire, and asks what kinds of underlying mental capacity is implicated by these properties.

Our program emphasizes the place of this field of study among the cognitive sciences, and provides coursework and individual advising to prepare students to engage with and produce research in the field.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
There are no specific prerequisites for admission.

Special Application Requirements:
Applicants must submit the following application materials by December 15 of the preceding academic year:

(i)University of Minnesota Application form;
(ii)a statement of purpose;
(iii)a writing sample;
(iv)three letters of recommendation;
(v)a supplementary questionnaire;
(vi)transcripts from each college or university attended;
(vii)GRE scores;
(viii)English Language Proficiency Scores (TOEFL, MELAB or IELTS) are required of international applicants.

Entry is for fall semester.

International applicants must submit score(s) from one of the following tests:
•TOEFL
•IELTS
•MELAB

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 20 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 26 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is an original paper usually a revision of a course project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: See other requirements (below)

Students must demonstrate competence (the equivalent of two or more years of study) in one language other than English.

Required Courses

- LING 5001 - Introduction to Linguistics (4.0 cr)
- LING 5201 - Syntactic Theory I (3.0 cr)
- LING 5202 - Syntactic Theory II (3.0 cr)
- LING 5205 - Semantics (3.0 cr)
- LING 5302 - Phonological Theory I (3.0 cr)
- LING 8105 - Field Methods in Linguistics I (4.0 cr)

Outside Coursework

Take 6 credits outside the major.

Plan Options

Plan A

Thesis Credits
Take 10 or more credit(s) from the following:
• LING 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

- OR -

Plan B

LING 8005 - Research Paper Workshop (3.0 cr)

Linguistics Electives
Take 3 or more credit(s) from the following:
• LING 5xx
• LING 8xx
Twin Cities Campus
Linguistics Minor
Linguistics, Institute of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Institute of Linguistics, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455  (612-624-3331; fax: 612-624-4579)
Email: ling@umn.edu
Website: http://www.linguistics.umn.edu/grad/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 10
- Length of program in credits (Doctorate): 16
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Linguistics is the scientific study of human language. Investigation in phonology, syntax, and semantics/pragmatics seeks to determine general principles governing the structure and use of human language and the parameters that determine degree and manner of variation across languages. These core areas constitute the foundation for other subfields of linguistics, including psycholinguistics, sociolinguistics, historical linguistics, computational linguistics, and neurolinguistics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Courses
LING 5001 - Introduction to Linguistics (4.0 cr)
LING 5201 - Syntactic Theory I (3.0 cr)
or LING 5302 - Phonological Theory I (3.0 cr)
One additional LING course (3.0 or more credits) approved by the director of graduate studies.
Take 3 or more credit(s) from the following:
• LING 5xxx
• LING 8xxx

Doctoral
Required Courses
LING 5001 - Introduction to Linguistics (4.0 cr)
LING 5201 - Syntactic Theory I (3.0 cr)
LING 5302 - Phonological Theory I (3.0 cr)
Two additional LING courses (6.0 or more credits) approved by the director of graduate studies.
Take 6 or more credit(s) from the following:
• LING 5xxx
• LING 8xxx
Twin Cities Campus
Linguistics Ph.D.
Linguistics, Institute of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Institute of Linguistics, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-3331; fax: 612-624-4579)
Email: ling@umn.edu
Website: http://www.linguistics.umn.edu/grad/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 78
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Our program's goal is to trains students in the scientific study of the human mental capacity for language. Successful study in this area investigates the syntactic, phonological and semantic/pragmatic properties of language systems that humans naturally acquire, and asks what kind of underlying mental capacity is implicated by these properties.

Our program emphasizes the place of this field of study among the cognitive sciences, and provides coursework and individual advising to prepare students to engage with and produce research in the field.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
There are no specific prerequisites for admission.

Special Application Requirements:
Applicants must submit the following application materials by December 15 of the preceding academic year:

(i) University of Minnesota Application form;
(ii) a statement of purpose;
(iii) a writing sample;
(iv) three letters of recommendation;
(v) a supplementary questionnaire;
(vi) transcripts from each college or university attended;
(vii) GRE scores;
(viii) English Language Proficiency Scores (TOEFL, MELAB or IELTS) are required of international applicants.

Entry is for fall semester.

International applicants must submit score(s) from one of the following tests:
- TOEFL

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

42 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: See below.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students must demonstrate competence (the equivalent of two or more years of study) in two languages other than their native language before the PhD can be awarded.

Upon completion of required coursework, students must pass a preliminary written exam. To pass the preliminary written exam, a student must complete (1) a paper judged to be of near publishable quality by the student's committee in the student's primary area of specialization; (2) a paper judged to be of near publishable quality by the student's committee in the student's chosen secondary area of specialization.

Students are required to pass the preliminary oral exam. The preliminary oral exam is a presentation and defense of a research-paper-length dissertation prospectus, which introduces and motivates the student's dissertation topic and provides a detailed plan for completion of the dissertation.

Students are required to complete a dissertation and pass the Final Oral Exam, which is a defense of the completed dissertation.

Required Courses

LING 5001 - Introduction to Linguistics (4.0 cr)
LING 5201 - Syntactic Theory I (3.0 cr)
LING 5202 - Syntactic Theory II (3.0 cr)
LING 5205 - Semantics (3.0 cr)
LING 5302 - Phonological Theory I (3.0 cr)
LING 5303 - Phonological Theory II (3.0 cr)
LING 8005 - Research Paper Workshop (3.0 cr)
LING 8105 - Field Methods in Linguistics I (4.0 cr)
LING 8106 - Field Methods in Linguistics II (4.0 cr)
LING 8210 - Seminar in Syntax (3.0 cr)

Linguistics Seminar Courses

Take 9 or more credit(s) from the following:
- LING 8200 - Topics in Syntax and Semantics (3.0 cr)
- LING 8210 - Seminar in Syntax (3.0 cr)
- LING 8300 - Topics in Phonetics and Phonology (3.0 cr)
- LING 8500 - Topics in Second Language Acquisition (3.0 cr)
- LING 8900 - Seminar: Topics in Linguistics (3.0 cr)
- LING 8921 - Seminar in Language and Cognition (3.0 cr)
- LING 8991 - Independent Study (1.0 - 4.0 cr)

Supporting Program Courses

The required 12 credits of coursework from outside the major can be in the same field or in different fields. 6 credits of outside coursework from the MA may be used towards the PhD supporting program requirement.

Thesis Credits

Take 24 or more credit(s) from the following:
- LING 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
- LING 8888W - Thesis Credit Dissertation Seminar (1.0 - 3.0 cr)
**Twin Cities Campus**

**Literacy and Rhetorical Studies Minor**

*Writing Studies Department*

*College of Liberal Arts*

Link to a list of faculty for this program.

**Contact Information:**
Center for Writing, 10 Nicholson Hall, 216 Pillsbury Drive SE, Minneapolis, MN 55455 (612-626-7583; fax: 612-626-7580)
Email: writing@umn.edu
Website: [http://writing.umn.edu](http://writing.umn.edu)

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The goal of the literacy and rhetorical studies (LRS) minor is to encourage students to contribute to interdisciplinary activity and to create a forum for them and several dozen faculty members at the University whose research and teaching emphasize various facets of writing and communication. By crafting an individualized program of study with the LRS director of graduate studies ([http://writing.umn.edu/lrs/people.html](http://writing.umn.edu/lrs/people.html)), including theory, pedagogy, and research, often in a historical context, students can complement their disciplinary degree, and thereby open up new perspectives for their scholarship and teaching.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**
For specific information about applying for the LRS minor, see: [http://writing.umn.edu/lrs/admission.html](http://writing.umn.edu/lrs/admission.html)

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

All courses are chosen in consultation with the LRS director of graduate studies.

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Masters**
To ensure the minor is interdisciplinary, no more than one of the three courses may be from the student’s home department.

Students must write a substantial paper that emerges from one of the three courses.

**Literacy Theory or Practice**
Take 3 or more credit(s) from the following:
- A course in literacy theory or practice, including pedagogy.

**Research Methods and Practices**
Take 3 or more credit(s) from the following:
A course in research methods and practices in one of the areas of the minor.

**Historical Topic**
Take 3 or more credit(s) from the following:
A course about a historical topic (e.g., history of the book), of rhetoric or of literacy.

**Doctoral**
To ensure the minor is interdisciplinary, no more than two of the four courses may be from the student's home department.

To complete the doctoral minor, students must submit a capstone writing project emerging from their studies in literacy and/or rhetoric, such as a seminar paper or a completed dissertation chapter.

**Literacy Theory or Practice**
Take 3 or more credit(s) from the following:
A course in literacy theory or practice, including pedagogy.

**Research Methods and Practices**
Take 3 or more credit(s) from the following:
A course in research methods and practices in one of the areas of the minor.

**Historical Topic**
Take 3 or more credit(s) from the following:
A course about a historical topic (e.g., history of the book), of rhetoric or of literacy.

**Additional Coursework**
Take at least 3 credits to meet the 12-credit minimum for the doctoral minor, chosen in consultation with the LRS director of graduate studies.
Twin Cities Campus
Mass Communication M.A.
School of Journalism & Mass Communication
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Hubbard School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-625-9824; fax: 612-625-9525)
Email: sjmcgrad@umn.edu
Website: http://sjmc.umn.edu/grad

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 35
• This program does not require summer semesters for timely completion.
• Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's degree in mass communication emphasizes the theoretical study of mass communication and analysis of media systems and effects. The degree is intended for those who wish to pursue PhD degrees or teaching and research careers, as well as those who seek communication-related positions. The general master's program is not designed to provide professional skills training in journalism. Individuals with a bachelor's degree in journalism and mass communication or with strong social science or liberal arts backgrounds in areas such as political science, psychology, sociology, history, and English are encouraged to apply. Individuals with extensive professional experience in mass communication are also welcome. The program is suffused with the study of new communication technologies.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Students whose native language is not English are required to submit scores from the TOEFL or IELTS (academic). In addition, such students seeking teaching assistantships are required to pass the SPEAK test of spoken-English proficiency prior to appointment. Admission is considered for fall semester only; the priority application deadline is January 15, with a rolling deadline of March 1.

The mass communication MA and PhD programs offer a joint degree with the Law School. Applicants to either joint degree--either the MA/JD or the PhD/JD--are reviewed separately by the Law School and the mass communication programs for admission, but are asked to identify themselves as seeking the joint degree option in their statement of intent for the mass communication application. For more information, contact sjmcgrad@umn.edu.

Special Application Requirements:
Applicants must submit a department application; a clearly written statement of career interests, goals, and objectives; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of transcripts; academic work samples in English; a resume or curriculum vita; and scores from the General Test of the GRE.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
• IELTS
• MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
Program Requirements

Plan A: Plan A requires 19 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

All coursework must be taken A-F, except for JOUR 8009, which is taken S/N.

Required Mass Communication Core

JOUR 8001 - Studies and Theories of Mass Communication (3.0 cr)
JOUR 8009 - Pre-seminar in Mass Communication (1.0 cr)
One additional theory course inside or outside SJMC, chosen in consultation with the student's adviser (3.0 cr)

Required Methodology Core

JOUR 8501 - Seminar: The Process of Quantitative Mass Communication Research (3.0 cr)
JOUR 8503 - Seminar: Qualitative Methods in Mass Communication Research (3.0 cr)

Electives

Take 6 or more credit(s) from the following:
- JOUR 5xxx
- JOUR 8xxx
Courses are chosen in consultation with the advisor.

Outside Coursework

Take 6 credits outside the major.

Thesis Credits

Take exactly 10 credit(s) from the following:
- JOUR 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Joint- or Dual-degree Coursework: MA in Mass Communication and JD in Law (dual degree) Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Mass Communication Minor
School of Journalism & Mass Communication
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Hubbard School Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-625-9824; fax: 612-625-9525).
Email: sjmcgrad@umn.edu
Website: http://sjmc.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 14
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The mass communication program emphasizes the theoretical study of mass communication and analysis of media systems and effects. The program is not designed to provide professional skills training in journalism.

Areas of specialization include media processes, influences, and effects (including health communication, advertising, and political communication); media law, ethics, history; and media management. All programs are suffused with the study of new communication technologies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Minor programs are planned in consultation with the director of graduate studies or another member of the mass communication graduate faculty. The master's minor consists of a minimum of 9 credits in a coherent area, with at least 6 credits at 8xxx. A PhD minor program consists of a minimum of 14 credits in a coherent disciplinary area.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Take 9 or more credit(s) from the following:
At least 6 credits must be taken at the 8xxx level:
- JOUR 5xxx
- or JOUR 8xxx

Doctoral
Required Courses
Take 14 or more credit(s) from the following:
• JOUR 5xxx
• JOUR 8xxx
Twin Cities Campus
Mass Communication Ph.D.
School of Journalism & Mass Communication
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Hubbard School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-625-9824; fax: 612-625-9525)
Email: sjmcsgrad@umn.edu
Website: http://sjmc.umn.edu/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 70
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD offers training for academic careers primarily in communication instruction, research, or policy. Areas of specialization include media processes, influences, and effects (including health communication, advertising, and political communication); media law, ethics, history; and media management. The program is suffused with the study of new communication technologies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Students whose native language is not English are required to submit scores from the TOEFL or IELTS (academic). In addition, such students seeking teaching assistantships are required to pass the SPEAK test of spoken-English proficiency prior to appointment. Admission is considered for fall semester only; the application deadline is January 15.

The mass communication MA and PhD programs offer a joint degree with the Law School. Applicants to either joint degree--either the MA/JD or the PhD/JD--are reviewed separately by the Law School and the mass communication programs for admission, but are asked to identify themselves as seeking the joint degree option in their statement of intent for the mass communication application. For more information, contact sjmcsgrad@umn.edu.

Special Application Requirements:
Applicants must submit a department application; a clearly written statement of career interests, goals, and objectives; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of transcripts; academic work samples in English; a resume or curriculum vita; and scores from the General Test of the GRE.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS
- MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
34 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.5 is required for students to remain in good standing.

A minimum of 46 course credits and 24 thesis credits are required. Coursework must include 16 credits in required core courses, and at least 30 other graduate credits. Of these credits, at least 18 credits must come from SJMC courses and at least 12 credits from outside the SJMC. All courses included on the PhD graduate degree plan must be taken A-F, except for JOUR 8009, which is taken S/N.

Required Mass Communication Core
- JOUR 8001 - Studies and Theories of Mass Communication (3.0 cr)
- JOUR 8009 - Pro-seminar in Mass Communication (1.0 cr)
One additional theory course either inside of outside the SJMC, chosen in consultation with the student's adviser (3.0 cr)

Required Methodology Core
- JOUR 8501 - Seminar: The Process of Quantitative Mass Communication Research (3.0 cr)
- JOUR 8503 - Seminar: Qualitative Methods in Mass Communication Research (3.0 cr)
One additional methods course outside of the SJMC, chosen in consultation with the student's adviser (3.0 cr)

Electives
Take 18 or more credit(s) from the following:
- JOUR 5xxx
- JOUR 8xxx

Outside the Major in a Supporting Program
Take 12 credits outside the major in a minor or supporting program.

Thesis Credits
Take exactly 24 credit(s) from the following:
- JOUR 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Joint- or Dual-degree Coursework: JD/ Mass Communications PhD
Twin Cities Campus

Medieval Studies Minor

Medieval Studies, Center for
College of Liberal Arts

Medieval Studies Minor

Contact Information:
Department of Center for Medieval Studies, 1110 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455 (612-626-0805).
Email: cmedst@umn.edu
Website: http://cmedst.umn.edu

Program Type: Graduate free-standing minor
Requirements for this program are current for Fall 2018
Length of program in credits (Masters): 6
Length of program in credits (Doctorate): 12
This program does not require summer semesters for timely completion.

The medieval studies minor is available to master's and doctoral students. The Center for Medieval Studies (CMS) encourages collegial interaction and scholarly collaboration among faculty and students in all areas of medieval studies. CMS seeks to provide an opportunity for scholars of all disciplines and at all levels to focus intensively on historical, literary, anthropological, social, economic, religious, artistic, cultural, and methodological inquiries into the medieval period, which may fall within the chronology of roughly 300 to 1,500 A.D. The program emphasizes an interdisciplinary and cross-cultural approach to medieval culture including the study of medieval texts in original languages. Departments associated with the minor include: history; art history; theatre arts; music; English; French and Italian; German, Scandinavian, and Dutch; Spanish and Portuguese studies; Classical and Near Eastern studies; Asian languages and literatures; and others.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Use of 4xxx courses toward program requirements is permitted only with the permission of the CMS director.

The master's minor requires 6 graduate credits: two courses in medieval studies outside the student's major department, including a course which demonstrates command of Latin texts, normally LATN 51xx or higher or other Latin course by permission of the director of graduate studies, and one additional course in MEST or on a medieval topic.

The doctoral minor requires 12 graduate credits: four courses in medieval studies outside the student's major department, including a course which demonstrates command of Latin texts, normally LATN 51xx or higher or other Latin course by permission of the DGS; a second Latin course 51xx or above, or a course 5xxx or above in Arabic, Greek, Hebrew, classical Chinese, or a medieval vernacular; and two additional courses in MEST or on medieval topics.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Latin Course
Take 3 or more credit(s) from the following:
- LAT 5xxx
- LAT 8xxx

Medieval Studies or Medieval Topics Course
Course must be outside of the student's major field.

Consult with the Medieval Studies director of graduate studies for other courses that may fulfill this requirement.
Take 3 or more credit(s) from the following:
- MEST 4610 - Intermediate Topics in Medieval Studies (3.0 - 4.0 cr)
- MEST 5610 - Advanced Topics in Medieval Studies (3.0 - 4.0 cr)
- MEST 5993 - Directed Studies in Medieval Studies (1.0 - 3.0 cr)
- MEST 8010 - Medieval Studies Colloquium (3.0 cr)
- MEST 8110 - Seminar in Medieval Studies (3.0 - 4.0 cr)
- MEST 5xxx
- MEST 8xxx
- ANTH 5442 - Archaeology of the British Isles (3.0 cr)
- ARCH 5423 - Gothic Architecture (3.0 cr)
- ARTH 5324 - 15th-Century Painting (3.0 cr)
- ARTH 5765 - Early Chinese Art (3.0 cr)
- ARTH 5777 - The Diversity of Traditions: Indian Art 1200 to Present (3.0 cr)
- ARTH 5787 - Visual Cultures in Contact: Cross-Cultural Interaction in the Ancient and Early Medieval Worlds (3.0 cr)
- ARTH 8200 - Seminar: Medieval Art (3.0 cr)
- ENGL 4612 - Old English I (3.0 cr)
- ENGL 4613 - Old English II (3.0 cr)
- ENGL 5110 - Medieval Literatures and Cultures: Intro to Medieval Studies (3.0 cr)
- ENGL 8110 - Seminar: Medieval Literature and Culture (3.0 cr)
- GER 5711 - History of the German Language I (3.0 cr)
- GER 5721 - Introduction to Middle High German (3.0 cr)
- GER 5722 - Middle High German: Advanced Readings (3.0 cr)
- GER 5734 - Old Saxon (3.0 cr)
- GER 5740 - Topics in Germanic Medieval Studies (3.0 cr)
- GER 8200 - Seminar in Medieval German Literature and Culture (3.0 cr)
- GER 8751 - Paleography: Medieval Manuscript Readings (3.0 cr)
- GER 8752 - Medieval Text Editing (3.0 cr)
- HIST 5111 - Proseminar in the History of Medieval Europe (3.0 cr)
- HIST 5115 - Medieval Latin Historians (3.0 cr)
- HIST 5271 - The Viking World: Story, History, and Archaeology (3.0 cr)
- HIST 5281 - European Intellectual History: The Early Modern Period, Antiquity to 1750 (3.0 cr)
- HIST 5469 - Historiographies of China, 1000-1700 (3.0 cr)
- HIST 5611 - New Directions in the Middle Ages, ca. 300-1100 (3.0 cr)
- HIST 5612 - New Directions in the Middle Ages, ca. 1100-1500 (3.0 cr)
- HIST 5614 - The Medieval Church (3.0 cr)
- HIST 5900 - Topics in European/Medieval History (1.0 - 4.0 cr)
- HIST 5962 - Bell Library Research Seminar in Comparative World History, ca. 1000-1800 CE (3.0 cr)
- HIST 8110 - Medieval History: Research Seminar (3.0 cr)
- HIST 8905 - Topics in European Medieval History (1.0 - 4.0 cr)
- ITAL 5401 - Mondo di Dante (4.0 cr)
- ITAL 5609 - World of Dante (4.0 cr)
- LAT 5200 - Advanced Reading in Later Latin (3.0 cr)
- LAT 8263 - Survey of Latin Literature II (3.0 cr)
- LAT 8267 - Graduate Survey of Latin Literature of Late Antiquity (3.0 cr)
- MUS 8631 - Seminar: Music in Medieval Europe (3.0 cr)
- PHIL 8080 - Seminar: History of Ancient and Medieval Philosophy (3.0 cr)
- POL 8251 - Ancient and Medieval Political Thought (3.0 cr)
- SCAN 5502 - The Icelandic Saga (3.0 cr)
- SCAN 5701 - Old Norse Language and Literature (3.0 cr)
- SCAN 5703 - Old Norse Poetry (3.0 cr)
- SCAN 5710 - Topics in Old Norse Literature (3.0 cr)
- SCAN 8500 - Seminar in Medieval Scandinavian Languages and Literature (3.0 cr)
- SPAN 5701 - History of Ibero-Romance (3.0 cr)
- SPAN 8312 - Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina] (3.0 cr)
- TH 8111 - History and Theory of Western Theatre: Ancient World and Early Medieval (3.0 cr)
- TH 8112 - History and Theory of Western Theatre: Medieval Through Renaissance (3.0 cr)

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Information current as of August 31, 2018
•MEST 4612 - Old English I (3.0 cr)
or ENGL 4612 - Old English I (3.0 cr)

•Old English II
•MEST 4613 - Old English II (3.0 cr)
or ENGL 4613 - Old English II (3.0 cr)

Doctoral
Student can only take Old English I (MEST/ENGL 4612) and Old English II (MEST/ENGL 4613) to fulfill either the medieval vernacular course requirement OR the medieval studies/medieval topics course requirement, not both.

Latin Course
Take 3 or more credit(s) from the following:
•LAT 5xxx
•LAT 8xxx

Medieval Vernacular Course
Take 3 or more credit(s) from the following:
•ARAB 5xxx
•ARAB 8xxx
•COPT 5xxx
•GRK 5xxx
•GRK 8xxx
•HEBR 5xxx
•HEBR 8xxx
•LAT 5xxx
•LAT 8xxx

•Old English I
•MEST 4612 - Old English I (3.0 cr)
or ENGL 4612 - Old English I (3.0 cr)

•Old English II
•MEST 4613 - Old English II (3.0 cr)
or ENGL 4613 - Old English II (3.0 cr)

•Introductory Classical Chinese I
•CHN 5211 - Introductory Classical Chinese I (3.0 cr)
or JPN 5211 - Introductory Classical Chinese I (3.0 cr)
or KOR 5211 - Introductory Classical Chinese I (3.0 cr)

•Introductory Classical Chinese II
•CHN 5212 - Introductory Classical Chinese II (3.0 cr)
or JPN 5212 - Introductory Classical Chinese II (3.0 cr)
or KOR 5212 - Introductory Classical Chinese II (3.0 cr)

Medieval Studies or Medieval Topics Course
Course must be outside of the student's major field.

Consult with the Medieval Studies director of graduate studies for other courses that may fulfill this requirement.
Take 6 or more credit(s) from the following:
•MEST 4610 - Intermediate Topics in Medieval Studies (3.0 - 4.0 cr)
•MEST 5610 - Advanced Topics in Medieval Studies (3.0 - 4.0 cr)
•MEST 5993 - Directed Studies in Medieval Studies (1.0 - 3.0 cr)
•MEST 8010 - Medieval Studies Colloquium (3.0 cr)
•MEST 8110 - Seminar in Medieval Studies (3.0 - 4.0 cr)
•MEST 5xxx
•MEST 8xxx
•ANTH 5442 - Archaeology of the British Isles (3.0 cr)
•ARCH 5423 - Gothic Architecture (3.0 cr)
•ARTH 5324 - 15th-Century Painting (3.0 cr)
•ARTH 5765 - Early Chinese Art (3.0 cr)
•ARTH 5777 - The Diversity of Traditions: Indian Art 1200 to Present (3.0 cr)
•ARTH 5787 - Visual Cultures in Contact: Cross-Cultural Interaction in the Ancient and Early Medieval Worlds (3.0 cr)
•ARTH 8200 - Seminar: Medieval Art (3.0 cr)
•ENGL 4612 - Old English I (3.0 cr)
•ENGL 4613 - Old English II (3.0 cr)
•ENGL 5110 - Medieval Literatures and Cultures: Intro to Medieval Studies (3.0 cr)
•ENGL 8110 - Seminar: Medieval Literature and Culture (3.0 cr)
•GER 5711 - History of the German Language I (3.0 cr)
•GER 5721 - Introduction to Middle High German (3.0 cr)
•GER 5722 - Middle High German: Advanced Readings (3.0 cr)
• GER 5734 - Old Saxon (3.0 cr)
• GER 5740 - Topics in Germanic Medieval Studies (3.0 cr)
• GER 8200 - Seminar in Medieval German Literature and Culture (3.0 cr)
• GER 8751 - Paleography: Medieval Manuscript Readings (3.0 cr)
• GER 8752 - Medieval Text Editing (3.0 cr)
• HIST 5111 - Proseminar in the History of Medieval Europe (3.0 cr)
• HIST 5115 - Medieval Latin Historians (3.0 cr)
• HIST 5271 - The Viking World: Story, History, and Archaeology (3.0 cr)
• HIST 5281 - European Intellectual History: The Early Modern Period, Antiquity to 1750 (3.0 cr)
• HIST 5469 - Historiographies of China, 1000-1700 (3.0 cr)
• HIST 5611 - New Directions in the Middle Ages, ca. 300-1100 (3.0 cr)
• HIST 5612 - New Directions in the Middle Ages, ca. 1100-1500 (3.0 cr)
• HIST 5614 - The Medieval Church (3.0 cr)
• HIST 5900 - Topics in European/Medieval History (1.0 - 4.0 cr)
• HIST 5962 - Bell Library Research Seminar in Comparative World History, ca. 1000-1800 CE (3.0 cr)
• HIST 8110 - Medieval History: Research Seminar (3.0 cr)
• HIST 8905 - Topics in European Medieval History (1.0 - 4.0 cr)
• ITAL 5401 - Mondo di Dante (4.0 cr)
• ITAL 5609 - World of Dante (4.0 cr)
• LAT 5200 - Advanced Reading in Later Latin (3.0 cr)
• LAT 8263 - Survey of Latin Literature II (3.0 cr)
• LAT 8267 - Graduate Survey of Latin Literature of Late Antiquity (3.0 cr)
• MUS 8631 - Seminar: Music in Medieval Europe (3.0 cr)
• PHIL 8080 - Seminar: History of Ancient and Medieval Philosophy (3.0 cr)
• POL 8251 - Ancient and Medieval Political Thought (3.0 cr)
• SCAN 5502 - The Icelandic Saga (3.0 cr)
• SCAN 5701 - Old Norse Language and Literature (3.0 cr)
• SCAN 5703 - Old Norse Poetry (3.0 cr)
• SCAN 5710 - Topics in Old Norse Literature (3.0 cr)
• SCAN 8500 - Seminar in Medieval Scandinavian Languages and Literature (3.0 cr)
• SPAN 5701 - History of Ibero-Romance (3.0 cr)
• SPAN 8312 - Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina] (3.0 cr)
• TH 8111 - History and Theory of Western Theatre: Ancient World and Early Medieval (3.0 cr)
• TH 8112 - History and Theory of Western Theatre: Medieval Through Renaissance (3.0 cr)

- Old English I
  • MEST 4612 - Old English I (3.0 cr)
  or ENGL 4612 - Old English I (3.0 cr)

- Old English II
  • MEST 4613 - Old English II (3.0 cr)
  or ENGL 4613 - Old English II (3.0 cr)
Twin Cities Campus
Moving Image Studies Minor
Cultural Studies & Comparative Literature
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Cultural Studies and Comparative Literature, 216 Pillsbury Dr SE, 235 Nicholson Hall, Minneapolis, MN 55455 (612-624-8099)
Email: csclgrad@umn.edu
Website: http://movingimage.umn.edu/

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The moving image increasingly permeates the fabric of contemporary culture and society. From cinema theaters and home televisions to installation art, portable electronic devices, medical technologies, and science laboratories, and in public spaces from airport terminals to building façades, the moving image is nearly ubiquitous.

The graduate minor in moving image studies trains students from a variety of disciplinary fields in the critical analysis of the moving image in its disparate yet interrelated forms. Drawing from the faculty's extensive research interests and expertise, the curriculum brings together discourses ranging from film theory to media studies, from the philosophy of the image to the history of technology, and beyond.

Program Delivery
This program is available:
* via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Admission to the minor is by request, with the approval of the student's adviser and the director of Graduate Studies of the minor.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The PhD minor (minimum 15 credits) requires two core courses (6 credits): MIMS 8001 - Theories of the Moving Image (3 credits), and MIMS 8003 - Historiography of the Moving Image (3 credits). The PhD minor also requires three electives (minimum 9 credits): one 8xxx Topics Course (3 credits) chosen from a list of courses offered in a given year by film/media faculty in various departments, and two additional 5xxx or 8xxx courses (6 credits) chosen from a list of courses offered in a given year by film/media faculty in various departments, including, as a recommended option, a production-based course. The master's minor (minimum 9 credits) requires two core courses (6 credits): MIMS 8001 - Theories of the Moving Image (3 credits), and MIMS 8003 - Historiography of the Moving Image (3 credits). The master's minor also requires one additional 5xxx or 8xxx course (3 credits) chosen from a list of courses offered by film/media faculty in various departments.

Students are advised to check the program website indicated above for updated information.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Master's**

**Required Courses**
- MIMS 8001 - Theories of the Moving Image (3.0 cr)
- MIMS 8003 - Historiography of the Moving Image (3.0 cr)

**Electives**
- Take 3 or more credit(s) from the following:
  - 5xxx or 8xxx courses (3.0 cr) chosen from a list of courses offered in a given year by film/media faculty in various departments.

**Doctoral**

**Required**
- MIMS 8001 - Theories of the Moving Image (3.0 cr)
- MIMS 8003 - Historiography of the Moving Image (3.0 cr)

**Electives**
- Take 9 or more credit(s) from the following:
  - 8xxx - Topics Course (3.0 cr) chosen from a list of courses offered in a given year by film/media faculty in various departments.
  - 5xxx or 8xxx courses (6.0 cr) chosen from a list of courses offered in a given year by film/media faculty in various departments, including, as a recommended option, a production-based course.
Twin Cities Campus
Music D.M.A.
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Music, 100 Ferguson Hall, 2106 4th Street South, Minneapolis, MN 55455 (612-624-5093; fax: 612-624-8001)
Email: mnmusic@umn.edu
Website: http://www.music.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 85 to 90
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Musical Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Music offers the degrees of master of arts (M.A.), master of music (M.M.), doctor of musical arts (D.M.A.), and doctor of philosophy (Ph.D.). Specific degree plans and emphases are listed in each degree’s program requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants interested in doctoral level study must hold a master’s degree in an appropriate field of study.

Other requirements to be completed before admission:
Applicants must hold a bachelor’s degree or its equivalent with a major emphasis in one of the following areas of music: musicology/ethnomusicology, theory and/or composition, performance, or music education/therapy.

The performance degree (D.M.A.) requires an audition for admission.

The conducting degree (D.M.A.) requires a preliminary DVD, an audition, and interview for admission.

Special Application Requirements:
For some areas of performance, a preliminary DVD may be required prior to scheduling an audition.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 21
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
74 to 79 credits are required in the major.
9 credits are required outside the major.
4 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Varies according to field.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The doctor of musical arts offers and emphases in piano, organ, voice, guitar, collaborative piano/coaching, conducting, and instrumental performance (violin, viola, cello, flute, oboe, clarinet, saxophone, bassoon, trumpet, trombone, and percussion).
Twin Cities Campus
Music Education Post-Baccalaureate Licensure Certificate
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Music Admissions
200 Ferguson Hall
2106 4th St S,
Minneapolis, MN 55455
Phone: 612-624-5740
Email: mnmusic@umn.edu
Website: http://music.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 43 to 47
- This program does not require summer semesters for timely completion.
- Degree: Music Education Postbaccalaureate Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This post-baccalaureate certificate has two emphases that align with state teacher education requirements: K-12 Instrumental/General Music and K-12 Vocal/General Music. The certificate enables students with previous performance degrees to complete the required curriculum for licensure to teach music in K-12 settings in the state of Minnesota.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Eligibility requirements include a completed music degree from an accredited college or university with the following minima:
Music Theory and Aural Skills sequence--normally at least 4 semesters
Music History--a full sequence of at least 2 semesters of Western Art Music History from Renaissance to the present AND at least one semester of music history that focuses on genres beyond Western Art Music
Applied Music--7 semesters of intensive applied study on an instrument
Ensembles--at least 7 semesters of ensemble experience, at least 4 of which should be large ensembles appropriate to the major:
Wind Ensemble, Orchestra, or Symphonic band
Basic Conducting, One semester of basic conducting
Chorus or University Singers
Individual courses that are used to meet the above requirements must be passed with a grade of C- or better
Overall GPA must be at least 3.0

Special Application Requirements:
2 letters of recommendation
30 hours of field experience in a K-12 setting
Performance DVD on primary instrument
Successful completion of the Proficiency Exam for Music Education
- Written Skills
- Oral Skills
- Accompanying Skills
- Song- Leading Skills
- Error- Detection Skills

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Prerequisite courses:

All students must complete the following prerequisite course, or its equivalent as determined by the certificate program:
MUED 1201 Intro to Music Ed 2 credits

Students pursuing the Instrumental Emphasis must complete the following prerequisite course, or its equivalent as determined by the certificate program:
MUS 1260 Voice Class 2 credits
OR
MUSA 1404 Voice: Music Major Secondary 2-4 credits

Students pursuing the Vocal (Piano or Voice) Emphasis must complete the following prerequisite course, or its equivalent as determined by the certificate program:
MUSA 1404 Voice: Music Major Secondary 2-4 credits
OR
MUSA 1401 Piano: Music Major Secondary 2-4 credits

Professional Education Requirements

Take the following courses for a total of 11 credits. CI 5452 must be taken for 2 credits.
CI 4602 - English Learners and Academic Language (1.0 cr)
CI 5163 - Child and Adolescent Development for Teaching and Learning I (1.0 cr)
CI 5164 - Child and Adolescent Development for Teaching and Learning II (2.0 cr)
CI 5452 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EPSY 4001 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
OLPD 5005 - School and Society (2.0 cr)
OLPD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
PUBH 6003 - Fundamentals of Alcohol and Drug Abuse for Teacher Education (1.0 cr)

Music Education Core Requirements

Take the following courses for a total of 15 credits. MUED 5350 is taken for 5 credits.
MUED 5101 - Improvisation and Creativity in the Music Classroom (2.0 cr)
MUED 5301 - General Music I (3.0 cr)
MUED 5302 - General Music II (3.0 cr)
MUED 5350 - Student Teaching in Classroom Music (4.0 - 8.0 cr)
MUED 5650 - Student Teaching Seminar (2.0 cr)

Emphasis Options

Instrumental Emphasis

Take the following courses for a total of 21 credits. MUED 5550 is taken for 5 credits.
MUED 4502 - String Techniques and Teaching (2.0 cr)
MUED 4503 - Woodwind Techniques and Teaching (2.0 cr)
MUED 4504 - Brass Techniques and Teaching (2.0 cr)
MUED 4505 - Percussion Techniques and Teaching (2.0 cr)
MUED 5516 - Instrumental Methods and Materials I (3.0 cr)
MUED 5517 - Instrumental Methods and Materials II (3.0 cr)
MUED 5519 - Advanced Conducting and Repertoire (Instrumental) (2.0 cr)
-OR-

Vocal Emphasis (Piano or Voice)

Take the following courses for a total of 17 credits. MUED 5450 is taken for 5 credits.
MUED 4417 - Style, Pedagogy, and Diction in the Choral Music Classroom I (2.0 cr)
MUED 4418 - Style, Pedagogy, and Diction in the Choral Music Classroom II (2.0 cr)
MUED 5415 - Choral/Vocal Methods and Materials I (3.0 cr)
MUED 5416 - Choral/Vocal Methods and Materials II (3.0 cr)
MUED 5419 - Advanced Conducting and Repertoire (Choral) (2.0 cr)
MUED 5450 - Student Teaching in Vocal Music (4.0 - 8.0 cr)
Twin Cities Campus
Music M.A.
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Music, 100 Ferguson Hall, 2106 4th Street South, Minneapolis, MN 55455 (612-624-5093; fax: 612-624-8001)
Email: mnmusic@umn.edu
Website: http://www.music.umn.edu

Program Type: Master's
Requirements for this program are current for Fall 2018
Length of program in credits: 30 to 35
This program does not require summer semesters for timely completion.
Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Music offers the degrees of master of arts (MA) with an emphasis in composition, music therapy, musicology (ethnomusicology), and theory.

Program Delivery
This program is available:
via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Applicants must hold a bachelor’s degree or its equivalent with a major emphasis in one of the following areas of music: musicology/ethnomusicology, theory and/or composition, performance, or music therapy.

Special Application Requirements:
The M.A.’s theory emphasis requires submission of original papers (one tonal and one post-tonal analysis) for admission.
The composition emphasis requires submissions of original scores and recordings (2-4 scores of varying genres) for admission.
The musicology/ethnomusicology emphasis requires the submission of original papers for admission.
The music therapy emphasis requires documentation of at least 3,500 hours of clinical experience. An interview is also required.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 19 major credits, 3 to 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral.
This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Varies according to field.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Language requirements: A reading knowledge of French, German, or Italian is required for all MA degree emphases except therapy. For the emphasis in composition, reading knowledge of a foreign language or, with approval, an equivalent research tool.

The master of arts in music offers emphases in musicology/ethnomusicology (Plan A and Plan B), theory (Plan B only), composition (Plan B only).

The MA in music with emphasis in musicology/ethnomusicology requires 35 credits (25 course credits and 10 thesis credits) for Plan A and 31 course credits for Plan B; the emphasis in composition (Plan B only) requires 35 course credits, and the emphasis in music theory (Plan B only) requires 30 course credits. The credit totals for these emphases include 6 credits required for courses outside the major field. Final Exams: For the emphasis in musicology/ethnomusicology, the final exams are written and oral. For the emphases in theory and composition, the final exams are oral.

Concentrations

1. Theory
   (Plan B only)
   **Music Theory and/or Analysis**
   Take 18 or more credit(s) from the following:
   • MUS 85xx
   **Musicology/Ethnomusicology**
   Take 3 or more credit(s) from the following:
   • MUS 86xx
   • MUS 88xx
   **Music Electives**
   Courses chosen in consultation with the director of graduate studies. Courses include music composition, musicology, ethnomusicology, or performance. NOT including music education or therapy.
   Take 3 or more credit(s) from the following:
   • MUS 5xxx
   • MUS 8xxx
   • MUSA 5xxx
   • MUSA 8xxx
   **Outside the Major in a Supporting Program**
   Students choose 6 credits outside of the major in consultation with the director of graduate studies. This may also include courses in music education (MuEd) or music therapy.

   -OR-

2. Musicology/Ethnomusicology
   **Required Courses**
   • MUS 8644 - Seminar: Advanced Research in Historical Musicology (3.0 cr)
   • MUS 8864 - Current Issues in Ethnomusicology (3.0 cr)
   • MUS 85xx - Seminar in Music Theory (3.0 cr)
   **Outside the Major in a Supporting Program**
   Students choose 6 credits outside of the major in consultation with the director of graduate studies. This may also include courses in music education or music therapy.

**Plan Options**

**Plan A**
   **Musicology or Ethnomusicology Electives**
   Take 9 or more credit(s) from the following:
   • MUS 56xx
   • MUS 86xx
   • MUS 58xx
   • MUS 88xx
   **Thesis Credits**
Take exactly 10 credit(s) from the following:
- MUS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or Plan B

Musicology or Ethnomusicology Electives
Take 15 or more credit(s) from the following:
- MUS 56xx
- MUS 58xx
- MUS 86xx
- MUS 88xx

-OR-

3. Composition
(Plan B only)
MUS 5591 - Introduction to Music Information Technology (3.0 cr)

Theory and/or Analysis
Take 3 or more credit(s) from the following:
- MUS 85xx

Composition
Take exactly 12 credit(s) from the following:
- MUS 8550 - Composition (3.0 cr)

Musicology/Ethnomusicology
Take 3 or more credit(s) from the following:
- MUS 56xx
- MUS 58xx
- MUS 86xx
- MUS 88xx

Creative Studies and Media
Courses chosen in consultation with the director of graduate studies.
Take 6 or more credit(s) from the following:
- MUS 5xxx
- MUS 8xxx

Ensemble
Take exactly 2 credit(s) from the following:
- MUS 54xx

Outside the major in a Supporting Program
Students choose 3 credits outside of the major in consultation with the director of graduate studies. This may also include courses in music education (MuEd) or music therapy.

-OR-

4. Music Therapy Equivalency
(Plan B only)
Bachelor’s Equivalent Coursework for Music Therapy
If students have not taken these courses during their bachelor's degree, they are required to take them as graduate students.

Prerequisites
MUED 3802 - Guitar I for Music Education and Music Therapy Majors: Developing Group Songleading Skills (2.0 cr)
MUED 3803 - Guitar II for Music Education and Music Therapy Majors: Developing Group Songleading Skills (2.0 cr)
MUED 5803 - Therapeutic Management in Music Settings (4.0 cr)
MUED 5804 - Music Therapy Methods and Procedures I (4.0 cr)
MUED 5805 - Music Therapy Methods and Procedures II (4.0 cr)
MUED 5806 - Career Preparation (4.0 cr)

Internship
MUED 5855 - Music Therapy Internship (1.0 - 13.0 cr)

Psychiatric Music Therapy
(3 credits; 4 credits if includes clinical component)
Take 3 - 4 credit(s) from the following:
- MUED 5807 - Psychiatric Music Therapy (3.0 - 4.0 cr)

Medical Music Therapy
(3 credits; 4 credits if includes clinical component)
Take 3 - 4 credit(s) from the following:
- MUED 5808 - Medical Music Therapy (3.0 - 4.0 cr)

Research Core
Take 6 or more credit(s) from the following:
- MUED 8112 - Introduction to Research Methods and Design in Arts Education (3.0 cr)
- MUED 8115 - Assessment in Arts Education (3.0 cr)
- MUED 8118 - Qualitative Research in Arts Education (3.0 cr)
Music Electives
Can be taken in musicology/ethnomusicology, theory, and creative studies and media.
Take 6 or more credit(s) from the following:
MUS 55xx
MUS 56xx
MUS 57xx
MUS 58xx
MUS 85xx
MUS 86xx
MUS 87xx
MUS 88xx

Research Project
Take 5 or more credit(s) from the following:
•MUED 8880 - Master's Research Project (3.0 - 6.0 cr)

Outside the Major in a Supporting Program
At least 3 credits MUST be taken outside the School of Music. May include social work, psychology, education, health, music, or music education/therapy (pending advisor approval).

5. Music Therapy Post Board Certification
(Plan B Only)
Music Therapy Courses
One of the following courses must be taken for 4 credits by including a clinical component.
Take 7 - 8 credit(s) from the following:
•MUED 5807 - Psychiatric Music Therapy (3.0 - 4.0 cr)
•MUED 5808 - Medical Music Therapy (3.0 - 4.0 cr)

Research Core
Take 6 or more credit(s) from the following:
•MUED 8112 - Introduction to Research Methods and Design in Arts Education (3.0 cr)
•MUED 8115 - Assessment in Arts Education (3.0 cr)
•MUED 8118 - Qualitative Research in Arts Education (3.0 cr)

Music Electives
Musicology/ethnomusicology, theory, and creative studies and media
Take 6 or more credit(s) from the following:
MUS 55xx
MUS 56xx
MUS 57xx
MUS 58xx
MUS 85xx
MUS 86xx
MUS 87xx
MUS 88xx

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Music Education
This sub-plan is limited to students completing the program under Plan B.

The Music Education sub-plan is no longer accepting applications, Music Education is now served by the Music Education Post-Baccalaureate Certificate option. Please refer to the School of Music's website at http://www.music.umn.edu.
Twin Cities Campus
Music M.M.
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Music, 100 Ferguson Hall, 2106 4th Street South, Minneapolis, MN 55455 (612-624-5093; fax: 612-624-8001)
Email: mmnmusic@umn.edu
Website: http://www.music.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Music

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Music offers the degrees of master of arts (M.A.), master of music (M.M.), doctor of musical arts (D.M.A.), and doctor of philosophy (Ph.D.). Specific degree plans and emphases are listed in each degree’s program requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants interested in doctoral level study must hold a master's degree in an appropriate field of study.

Other requirements to be completed before admission:
Applicants must hold a bachelor's degree or its equivalent with a major emphasis in one of the following areas of music: musicology/ethnomusicology, theory and/or composition, performance, or music education/therapy.

The collaborative piano/coaching M.M. requires an audition for admission.

The M.M. in choral conducting, orchestral conducting, and wind ensemble/band conducting degrees all required a preliminary DVD, audition, and interview for admission.

The performance M.M. requires an audition for admission.

Special Application Requirements:
For some areas of performance, a preliminary DVD may be required prior to scheduling an audition.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 30 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The master of music degree offers emphases in piano, organ, voice, violin, viola, cello, double bass, violin performance and Suzuki pedagogy, flute, oboe, clarinet, saxophone, bassoon, French horn, trumpet, trombone, euphonium, tuba, percussion, harp, guitar, collaborative piano/coaching, orchestral conducting, wind ensemble/band conducting, and choral conducting.

The M.M. requires credit distribution among the following for each emphasis: applied music, study directly related to the emphasis (literature, pedagogy, performance practice, conducting, secondary instrument, chamber music, etc.), ensemble, and musicology/ethnomusicology and theory/composition. One recital is required for all emphases except collaborative piano/coaching, which requires two.

The minimum credit requirement for each emphasis is as follows: 30 credits are required for piano, instrumental performance, guitar, piano pedagogy, orchestral conducting, wind ensemble/band conducting, and choral conducting; 33 credits for organ and voice; 37 credits for violin performance and Suzuki pedagogy; 39 credits for collaborative piano/coaching.

The M.M. in both Research requires 33 credits and the M.M. in Pedagogy requires 30 credits.
Twin Cities Campus
Music Minor
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Music, 100 Ferguson Hall, 2106 4th St S, Minneapolis, MN 55455 (612-624-5093; fax: 612-624-8001)
Email: mnmusic@umn.edu
Website: http://www.music.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The music minor is open to non-music major graduate students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Applicants must be actively pursuing a graduate degree in a non-music field at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The music minor requires a minimum of 12 credits (four 8xxx-level, 3-credit courses) in musicology/ethnomusicology or theory.
One or more courses may be at the 5xxx-level, but only with prior approval of the student's advisor and the music director of graduate studies.
Prior to registering for any 5xxx- or 8xxx-level courses offered by the School of Music, students must complete any prerequisites or background-knowledge equivalents, or obtain instructor approval.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
Required Courses
*Can substitute 5xxx-level or MUSA 83xx with director of graduate studies approval.
Take 12 or more credit(s) from the following:
ONLY MUS 85xx, 86xx, 88xx.
Twin Cities Campus
Music Ph.D.
School of Music
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Music, 100 Ferguson Hall, 2106 4th Street South, Minneapolis, MN 55455 (612-624-5093; fax: 612-624-8001)
Email: mnmusic@umn.edu
Website: http://www.music.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 87 to 92
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Music offers the degrees of master of arts (M.A.), master of music (M.M.), doctor of musical arts (D.M.A.), and doctor of philosophy (Ph.D.). Specific degree plans and emphases are listed in each degree's program requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants interested in doctoral level study must hold a master's degree in an appropriate field of study. For the Ph.D. in music education/therapy, applicants must also have documentation of at least 3 years of teaching experience or at least 3,500 hours of clinical experience.

Special Application Requirements:
The theory Ph.D. requires original papers (one tonal and one post-tonal analysis) for admission.
The composition Ph.D. requires original scores and recordings (2-4 scores of varying genre) for admission.
The musicology/ethnomusicology Ph.D. requires original papers for admission.
The music education/music therapy Ph.D. requires original papers (e.g. research or professional papers) and documentation of at least 3 years of teaching experience or at least 3,500 hours of clinical experience. An interview is also required.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
51 to 56 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Varies according to field.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The language requirement for musicology and ethnomusicology includes two languages chosen from French, German, and Italian. Substitution may be made when a different language is needed for the thesis.

For composition, the language requirement includes reading knowledge of two foreign languages; with approval, an equivalent research tool may be substituted for a foreign language.

For theory, the language requirement includes German and either French or Italian. Substitution may be made when a different language is needed for the thesis; with approval, the second language may also be replaced by a collateral field of knowledge or a special research technique.

There is no language requirement for the education/therapy degree.
Twin Cities Campus
Philosophy M.A.
Philosophy Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Philosophy, 271 19th Avenue South, 831 Heller Hall, Minneapolis, MN 55455-0310 (612-625-6563; fax: 612-626-8380)
Email: umphil@umn.edu
Website: http://www.philosophy.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students are primarily admitted to the PhD program, while admission to the MA is intended for those with professional goals in other fields, and is limited (0-2 candidates per year).

Philosophy is noteworthy for its emphasis on the individual student's research interests. With the help of an advisor, students design their own program of study, which consists of the philosophy major and either a supporting program or a minor. The minor or supporting program, drawn at least in part from a department or departments other than philosophy, complements the student's research focus. Students gain a broad base of knowledge through required coursework. Terminal MA students are required to take two history courses; one in ancient philosophy and one in modern.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Recognizing that evidence of ability to pursue graduate study in philosophy is diverse, the department does not specify prerequisites for admission. Normally, those admitted have a broad undergraduate background that includes some courses in philosophy.

Special Application Requirements:
Students must apply to both the University and the Department of Philosophy. The department application for admission and aid is available from the Admissions and Aid Committee at the address listed above, or may be downloaded from the philosophy website at www.philosophy.umn.edu. All application materials may be uploaded the Graduate School Admissions website. Department materials required include a completed application form, personal statement, transcripts, scores from the GRE General Test, three letters of recommendation, and a writing sample. Students interested in DOVE or ICGC Fellowship (Interdisciplinary Center for Global Change) should include a statement expressing their interest. Students interested in the ICGC Fellowship should also contact the Interdisciplinary Center for the Study of Global Change. Applications, together with all supporting materials, must be received by December 31. The philosophy department reviews applications once a year, and admits students for entry in the fall semester only.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
- Total Score: 6.5

• MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The project is three Plan B papers. For details see Philosophy Department Degree Program: MA, available as a PDF on the philosophy website at www.philosophy.umn.edu.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Use of 4xxx level courses toward program requirements is permitted under certain conditions with advisor approval. For graduate credit, students must enroll in the appropriate 8xxx level (1 credit) accompanying workshop.

Courses from outside the Philosophy department, in consultation with the director of graduate studies, may be applied towards the major credit requirement in certain circumstances.

Required Philosophy Courses

Philosophy coursework should show that consideration has been paid to the diversity and variety of areas of philosophy, as well as to the student's specialized interest. The department recommends that students consult with their advisors and the director of graduate studies when choosing coursework.

Take 14 or more credit(s) from the following:

• PHIL 5xxx
• PHIL 8xxx

Outside Courses -- Related Fields

Take 6 credits outside the major in related fields or a minor.

Plan Options

Plan A

Thesis Credits

Take 10 or more credit(s) from the following:

• PHIL 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B

Take 10 or more credit(s) from the following:

• PHIL 5xxx
• PHIL 8xxx
Twin Cities Campus
Philosophy Minor
Philosophy Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Philosophy, 271 19th Avenue South, 831 Heller Hall, Minneapolis, MN 55455-0310 (612-625-6563; fax: 612-626-8380)
Email: umphil@umn.edu
Website: http://www.philosophy.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A master's minor requires 6 course credits in philosophy approved by the director of graduate studies in Philosophy. Programs are tailored to meet the interests and needs of the student. A doctoral minor requires 12 course credits in philosophy approved by the director of graduate studies in philosophy. Programs are tailored to meet the interests and needs of the student.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students majoring in other fields who wish to pursue a Master's or Doctoral minor in philosophy should contact the director of graduate studies to set up an appointment to discuss their goals and objectives.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The philosophy minor coursework is tailored to meet the interests and needs of the student.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Take 6 or more credit(s) from the following:
- PHIL 5xxx
- PHIL 8xxx

Doctoral
Required Courses
Take 12 or more credit(s) from the following:
- PHIL 5xxx
Twin Cities Campus
Philosophy Ph.D.
Philosophy Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Philosophy, 271 19th Avenue South, 831 Heller Hall, Minneapolis, MN  55455-0310 (612-624-6563; fax: 612-626-8380)
Email: umphil@umn.edu
Website: http://www.philosophy.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 62 to 68
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Philosophy offers both PhD and MA degrees. Students are primarily admitted to the PhD program, while admission to the MA is intended for those with professional goals in other fields and disciplines. The stand-alone MA program is not considered a laddering program into the PhD program at the University of Minnesota or any other institution. Students admitted to the PhD program usually choose to complete an MA Plan B en route to the PhD unless they already hold a master's degree in philosophy from another institution.

Philosophy is noteworthy for its emphasis on the individual student's research interests. With the help of an advisor, students design their own program of study, which consists of the philosophy major and either a supporting program or a minor. The minor or supporting program, drawn at least in part from a department or departments other than philosophy, complements the student's research focus. Students gain a broad base of knowledge through required coursework. PhD students take courses in four main areas: history of philosophy, logic, ELMS (epistemology, philosophy of language, metaphysics or mathematics, philosophy of science), moral and political philosophy, and value theory. These areas provide a firm foundation for research and teaching beyond the PhD program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Recognizing that evidence of ability to pursue graduate study in philosophy is diverse, the department does not specify prerequisites for admission. Normally, those admitted have a broad undergraduate background that includes some courses in philosophy.

Special Application Requirements:
Students must apply to both the University and the Department of Philosophy. The department application for admissions and aid is available from the Admissions and Aid Committee at the address listed above or may be downloaded from the philosophy website at www.philosophy.umn.edu. All application materials may be uploaded electronically to the Graduate School Admissions web site. Department materials required include a completed application form, personal statement, transcripts, three academic letters of recommendation, and a philosophical writing sample that does not exceed 25 pages. Students interested in DOVE or ICGC Fellowship (Interdisciplinary Center for Global Change) should include a statement expressing their interest. Students interested in the ICGC Fellowship should also contact the Interdisciplinary Center for the Study of Global Change. Applications, together with all supporting materials, must be received by December 31 for full consideration. The philosophy department reviews applications once a year, and only admits students for fall semester.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
  - IELTS - Total Score: 6.5
  - MELAB

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
26 to 28 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Use of 4xxx level courses toward program requirements is permitted under certain conditions with adviser approval. For graduate credit, students must enroll in the appropriate 8xxx level (1 credit) accompanying workshop. A maximum of nine (9) 4xxx level courses is allowed according to University policy.

Successful second-year department review includes completion of coursework with specified requirements, which constitutes passing the preliminary written examination. Successful third-year department review includes passing a three-paper examination, Stage 1 and Stage 2 review constitutes passing the preliminary oral examination. Students then write and defend a dissertation proposal and later defend a dissertation at the final oral examination. For details, see the Philosophy Department degree program policy, which is available as a PDF on the philosophy website: www.philosophy.umn.edu.

Required Philosophy Courses
The courses taken in philosophy should show that consideration has been paid to the diversity and variety of areas of philosophy as well as to the student’s specialized interest. The department recommends that students consult with their advisor and the director of graduate studies (DGS) when choosing coursework. Some courses outside the department of philosophy may be used in certain circumstances towards major requirements, with permission from the DGS.

Take 26 - 28 credit(s) from the following:
  • PHIL 5xxx
  • PHIL 8xxx

Outside the Major in a Supporting Field
Take 12 credits outside the major in a supporting field or minor.

Thesis Credits
Take 24 or more credit(s) from the following:
  • PHIL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Political Psychology Minor

School of Journalism & Mass Communication, Political Science Department, Psychology

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Political Science, 1414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455-0410 (612-626-7489; fax: 612-626-7599)
Email: ppcenter@umn.edu
Website: http://www.polisci.umn.edu/cspp/minor.php

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 13
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: This minor is available to doctoral students only.

Political psychology is a rapidly advancing field of scientific inquiry concerned with psychological aspects of political behavior. It encompasses a variety of interdisciplinary research perspectives, drawing on the theories and methods of core disciplines such as psychology, political science, law, and sociology, as well as interdisciplinary fields such as mass communication and decision sciences. The minor's structured curriculum provides a foundation in basic areas of political psychology: social attitudes and cognition, judgment and decision making, group relations, personality and leadership, mass communication, public opinion, mass political behavior, and political socialization. In addition to providing a background in political psychology, the program trains students in the theory and methods useful to this field, such as content analysis, survey analysis, and experimental design. The faculty is drawn from across the University.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
Core Courses
With the approval of the minor DGS, students may substitute an alternative course of at least 3 credits for one of the three core courses listed below. This option may only be utilized if the student takes all three core courses listed below but wishes to count one of the three core courses towards their PhD major rather than their PhD minor.

POL 8311 - Political Psychology and Socialization (3.0 cr)
PSY 8201 - Social Cognition (3.0 cr)
JOUR 8661 - Seminar: Mediated Political Communication in the Digital Age (3.0 cr)

Political Psychology Proseminar
Take at least two semesters of the proseminar.
POL 8307 - Proseminar in Political Psychology I (2.0 cr)
POL 8308 - Proseminar in Political Psychology II (2.0 cr)
or PSY 8211 - Proseminar in Political Psychology I (2.0 cr)
PSY 8212 - Proseminar in Political Psychology II (2.0 cr)

**Methodology Requirement**

Students are advised to do a sequence of methods courses appropriate for their own research plans in political psychology. Generally, this is the standard quantitative method sequence within their major field (e.g. PSY 8814/8815; POL 8106/8107), but may include other courses depending on the students research goals. Students should consult with the minor DGS, especially if they do not plan to complete the standard quantitative method sequence in their major field.
Twin Cities Campus
Political Science M.A.
Political Science Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Political Science, 1414 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4144; fax: 612-626-7599)
Email: polisci@umn.edu
Website: http://www.polisci.umn.edu/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 33
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The political science program only admits students into the PhD program. However, students admitted to the PhD program may earn a master's degree (Plan B) while pursuing their doctorate.

The political science curriculum is divided into five subfields: formal models and methodology, political theory, American politics, international relations, and comparative politics.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 27 major credits and 6 credits outside the major. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Three research papers, usually written in connection with coursework, are required.
Emphases
Choose two core courses from the emphases listed below.
Take 6 or more credit(s) from the following:

Political Theory
- POL 8201 - Understanding Political Theory (3.0 cr)
- American Politics
  - POL 8301 - American Politics (3.0 cr)
- International Relations
  - POL 8401 - International Relations (3.0 cr)
- Comparative Politics
  - POL 8601 - Introduction to Comparative Politics (3.0 cr)
- Political Models and Methodology
  - POL 8120 - Core Course in Political Methodology: Modeling Political Processes (3.0 cr)

Electives
Select two emphases from the above list, and take 9 elective credits to fulfill requirements for each. The additional elective credits can be chosen from any emphasis.

Emphasis 1
Take 9 or more credit(s) from the following:
- POL 8xxx

Emphasis 2
Take 9 or more credit(s) from the following:
- POL 8xxx

Floating Elective
Take 3 or more credit(s) from the following:
- POL 8xxx

Outside Coursework
Take at least 6 credits outside the major.
Twin Cities Campus
Political Science Ph.D.
Political Science Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Political Science, 1414 Social Sciences, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4144; fax: 612-626-7599)
Email: polisci@umn.edu
Website: http://cla.umn.edu/polisci/graduate

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The political science curriculum is divided into five subfields: formal models and methodology, political theory, American politics, international relations, and comparative politics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
All students are admitted directly into the Ph.D. program. To apply, submit the following through the University's graduate online application: Unofficial transcripts, research and diversity statements, GRE scores, three letters of recommendation, curriculum vitae or resume, writing sample, TOEFL or IELTS for non-native English speakers.

The application deadline is December 15. For more information, see the Political Science Admissions website.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
30 credits are required in the major.
6 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.30 is required for students to remain in good standing.

Research methodology requirementstudents must demonstrate one of the following: a) high proficiency in one foreign language; b) high proficiency in research methodology; c) low proficiency in two foreign languages; d) low proficiency in one foreign language and low proficiency in research methodology.

Field Emphases
Choose two of the core courses from the fields below:
Take 6 or more credit(s) from the following:
Political Theory
• POL 8201 - Understanding Political Theory (3.0 cr)

American Politics
• POL 8301 - American Politics (3.0 cr)

International Relations
• POL 8401 - International Relations (3.0 cr)

Comparative Politics
• POL 8601 - Introduction to Comparative Politics (3.0 cr)

Political Models and Methodology
• POL 8120 - Core Course in Political Methodology: Modeling Political Processes (3.0 cr)

Electives
Students select 2 emphases from above for which to fulfill their electives below:

Emphasis 1
Take 9 or more credit(s) from the following:
• POL 8xxx

Emphasis 2
Take 9 or more credit(s) from the following:
• POL 8xxx

Floating Elective
Take 3 or more credit(s) from the following:
• POL 8xxx

Professional Development Courses
Take 3 or more credit(s) from the following:
Taken during Spring of first year:
• POL 8104 - Professional Development I (2.0 cr)

Taken during Fall of Third year:
• POL 8105 - Professional Development II (1.0 cr)

Outside the Major in a Supporting Program
Take 6 graduate credits outside the department of political science in a minor or supporting program.

Thesis Credits
Take 24 or more credit(s) from the following:
• POL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Population Studies Minor
Sociology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Sociology, 909 Social Sciences, 267 19th Ave S, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: popminor@umn.edu
Website: https://pop.umn.edu/gradstudent-training/popminor

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Population studies is a multidisciplinary research area at the intersection of the mathematical sciences, the health and social sciences, and public policy. The curriculum provides solid grounding in the theories and methods of demography, with additional specialized training across five interdisciplinary subject areas: historical demography, population geography, economic demography, public health demography, and family and life course demography.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

All courses should be from the same subject area and may not be in the student’s major field. Courses must be taken A-F.

SOC 8590 (Topics in Life Course Sociology; 3 credits) can be applied as an elective only if the topic is one of the following:

Sociology of Time: Age, Work and the Gendered Life Course
Work Health and Well Being

Required Courses
PA 5301 - Population Methods & Issues for the United States & Global South (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Electives
Take 3 or more credit(s) from the following:
• APEC 8701 - Trade and Development I (2.0 cr)
• FW 5051 - Analysis of Populations (4.0 cr)
• GERO 5103 - Aging and Society (2.0 cr)

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Information current as of August 31, 2018
• HIST 5797 - Methods of Population History (3.0 cr)
• HIST 5970 - Advanced Research in Quantitative History (4.0 cr)
• HIST 8970 - Advanced Research in Quantitative History (3.0 cr)
• HSG 8463 - Housing: Race and Class (3.0 cr)
• PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)
• PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
• PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
• PA 8312 - Analysis of Discrimination (4.0 cr)
• PA 8331 - Economic Demography (3.0 cr)
• PA 8461 - Global and U.S. Perspectives on Health and Mortality (3.0 cr)
• PUBH 5099 - Topics: Epidemiology and Community Health (1.0 - 4.0 cr)
• PUBH 6370 - Social Epidemiology (2.0 cr)
• PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
• PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 cr)
• PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
• PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SOC 8551 - Life Course Inequality & Health (3.0 cr)
• SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)
• SOC 8590 - Topics in Life Course Sociology (3.0 cr)
  SOC 8590 (Topics in Life Course Sociology; 3 credits) can be applied as an elective only if the topic is one of the following:
  - Sociology of Time: Age, Work and the Gendered Life Course
  - Work Health and Well Being
• SOC 5090 - Topics in Sociology (1.0 - 3.0 cr)
  SOC 5090 (Topics in Life Course Sociology; 3 credits) can be applied as an elective only if the topic is one of the following:
  - Immigration to the U.S.: Beyond Walls

Doctoral
Electives
Take 9 or more credit(s) from the following:
• APEC 8701 - Trade and Development I (2.0 cr)
• FW 5051 - Analysis of Populations (4.0 cr)
• GER 5103 - Aging and Society (2.0 cr)
• HIST 5797 - Methods of Population History (3.0 cr)
• HIST 5970 - Advanced Research in Quantitative History (4.0 cr)
• HSG 8463 - Housing: Race and Class (3.0 cr)
• PA 5022 - Applications of Economics for Policy Analysis (1.5 - 3.0 cr)
• PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
• PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
• PA 8312 - Analysis of Discrimination (4.0 cr)
• PA 8331 - Economic Demography (3.0 cr)
• PA 8461 - Global and U.S. Perspectives on Health and Mortality (3.0 cr)
• PUBH 5099 - Topics: Epidemiology and Community Health (1.0 - 4.0 cr)
• PUBH 6370 - Social Epidemiology (2.0 cr)
• PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
• PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 cr)
• PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
• PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SOC 8551 - Life Course Inequality & Health (3.0 cr)
• SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)
• SOC 8590 - Topics in Life Course Sociology (3.0 cr)
  SOC 8590 (Topics in Life Course Sociology; 3 credits) can be applied as an elective only if the topic is one of the following:
  - Sociology of Time: Age, Work and the Gendered Life Course
  - Work Health and Well Being
• SOC 5090 - Topics in Sociology (1.0 - 3.0 cr)
  SOC 5090 (Topics in Life Course Sociology; 3 credits) can be applied as an elective only if the topic is one of the following:
  - Immigration to the U.S.: Beyond Walls

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Twin Cities Campus
Psychology M.A.
Psychology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Psychology, S253 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-4181; fax: 612-626-2079)
Email: psyapply@umn.edu
Website: http://psych.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are admitted only for the PhD degree.

Doctoral program specialties are offered in biological psychopathology; clinical science and psychopathology research; cognitive and brain sciences; counseling psychology; industrial/organizational psychology; personality, individual differences, and behavior genetics; quantitative/psychometric methods; and social psychology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: Plan B requires one to three review papers in lieu of a thesis.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Courses
Take 14 or more credit(s) from the following:
• PSY 5xxx
• PSY 8xxx

Outside the Major in a Supporting Program
Students are required to take 6 credits outside the major in a minor or supporting program.

Plan Options

Plan A
Thesis Credits
Take 10 or more credit(s) from the following:
• PSY 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Take 10 or more credit(s) from the following:
• PSY 5xxx
• PSY 8xxx
Twin Cities Campus
Psychology Minor
Communication Studies, Political Science Department, Psychology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Psychology, S253 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-4181; fax: 612-626-2079)
Email: psyapply@umn.edu
Website: http://psych.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate minor in psychology is only available to doctoral students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Students must obtain the approval of the Psychology director of Graduate Studies to pursue the minor.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The student must also obtain the approval of the Psychology director of Graduate Studies to use 4xxx courses for the minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
Doctoral Minor Requirements
Take 12 or more credit(s) from the following:
- PSY 5xxx
- PSY 8xxx
Twin Cities Campus
Psychology Ph.D.
Psychology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Psychology, S246 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-4181; fax: 612-626-2079)
Email: psyapply@umn.edu
Website: http://psych.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60 to 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students are admitted only for the Ph.D. degree. Doctoral program specialties are offered in biological psychopathology; clinical science and psychopathology research; cognitive and brain sciences; counseling psychology; industrial/organizational psychology; personality, individual differences, and behavior genetics; quantitative/psychometric methods; school psychology; and social psychology.

Accreditation
This program is accredited by Committee on Accreditation of the Amer. Psychological Assoc (for Clinical & Counseling specialities)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Although there are no specific minimums for GPA and GRE scores, previous admissions statistics are available from the psychology website at psych.umn.edu.

Other requirements to be completed before admission:
Recommended academic preparation includes a minimum of 12 credits (three to four courses) of psychology coursework beyond introductory psychology, including one course in statistics or psychological measurement. Applicants to the clinical science program must have completed a course in abnormal psychology. An undergraduate major in psychology is desirable, but not required.

Special Application Requirements:
Applications are accepted for fall admission only; the deadline is December 1. A department application; a statement of career interests, goals, and objectives; three letters of recommendation from persons familiar with the applicant's scholarship and research potential; and scores from the GRE General Test are required. The GRE Subject Test in psychology is not required, but highly recommended. Applicants whose native language is not English must submit the results of the TOEFL iBT. Applications are submitted electronically through the ApplyYourself application system. For more information about the application procedures, see the psychology website at psych.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 23
- IELTS
  - Total Score: 6.5
- MELAB
  - Speaking test score: 8
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

24 to 36 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Students must satisfy the general area distribution requirement using selected courses in four areas outside their specialization. There are no other general departmental course requirements. Each student's program is individually planned in consultation with an adviser to meet both the individual's goals and the specialty requirements. The specializations in clinical psychology and counseling psychology include specific requirements for applied coursework and practicum and internship experience. Each specialization also requires completion of a series of Ph.D. seminars covering scholarship and research skills. Students also complete a minimum of 12 credits in a minor or supporting program. Students are admitted into one specialty area when they apply. Please go to the Psychology website at www.psych.umn.edu to learn more about our specialty areas. Applicants are allowed to apply to only one specialty area.

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

School Psychology
Twin Cities Campus
Public Art Minor
Art Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Public Art Program, Weisman Art Museum, University of Minnesota, 333 East River Road, Minneapolis, MN 55455 (612-625-9686; fax: 612-625-9630)

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Public Art minor is inactive at this time. The graduate minor in public art (PArt) is an interdisciplinary program designed to expose students to the history of public art, contemporary issues, and current practices. The minor provides students the opportunity to work with instructors and other students with backgrounds in studio arts, design, architecture, landscape architecture, urban design, and public policy to learn collaborative methods essential to public art making and public art administration. Specifically, the minor provides students with a theoretical basis to both understand and produce public art projects. The minor includes a set of core courses in public art history, current issues and criticisms, and public engagement.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
This graduate minor is available to master's and doctoral students. Preference will be given to students with backgrounds in art, architecture, landscape architecture, urban design, and public policy. The PArt Admissions Committee screens applications and determines admission. Admission is limited to 25 students annually.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Master's and doctoral students take Issues and Ideas in Contemporary Public Art and History of Public Art as well as a practicum in Public Engagement. Doctoral students must also complete an internship.
**Twin Cities Campus**

**Religious Studies Minor**  
Classical & Near Eastern Studies  
College of Liberal Arts

Link to a list of faculty for this program.

**Contact Information:**  
Religious Studies Program, 245 Nicholson Hall, 216 Pillsbury Avenue S.E., Minneapolis, MN 55455 (612-625-6393)  
Email: rels@umn.edu  
Website: [http://religiousstudies.umn.edu/grad/](http://religiousstudies.umn.edu/grad/)

- Program Type: Graduate free-standing minor  
- Requirements for this program are current for Fall 2018  
- Length of program in credits (Masters): 9  
- Length of program in credits (Doctorate): 12  
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](http://religiousstudies.umn.edu/grad/) section of the catalog website for requirements that apply to all major fields.

The minor in religious studies is available to master's and doctoral students in relevant fields such as American studies, anthropology, art history, classics, English, history, journalism, philosophy, and sociology, and is under the general direction of members of the graduate faculty who represent a broad spectrum of disciplines.

**Program Delivery**  
This program is available:  
* via classroom (the majority of instruction is face-to-face)  

**Prerequisites for Admission**  
Other requirements to be completed before admission:  
Admission is contingent on prior admission to a master's or doctoral degree-granting program.

For an online application or for more information about graduate education admissions, see the [General Information](http://religiousstudies.umn.edu/grad/) section of the catalog website.

**Program Requirements**  
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

All students pursuing the minor must complete RELS 5001. Remaining coursework is chosen in consultation with the Religious Studies director of Graduate Studies.

**Required Course**  
RELS 5001 - Theory and Method in the Study of Religion: Critical Approaches to the Study of Religion (3.0 cr)

**Program Sub-plans**  
Students are required to complete one of the following sub-plans.  
Students may not complete the program with more than one sub-plan.

**Masters**  
**Religious Studies Electives**  
Take 6 or more credit(s) from the following:  
• RELS 5xxx  
• RELS 8xxx

**Doctoral**  
**Religious Studies Electives**
Take 9 or more credit(s) from the following:
- RELS 5xxx
- RELS 8xxx
**Twin Cities Campus**  
**Rhetoric, Scientific and Technical Communication M.A.**  
**Writing Studies Department**  
**College of Liberal Arts**

Link to a list of faculty for this program.

**Contact Information:**  
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Drive, SE, Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)  
Email: WRIT@umn.edu  
Website: http://cla.umn.edu/writing-studies

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 33  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MA in rhetoric and scientific and technical communication prepares students to address complex issues in language, science, and technology. This program prepares students for doctoral-level research through courses and seminars in research methods, rhetoric, writing studies, pedagogy, and technical communication, technology and culture. Students also pursue additional courses of interest in allied departments to broaden their experience. In addition, you will write a research paper on a limited topic and present it at an oral examination.

Required courses include classical and modern rhetoric, research methods, and courses in writing studies and pedagogy, technical communication, and technology and culture. Students take at least 6 credits outside the department as a masters minor or supporting field. They also write a plan "B" paper in the context of a directed research course.

All MA applicants must meet the admission requirements of the University. MA applicants should have a strong interest in language and rhetorical theory or communication theory. A background in a science, Internet studies, environmental studies, or pedagogy and technology is helpful.

**Program Delivery**  
This program is available:  
* via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
Undergraduate degree in a related discipline.

**Special Application Requirements:**  
Scores from the General Test of the GRE that are less than five years old are required of students with baccalaureate degrees from U.S. institutions. International students are encouraged to take the General Test of the GRE. Nonnative speakers of English are required to take an appropriate test with satisfactory scores. All applicants must submit three letters of recommendation, two writing samples, and a professional objective statement. All M.A. and Ph.D. applicants begin in the fall semester and should apply by the January 1 application deadline.

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Total Score: 79  
  - Internet Based - Writing Score: 21  
  - Internet Based - Reading Score: 19  
  - Paper Based - Total Score: 550  
- IELTS  
  - Total Score: 6.5  
- MELAB  
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

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Information current as of August 31, 2018
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan B:** Plan B requires 27 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Research Core**
- WRIT 8011 - Research Methods in Writing Studies and Technical Communication (3.0 cr)
- WRIT 8012 - Applied Research Methods in Writing Studies and Technical Communication (3.0 cr)

**Rhetoric Core**
- WRIT 5775 - The Rhetorical Tradition: Classical Period (3.0 cr)
- WRIT 5776 - The Rhetorical Tradition: Modern Era (3.0 cr)

**Writing Studies and Pedagogy**
- WRIT 8540 - Seminar in Technical Communication and Composition Pedagogies (3.0 cr)
  - or WRIT 8560 - Seminar in Writing Studies and Usability (3.0 cr)
  - or WRIT 5531 - Introduction to Writing Theory and Pedagogy (3.0 cr)

**Technical Communication and Composition Pedagogies**
- WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)
  - or WRIT 8550 - Seminar in Technology, Culture, and Communication (3.0 cr)

**Plan B Project Credits**
Take 3 or more credit(s) from the following:
- WRIT 8794 - Directed Research (1.0 - 4.0 cr)

**Specialty Area/Concentration**
Students are required to take 6 credits for this area, of which 3 credits must be taken in the Department of Writing Studies. The student's area of concentration will be developed chiefly through seminars in writing studies, and through consultation with the advisor.

**Outside Coursework**
Take at least 6 credits outside the Department of Writing Studies. Students often pursue a formal minor related to their research interests, chosen in conjunction with their advisor.
Twin Cities Campus
Rhetoric, Scientific and Technical Communication Minor
Writing Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Dr SE, Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://cla.umn.edu/writing-studies

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate minor in Rhetoric, Scientific and Technical Communication.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Students must be admitted into a master's or doctoral program at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

For master's degree students, the minor requires 6 credits in 5xxx and 8xxx WRIT courses. The minor for PhD students requires 12 credits of 5xxx and 8xxx WRIT courses, with one course being in rhetorical theory and criticism. Students may choose the remaining courses from any of writing studies graduate courses.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Coursework
Take 6 or more credit(s) from the following:
• WRIT 5xxx
• WRIT 8xxx

Doctoral
Rhetorical Theory and History
Take 3 or more credit(s) from the following:
• WRIT 8510 - Seminar in Rhetoric (3.0 cr)
• WRIT 5775 - The Rhetorical Tradition: Classical Period (3.0 cr)
• WRIT 5776 - The Rhetorical Tradition: Modern Era (3.0 cr)
Electives
Take 9 or more credit(s) from the following:

- WRIT 5xxx
Twin Cities Campus
Rhetoric, Scientific and Technical Communication Ph.D.
Writing Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Drive, SE, Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://cla.umn.edu/writing-studies

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The primary purpose of the PhD program is to prepare graduate students to do research in areas related to writing, rhetoric, and scientific & technical communication, and to publish the results of that research.

Working in collaboration with faculty mentors, other students, and resources, such as the library and the internet, graduate students will become expert in a specialized field of knowledge, developing the scholarly and research skills needed to make a new and original contribution to research in rhetoric, composition, writing studies, literacy, or technical/scientific communication. Graduate students build their expertise and skills in the core areas of rhetoric, theory and history, writing studies and pedagogy, and technical communication and technology and culture. They also develop and refine knowledge and skills through departmental seminars and a supporting program of courses outside the department. The dissertation—an original, systematic, and significant program of research—will allow graduate students to join scholarly conversations and contribute to knowledge and theory within the field. This project, and the mentoring students receive as they complete the project, will stand students in good stead to continue to make important research contributions in their academic careers as they unfold.

Preparing graduate students to teach first-year writing, scientific and technical communication, and other courses related to their expertise is an important part of the program because the expectation is that graduates will teach at the college level. While most graduate students have entered college teaching, a few have preferred to work in industry or non-government organizations.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Masters in a related discipline, e.g., rhetoric, technical and professional communication, English, communication studies.

Other requirements to be completed before admission:
Applicants for the PhD must complete a master's degree, no later than the end of the first semester in our PhD program. Applicants will be asked to discuss their interests, explain their master's program and how the PhD will build upon it.

Special Application Requirements:
Scores from the General Test of the GRE that are less than five years old are required of students with baccalaureate degrees from U.S. institutions. International students are encouraged to take the General Test of the GRE and to have those results forwarded to the University. Nonnative speakers of English are required to take an appropriate test with satisfactory scores. All applicants must submit three letters of recommendation, two writing samples, and a professional objective statement. All M.A. and Ph.D. applicants begin in the fall semester and should apply by the January 5th application deadline.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

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Information current as of August 31, 2018
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
30 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Up to 6 credits from a master's program, upon consultation with the advisor and approval of the director of graduate studies, can be applied to the PhD.

Research Core
Take the following 6 credits of research core coursework:
- WRIT 8011 - Research Methods in Writing Studies and Technical Communication (3.0 cr)
- WRIT 8012 - Applied Research Methods in Writing Studies and Technical Communication (3.0 cr)

Required Core Areas
Take at least 3 credits from each of the following core areas, and an additional 6 credits from any of these areas, for a total of 15 credits.

Take 15 or more credit(s) from the following:
Rhetoric Theory and History
Take at least 3 credits from the following:
- WRIT 8510 - Seminar in Rhetoric (3.0 cr)
- WRIT 5775 - The Rhetorical Tradition: Classical Period (3.0 cr)
- WRIT 5776 - The Rhetorical Tradition: Modern Era (3.0 cr)

Writing Studies and Pedagogy
Take at least 3 credits from the following:
- WRIT 8540 - Seminar in Technical Communication and Composition Pedagogies (3.0 cr)
- WRIT 8560 - Seminar in Writing Studies and Usability (3.0 cr)
- WRIT 5531 - Introduction to Writing Theory and Pedagogy (3.0 cr)

Technical Communication and Composition Pedagogies
Take at least 3 credits from the following:
- WRIT 8520 - Seminar in Scientific and Technical Communication (3.0 cr)
- WRIT 8550 - Seminar in Technology, Culture, and Communication (3.0 cr)

Writing Studies Specialty Area/Concentration
Specialties include areas such as rhetoric, literacies, professional and technical communication, internet studies, theories of writing, writing pedagogies, rhetorics of science, medicine, or law, and the environment.

Writing Studies Courses
Take 6 or more credit(s) from the following:
- WRIT 5xxx
- WRIT 8xxx

Non-Writing Studies Course
Take at least 3 credits.
Coursework is chosen in consultation with the advisor, and must be outside the writing studies department but within the specialty area/concentration theme.

Outside Coursework
Take 12 credits of coursework outside the major.
Thesis Credits
Take 24 or more credit(s) from the following:
- WRT 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Scientific and Technical Communication M.S.
Writing Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 214 Nolte Center, 315 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://cla.umn.edu/writing-studies

- Program Type: Master’s
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's of science in scientific and technical communication focuses on applying basic theory and research to the practice of scientific and technical communication in the workplace.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 21 major credits and 9 credits outside the major. There is no final exam. A capstone project is required.
Capstone Project: The capstone course (WRIT 8505), this is the final course necessary to complete the degree requirements. The course is primarily for students seeking the MS in scientific and technical communication, but is also suitable for graduate students in any program who want structured support to write an extended project report. Classes are conducted in a “writers’ workshop” format, during which each student receives feedback and support for his or her individual research report writing.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Required Courses
Take the following courses for a total of 18 credits:
WRIT 5001 - Introduction to Graduate Studies in Scientific and Technical Communication (3.0 cr)
WRIT 5112 - Information Design: Theory and Practice (3.0 cr)
WRIT 5561 - Editing and Style for Technical Communicators (3.0 cr)
WRIT 8505 - Professional Practice (3.0 cr)
WRIT 5671 - Visual Rhetoric (3.0 cr)
WRIT 4501 - Usability and Human Factors in Technical Communication (3.0 cr)

Electives
Take at least 3 credits of electives, in consultation with the advisor.
Electives
Take 3 or more credit(s) from the following:
  • WRIT 4xxx

Related Field Competency Area
Take at least 9 credits outside the Department of Writing Studies, in consultation with the director of graduate studies.
Possible areas of study include, but are not limited to:
  Health sciences
  International technical communication
  Food science and nutrition
  Technical communication and software engineering
  Technical communication and environmental science
  Technical communication and law
Twin Cities Campus
Scientific and Technical Communication Minor
Writing Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Dr SE, Minneapolis, MN 55455; (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: https://cla.umn.edu/writing-studies

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Writing Studies graduate minor in scientific and technical communication is available for students enrolled in other University graduate programs. The minor offers writing studies courses, many of which are online, in areas such as editing and style, writing with digital technologies, information design, and international professional communication.

Program Delivery

This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans

Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required
Take 6 or more credit(s) from the following:
• WRIT 5xxx
• WRIT 8xxx
Twin Cities Campus
Sociology M.A.
Sociology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Sociology, 909 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: soc@umn.edu
Website: http://cla.umn.edu/sociology/graduate

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 33
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: The sociology program only admits students into the Ph.D. program. However, students admitted to the Ph.D. may earn a master's degree while pursuing their doctorate. See the Ph.D. for admissions information.

Sociology is concerned with the study of human societies, groups, and social life. The program offers substantive training in seven areas of specialization:

1. Demography and population studies
2. Global, Transnational, & Comparative Sociology
3. Inequalities and identities: race, gender, sexuality, class, religion, and nation
4. Law, crime, punishment, and human rights
5. Life course: Family, education, and well-being
6. Networks, organizations, and work
7. Theory, knowledge, and culture

Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Special Application Requirements:
The sociology program only admits students into the Ph.D. program. However, students admitted to the Ph.D. may earn a master's degree while pursuing their doctorate. See the Ph.D. for admissions information.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 17 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written and oral.
This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Required Core Courses (17 Credits)**

- SOC 8701 - Sociological Theory (4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)

Take 3 or more credit(s) from the following:

- SOC 8851 - Advanced Qualitative Research Methods: In-Depth Interviewing (3.0 cr)
- SOC 8852 - Advanced Qualitative Research Methods: Ethnographic Practicum (3.0 cr)
- SOC 8853 - Advanced Qualitative Research Methods: Historical & Comparative Sociology (3.0 cr)
- SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)

Take 2 or more credit(s) from the following:

- SOC 8001 - Sociology as a Profession (1.0 cr)

**Outside Coursework (6 Credits)**

Select 6 credits outside the major, in consultation with the advisor.

**Plan Options**

**Plan A**

Thesis Credits

Take 10 or more credit(s) from the following:

- SOC 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

**Plan B**

Select additional coursework in consultation with the advisor.

Take 7 or more credit(s) from the following:

- SOC 8xxx
**Twin Cities Campus**

**Sociology Minor**

*Sociology*

*College of Liberal Arts*

Link to a list of faculty for this program.

**Contact Information:**
Department of Sociology, 909 Social Sciences Building, 267 19th Ave S, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: soc@umn.edu
Website: [http://cla.umn.edu/sociology/graduate](http://cla.umn.edu/sociology/graduate)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Sociology is concerned with the study of human societies, groups, and social life. The program offers substantive training in seven areas of specialization:

1. Demography and population studies
2. Global, transnational, and comparative sociology
3. Inequalities and identities: race, gender, sexuality, class, religion, and nation
4. Law, crime, punishment, and human rights
5. Life course: family, education, and well-being
6. Networks, organizations, and work
7. Theory, knowledge, and culture

Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

**Special Application Requirements:**
Students already enrolled in a University of Minnesota graduate program should contact the Sociology Department's graduate program associate as the first step toward applying for a graduate minor in sociology.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

Course choices are subject to the approval of the Sociology director of Graduate Studies.

**Program Sub-plans**

Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Masters**
Courses
Take 6 or more credit(s) from the following:
• SOC 5xxx
• SOC 8xxx

Doctoral Courses
Take 12 or more credit(s) from the following:
• SOC 8xxx
Twin Cities Campus
Sociology Ph.D.
Sociology
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Sociology, 909 Social Sciences Building, 267 19th Avenue South, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: soc@umn.edu
Website: http://cla.umn.edu/sociology/graduate

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 65
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Sociology is concerned with the study of human societies, groups, and social life. The program offers substantive training in seven areas of specialization:

1. Demography and population studies
2. Global, transnational, and comparative sociology
3. Inequalities and identities: Race, gender, sexuality, class, religion, and nation
4. Law, crime, punishment, and human rights
5. Life course: Family, education, and well-being
6. Networks, organizations, and work
7. Theory, knowledge, and culture

Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research. The doctoral program is for students planning to do research or teach.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
Students are not required to have earned a graduate or professional degree prior to entering the program.

It is recommended that applicants have a background in basic sociology, usually consisting of the equivalent of 18 credits in undergraduate work (including 9 credits of social science statistical methods), or an MA degree in sociology or a closely related field. Individuals without sociology coursework are generally required to complete background coursework in theory and statistics during their first year of residence.

Special Application Requirements:
Applicants are evaluated on their academic potential, commitment to the field, creativity, and potential for contribution to the field. In addition to the University application form, and its required documents, applicants must submit the following: GRE scores; a sample of written work, usually a term paper, written in English; three letters of recommendation; and a personal statement of professional objectives. Non-native English speakers are required to take the TOEFL test, this includes students who have studied in the U.S. The department accepts new students for fall admission only. The application deadline is December 15.

Applicants must submit their test score(s) from the following:
- GRE
International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 95
  - Internet Based - Listening Score: 22
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
  - Internet Based - Speaking Score: 27
  - Paper Based - Total Score: 587

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
29 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Required Core Courses (17 Credits)
Take 17 or more credit(s) from the following:
- SOC 8701 - Sociological Theory (4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)
- Take 3 or more credit(s) from the following:
  - SOC 8851 - Advanced Qualitative Research Methods: In-Depth Interviewing (3.0 cr)
  - SOC 8852 - Advanced Qualitative Research Methods: Ethnographic Practicum (3.0 cr)
  - SOC 8853 - Advanced Qualitative Research Methods: Historical & Comparative Sociology (3.0 cr)
  - SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)
- Take 2 or more credit(s) from the following:
  - SOC 8001 - Sociology as a Profession (1.0 cr)

Required Sociology Electives (12 Credits)
Select elective coursework in consultation with the advisor.
Take 12 or more credit(s) from the following:
- SOC 8xxx

Outside Coursework (12 Credits)
Select at least 12 credits outside the major, in consultation with the advisor.

Thesis Credits
Take 24 or more credit(s) from the following:
- SOC 8888 - Thesis Credits: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Speech-Language-Hearing Science M.A.
Speech-Language-Hearing Sciences
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Speech-Language-Hearing-Sciences, 115 Shevlin Hall, 164 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-3322; fax: 612-624-7586)
Email: slhsgrad@umn.edu
Website: http://www.slhs.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 36 to 60
- This program requires summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Speech-Language-Hearing Sciences offers an MA with three tracks: speech-language pathology, audiology, and speech-language-hearing sciences; however, the department only accepts MA applications for the speech-language pathology track. The speech-language pathology track focuses on meeting standards for certification as a speech-language pathologist by the American Speech-Language-Hearing Association. It emphasizes outcome-based learning activities that prepare graduates to interpret research findings and incorporate them into clinical practice. Coursework and clinical education focus on diagnostic, rehabilitative techniques, technology counseling approaches, and human development.

Individuals interested in pursuing an advanced degree in audiology should apply directly to the audiology AuD program. Students admitted to the AuD are eligible to apply for the MA with an audiology track.

The Speech-Language Pathology MA program is accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association, 2200 Research Blvd, Rockville, MD 20850, Telephone: 800-638-8255

Accreditation
This program is accredited by American Speech-Language-Hearing Association (ASHA).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Prerequisite coursework includes undergraduate transcript credit in physical science, biological science, social/behavioral science, and statistics.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

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Information current as of August 31, 2018
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 44 to 50 major credits, 0 to 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 30 to 60 major credits and 0 to 6 credits outside the major. The final exam is written and oral.

Plan C: Plan C requires 48 to 54 major credits and 0 to 6 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Related Fields

Take 6 or more credit(s) from the following:

- ADDS 5021 - Introduction to Evidence Based Practices and the Helping Relationship (3.0 cr)
- CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
- CPSY 4302 - Infant Development (3.0 cr)
- CPSY 4329 - Biological Foundations of Development (3.0 cr)
- CPSY 4341 - Perceptual Development (3.0 cr)
- CPSY 4343 - Cognitive Development (3.0 cr)
- CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- EPSY 5101 - Intelligence and Creativity (3.0 cr)
- EPSY 5135 - Human Relations Workshop (4.0 cr)
- EPSY 5400 - Special Topics in Counseling Psychology (1.0 - 4.0 cr)
- EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
- EPSY 5451 - College Students Today (3.0 cr)
- EPSY 5461 - Cross-Cultural Counseling (3.0 cr)
- EPSY 5609 - Family-centered Services (2.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
- EPSY 5641 - Foundations of Deaf Education (3.0 cr)
- EPSY 5642 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5644 - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
- EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
- EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
- EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
- GERO 5125 - Gerontology Service Learning (3.0 cr)
- HINF 5501 - US Health Care System: Information Challenges in Clinical Care (1.0 cr)
- KIN 8211 - Seminar: Perception and Action (3.0 cr)
- LING 8921 - Seminar in Language and Cognition (3.0 cr)
- NSCI 5101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
- NSCI 5111 - Medical Neuroscience for Graduate Students (5.0 cr)
- OTOL 8234 - Anatomy of the Head and Neck and Temporal Bone Dissection (2.0 cr)
- OTOL 8247 - Anatomy and Physiology of Hearing and Balance (3.0 cr)
- PHAR 5201 - Applied Medical Terminology (2.0 cr)
- PSY 4036 - Perceptual Issues in Visual Impairment (3.0 cr)
- PSY 4960 - Seminar in Psychology (1.0 - 4.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5037 - Psychology of Hearing (3.0 cr)
- PSY 5054 - Psychology of Language (3.0 cr)
- PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
- PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
• PSY 8037 - Psychophysics and Audition (3.0 cr)
• PUBH 6370 - Social Epidemiology (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SLHS 5900 - Topic in Speech-Language-Hearing Sciences (1.0 - 3.0 cr)
• SLHS 8530 - Seminar: Speech (3.0 cr)
• BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
• CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
• EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
• FSOS 5942 - Everyday Experiences of Families (2.0 cr)
• FSOS 5937 - Parent-Child Interaction (3.0 cr)
• FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
• OLDP 5211 - Introduction to the Undereducated Adult (1.0 cr)
• SOC 4246 - Sociology of Health and Illness (3.0 cr)
• BTHX 5000 - Topics in Bioethics (1.0 - 4.0 cr)
• CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
• CI 5642 - Assessing English Learners (3.0 cr)
• CI 5653 - Methods in Teaching English as a Second Language (ESL) in Higher Education (3.0 cr)
• CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
• FSOS 4107 - Traumatic Stress and Resilience in Vulnerable Families Across the Lifespan (3.0 cr)
• EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
• EPSY 8600 - Special Topics: Special Education Issues (1.0 - 3.0 cr)
• OLDP 5356 - Disability Policy and Services (3.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
• PSY 5062 - Cognitive Neuropsychology (3.0 cr)
• PSY 5138 - Adult Development and Aging (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Speech-Language Pathology
This sub-plan is limited to students completing the program under Plan A or Plan C.

The speech-language pathology program emphasizes outcome-based learning activities that prepare graduates to interpret research findings and incorporate them into clinical practice. Coursework and clinical education focus on diagnostic, rehabilitative techniques, technology counseling approaches, and human development. This sub-plan is accredited by the American Speech-Language-Hearing Association for certification in speech-language pathology.

Students in this sub-plan may elect the Plan A option (60-credit minimum) or the Plan C option (54-credit minimum).

Speech Language Pathology: Required Courses
SLHS 5401 - Counseling and Professional Issues (3.0 cr)
SLHS 5502 - Voice and Cleft Palate (3.0 cr)
SLHS 5503 - Fluency and Motor Speech Disorders (3.0 cr)
SLHS 5504 - Evaluation and Management of Dysphagia (2.0 cr)
SLHS 5602 - Speech Sound Disorders: Assessment and Treatment across Languages (3.0 cr)
SLHS 5603 - Assessment and Intervention of Language Disorders in Children (3.0 cr)
SLHS 5605 - Language and Cognitive Disorders in Adults (3.0 cr)
SLHS 5606 - Introduction to Augmentative and Alternative Communication (3.0 cr)
SLHS 5608 - Clinical Issues in Bilingualism and Cultural Diversity (3.0 cr)

Clinical Education in Speech-Language Pathology
Take exactly 17 credit(s) from the following:
• SLHS 8720 - Clinical Education in Speech-Language Pathology (1.0 - 8.0 cr)

Clinical Education in Audiology
Take exactly 1 credit(s) from the following:
• SLHS 8820 - Clinical Education in Audiology (1.0 - 8.0 cr)

Related Fields
In addition to the other Related Fields options, SLP students can use the following course to fulfill their requirement:
Take 0 or more course(s) from the following:
- SLHS 5804 - Cochlear Implants (3.0 cr)
- SLHS 5805 - Advanced Rehabilitative Audiology (3.0 cr)
- SLHS 5808 - Pathophysiology of Hearing Disorders (3.0 cr)

Plans Options for Speech-Language Pathology Track

Plan A
Take exactly 10 credit(s) from the following:
- SLHS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
- OR-

Plan C
Take exactly 4 credit(s) from the following:
- SLHS 8994 - Directed Research (1.0 - 12.0 cr)

Audiology
This sub-plan is limited to students completing the program under Plan B.

The audiology program emphasizes outcome-based learning activities that prepare graduates to interpret research findings and incorporate them into clinical practice. Coursework and clinical education focus on diagnostic, rehabilitative techniques, technology counseling approaches, and human development.

The audiology sub-plan requires a total of 60 credits, and a Plan B comprehensive written exam and a final oral examination.

Audiology Track: Required Courses
- SLHS 5401 - Counseling and Professional Issues (3.0 cr)
- SLHS 5801 - Advanced Audiologic Assessment (3.0 cr)
- SLHS 5802 - Hearing Aids I (3.0 cr)
- SLHS 5803 - Pediatric Audiology (3.0 cr)
- SLHS 5804 - Cochlear Implants (3.0 cr)
- SLHS 5805 - Advanced Rehabilitative Audiology (3.0 cr)
- SLHS 5806 - Auditory Processing Disorders (3.0 cr)
- SLHS 5807 - Noise and Hearing Conservation (3.0 cr)
- SLHS 5808 - Pathophysiology of Hearing Disorders (3.0 cr)
- SLHS 8801 - Electrophysiologic Assessment of Auditory Function (3.0 cr)
- SLHS 8802 - Hearing Aids II (3.0 cr)
- SLHS 8803 - Signals and Systems in Audiology (3.0 cr)
- SLHS 8805 - Hearing Science Foundations of Audiology (3.0 cr)
- SLHS 8807 - Balance Assessment (3.0 cr)

Laboratory Module in Audiology
Take exactly 2 credit(s) from the following:
- SLHS 5810 - Laboratory Module in Audiology (1.0 - 2.0 cr)

Clinical Research and Practice: Grand Rounds
Take exactly 4 credit(s) from the following:
- SLHS 5820 - Clinical Research and Practice: Grand Rounds (1.0 - 6.0 cr)

Clinical Foundations in Audiology
Take exactly 2 credit(s) from the following:
- SLHS 5830 - Clinical Foundations in Audiology (1.0 - 8.0 cr)

Related Fields
In addition to the other Related Fields course options, students in the AuD track can use the following courses to fulfill the Related Fields requirement:
Take 0 or more course(s) from the following:
- SLHS 5602 - Speech Sound Disorders: Assessment and Treatment across Languages (3.0 cr)
- SLHS 5603 - Assessment and Intervention of Language Disorders in Children (3.0 cr)

Plan B Audiology Track

Directed Research
Take exactly 4 credit(s) from the following:
- SLHS 8994 - Directed Research (1.0 - 12.0 cr)

Speech-Language-Hearing Sciences (SLHS)
This sub-plan is limited to students completing the program under Plan B.

**Speech-Language-Hearing Sciences Track: Required Courses**
- SLHS 5401 - Counseling and Professional Issues (3.0 cr)
- SLHS 5502 - Voice and Cleft Palate (3.0 cr)
- SLHS 5503 - Fluency and Motor Speech Disorders (3.0 cr)
- SLHS 5504 - Evaluation and Management of Dysphagia (2.0 cr)
- SLHS 5602 - Speech Sound Disorders: Assessment and Treatment across Languages (3.0 cr)
- SLHS 5603 - Assessment and Intervention of Language Disorders in Children (3.0 cr)
- SLHS 5605 - Language and Cognitive Disorders in Adults (3.0 cr)
- SLHS 5606 - Introduction to Augmentative and Alternative Communication (3.0 cr)
- SLHS 5608 - Clinical Issues in Bilingualism and Cultural Diversity (3.0 cr)

**Plan B Speech-Language-Hearing Sciences Track**

**Directed Research**
- Take exactly 4 credit(s) from the following:
  - SLHS 8994 - Directed Research (1.0 - 12.0 cr)
Twin Cities Campus
Speech-Language-Hearing Sciences Minor
Speech-Language-Hearing Sciences
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Speech-Language-Hearing Sciences, 115 Shevlin Hall, 164 Pillsbury Drive SE, Minneapolis, MN 55455 (612-624-3322; fax: 612-624-7586)
Email: slhs@umn.edu
Website: http://www.slhs.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 12
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Emphasis in the graduate program is speech-language pathology and audiology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The approval of the SLHS director of graduate studies is required prior to registration for any 4xxx-level minor field coursework.

Speech Language Pathology Focus
Take 12 or more credit(s) from the following:
• SLHS 5502 - Voice and Cleft Palate (3.0 cr)
• SLHS 5503 - Fluency and Motor Speech Disorders (3.0 cr)
• SLHS 5504 - Evaluation and Management of Dysphagia (2.0 cr)
• SLHS 5602 - Speech Sound Disorders: Assessment and Treatment across Languages (3.0 cr)
• SLHS 5603 - Assessment and Intervention of Language Disorders in Children (3.0 cr)
• SLHS 5605 - Language and Cognitive Disorders in Adults (3.0 cr)
• SLHS 5606 - Introduction to Augmentative and Alternative Communication (3.0 cr)
• SLHS 5608 - Clinical Issues in Bilingualism and Cultural Diversity (3.0 cr)

Audiology Focus
Take 12 or more course(s) from the following:
• SLHS 4801 - Hearing Measurement and Disorders (3.0 cr)
• SLHS 4802 - Rehabilitative Audiology (3.0 cr)
• SLHS 5801 - Advanced Audiologic Assessment (3.0 cr)
• SLHS 5802 - Hearing Aids I (3.0 cr)
• SLHS 5803 - Pediatric Audiology (3.0 cr)
• SLHS 5804 - Cochlear Implants (3.0 cr)
• SLHS 5805 - Advanced Rehabilitative Audiology (3.0 cr)
• SLHS 5806 - Auditory Processing Disorders (3.0 cr)
• SLHS 5807 - Noise and Hearing Conservation (3.0 cr)
• SLHS 5808 - Pathophysiology of Hearing Disorders (3.0 cr)
• SLHS 5810 - Laboratory Module in Audiology (1.0 - 2.0 cr)
• SLHS 5820 - Clinical Research and Practice: Grand Rounds (1.0 - 6.0 cr)
• SLHS 5830 - Clinical Foundations in Audiology (1.0 - 8.0 cr)
• SLHS 8801 - Electrophysiologic Assessment of Auditory Function (3.0 cr)
• SLHS 8802 - Hearing Aids II (3.0 cr)
• SLHS 8803 - Signals and Systems in Audiology (3.0 cr)
• SLHS 8805 - Hearing Science Foundations of Audiology (3.0 cr)
• SLHS 8807 - Balance Assessment (3.0 cr)

Combined Speech Language Pathology and Audiology Focus
Take 12 or more credit(s) from the following:
• SLHS 4301 - Introduction to the Neuroscience of Human Communication (3.0 cr)
• SLHS 4402 - Assessment and Treatment in Speech-Language Pathology (3.0 cr)
• SLHS 5401 - Counseling and Professional Issues (3.0 cr)
• SLHS 5990 - Topic in Speech-Language-Hearing Sciences (1.0 - 3.0 cr)
• SLHS 5993 - Directed Study (1.0 - 12.0 cr)
• SLHS 8410 - Seminar: Research (3.0 cr)
• SLHS 8420 - Seminar: Teaching (3.0 cr)
• SLHS 8530 - Seminar: Speech (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Twin Cities Campus
Speech-Language-Hearing Sciences Ph.D.
Speech-Language-Hearing Sciences
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Speech-Language-Hearing Sciences, 115 Shevlin Hall, 164 Pillsbury Dr SE, Minneapolis, MN 55455 (612-624-3322; fax: 612-624-7586)
Email: slhsgrad@umn.edu
Website: http://www.slhs.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 65
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Emphases in the PhD program are speech-language pathology, audiology, speech science, language science, or hearing science. The program prepares students for careers in research, teaching, and advanced clinical applications. Most students entering the program have a master's degree in speech-language pathology, audiology, or a related area. The PhD degree usually requires three or more years of work beyond the master's degree. In general, a student's program is designed by the student in consultation with the advisor to satisfy the particular objectives of the student and program requirements.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
29 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

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Information current as of August 31, 2018
A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

The PhD degree usually requires three years of work beyond the master's degree. In general, a student's program is designed by the student in consultation with the advisor to satisfy the particular objectives of the student, but there are also some department and University requirements that must be satisfied. These include coursework, research activities, teaching experience, and preliminary and final exams.

A minimum of 12 course credits in a minor or supporting program and registration for 24 thesis credits are required. Also required is a statistics sequence, for which students typically register during their first two years. The written and oral preliminary exams are taken at the end of the second year.

Each student completes a seminar (SLHS 8430) and a minimum of 4 credits of teaching experience that provide an opportunity for the student to develop and teach sections of department courses. Students also complete a seminar (SLHS 8410) and a minimum of 4 credits of research under the direction of one or more faculty members in the department other than the advisor.

**Required Courses**

**Seminar Requirements**

- SLHS 8410 - Seminar: Research (3.0 cr)
- SLHS 8420 - Seminar: Teaching (3.0 cr)
- or GRAD 8101 - Teaching in Higher Education (3.0 cr)

Take 6 or more credit(s) from the following:

- SLHS 8430 - Proseminar in Speech-Language-Hearing Sciences (1.0 - 6.0 cr)

**Directed Research Requirement**

Take 4 or more credit(s) from the following:

- SLHS 8994 - Directed Research (1.0 - 12.0 cr)

**Directed Teaching Requirement**

Take 4 or more credit(s) from the following:

- SLHS 5993 - Directed Study (1.0 - 12.0 cr)

**Statistics**

- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
- or EPSY 8252 - Statistical Methods in Education II (3.0 cr)

**Statistics Electives**

Take 3 or more credit(s) from the following:

- EPSY 8220 - Special Topics: Seminar in Quantitative Methods (1.0 - 6.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8265 - Factor Analysis (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8224 - Performance Assessment Design and Analysis (3.0 cr)
- EPSY 8225 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8226 - Item Response Models: Theory and Applications (3.0 cr)
- STAT 4101 - Theory of Statistics I (4.0 cr)
- STAT 4102 - Theory of Statistics II (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5031 - Statistical Methods for Quality Improvement (4.0 cr)
- STAT 5101 - Theory of Statistics I (4.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)
- STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)
- STAT 5601 - Nonparametric Methods (3.0 cr)
- STAT 5701 - Statistical Computing (3.0 cr)
- STAT 5931 - Topics in Statistics (3.0 cr)
- STAT 5993 - Tutorial (1.0 - 6.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• STAT 8102 - Theory of Statistics 2 (3.0 cr)
• STAT 8111 - Mathematical Statistics I (3.0 cr)
• STAT 8112 - Mathematical Statistics II (3.0 cr)
• STAT 8311 - Linear Models (4.0 cr)
• STAT 8801 - Statistical Consulting (3.0 cr)
• STAT 8913 - Literature Seminar (1.0 cr)
• STAT 8931 - Advanced Topics in Statistics (3.0 cr)
• STAT 8932 - Advanced Topics in Statistics (3.0 cr)
• STAT 4893W - Consultation and Communication for Statisticians [WI] (3.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
SLHS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Electives in Related Fields
Electives in Related Fields
Take 12 or more credit(s) from the following:
• ADDS 5021 - Introduction to Evidence Based Practices and the Helping Relationship (3.0 cr)
• CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
• CPSY 4302 - Infant Development (3.0 cr)
• CPSY 4329 - Biological Foundations of Development (3.0 cr)
• CPSY 4341 - Perceptual Development (3.0 cr)
• CPSY 4343 - Cognitive Development (3.0 cr)
• CPH 5906 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
• CPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
• CPH 5111 - Ways of Thinking about Health (2.0 cr)
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5135 - Human Relations Workshop (4.0 cr)
• EPSY 5400 - Special Topics in Counseling Psychology (1.0 - 4.0 cr)
• EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
• EPSY 5451 - College Students Today (3.0 cr)
• EPSY 5461 - Cross-Cultural Counseling (3.0 cr)
• EPSY 5609 - Family-centered Services (2.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)
• EPSY 5641 - Foundations of Deaf Education (3.0 cr)
• EPSY 5642 - Early Intervention for Infants, Toddlers and Families: Deaf and Hard of Hearing (3.0 cr)
• EPSY 5644 - Early Childhood Language and Literacy Development and Best Practices: Deaf and Hard of Hearing (3.0 cr)
• EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
• EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorder (3.0 cr)
• EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
• GER 5125 - Gerontology Service Learning (3.0 cr)
• HINF 5501 - US Health Care System: Information Challenges in Clinical Care (1.0 cr)
• KIN 8211 - Seminar: Perception and Action (3.0 cr)
• LING 8921 - Seminar in Language and Cognition (3.0 cr)
• NSCI 5101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
• NSCI 5111 - Medical Neuroscience for Graduate Students (5.0 cr)
• OTOL 8234 - Anatomy of the Head and Neck and Temporal Bone Dissection (2.0 cr)
• OTOL 8247 - Anatomy and Physiology of Hearing and Balance (3.0 cr)
• PHAR 5201 - Applied Medical Terminology (2.0 cr)
• PSY 4036 - Perceptual Issues in Visual Impairment (3.0 cr)
• PSY 4960 - Seminar in Psychology (1.0 - 4.0 cr)
• PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
• PSY 5037 - Psychology of Hearing (3.0 cr)
• PSY 5054 - Psychology of Language (3.0 cr)
• PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
• PSY 5205 - Applied Social Psychology (3.0 cr)
• PSY 5660 - Topics in Psychology (1.0 - 4.0 cr)
• PSY 8037 - Psychophysiology of Hearing and Audition (3.0 cr)
• PUBH 6370 - Social Epidemiology (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SPAN 5985 - Sociolinguistic Perspectives on Spanish in the United States (3.0 cr)
SLHS 5900 - Topic in Speech-Language-Hearing Sciences (1.0 - 3.0 cr)
SLHS 8530 - Seminar: Speech (3.0 cr)
BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
EPSY 8600 - Special Topics: Special Education Issues (1.0 - 3.0 cr)
FSOS 5942 - Everyday Experiences of Families (2.0 cr)
FSOS 5937 - Parent-Child Interaction (3.0 cr)
OLPD 5211 - Introduction to the Undereducated Adult (1.0 cr)
SOC 4246 - Sociology of Health and Illness (3.0 cr)
BTHX 5000 - Topics in Bioethics (1.0 - 4.0 cr)
CGSC 8410 - Perspectives in Learning, Perception, and Cognition (2.0 cr)
CI 5642 - Assessing English Learners (3.0 cr)
CI 5653 - Methods in Teaching English as a Second Language (ESL) in Higher Education (3.0 cr)
CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
OLPD 5356 - Disability Policy and Services (3.0 cr)
PSY 5062 - Cognitive Neuropsychology (3.0 cr)
PSY 5138 - Adult Development and Aging (3.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
BMEN 5411 - Neural Engineering (3.0 cr)
BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
BMEN 8502 - Physiological Control Systems (3.0 cr)
NSC 5561 - Systems Neuroscience (4.0 cr)
Twin Cities Campus
Statistics M.S.
Statistics, School of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Statistics, 313 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-624-8046; fax: 612-624-8868)
Email: info@stat.umn.edu
Website: http://www.stat.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Statistics is the primary venue at the University for research, teaching, and dissemination of the theory, methodology, and applications of statistical procedures. Students may specialize in any area of statistics. The core program for all students has strong components of both theoretical and applied statistics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Courses
Core Courses
STAT 8101 - Theory of Statistics 1 (3.0 cr)
STAT 8102 - Theory of Statistics 2 (3.0 cr)
STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling (3.0 cr)
STAT 8801 - Statistical Consulting (3.0 cr)
STAT 5701 - Statistical Computing (3.0 cr)

Statistics Electives
Take 6 or more credit(s) from the following:
• STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5601 - Nonparametric Methods (3.0 cr)
• STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
• STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
• STAT 8111 - Mathematical Statistics I (3.0 cr)
• STAT 8112 - Mathematical Statistics II (3.0 cr)
• STAT 8931 - Advanced Topics in Statistics (3.0 cr)
• STAT 8932 - Advanced Topics in Statistics (3.0 cr)

Outside Coursework
Take 6 credits outside the major.
Twin Cities Campus

Statistics Minor
Statistics, School of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Statistics, 313 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-625-8046; fax: 612-624-8868)
Email: info@stat.umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g164.html

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 9
• Length of program in credits (Doctorate): 14
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Statistics is the primary venue at the University for research, teaching, and dissemination of the theory, methodology, and applications of statistical procedures. Students may specialize in any area of statistics. The core program for all students has strong components of both theoretical and applied statistics.

Program Delivery
This program is available:
* via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Theory Requirement
Take the following courses for 8 credits:
STAT 4101 - Theory of Statistics I (4.0 cr)
STAT 4102 - Theory of Statistics II (4.0 cr)

Statistics Electives
Take a statistics elective, in consultation with the statistics director of graduate studies.
Take 1 or more credit(s) from the following:
• STAT 4xxx
• STAT 5xxx
• STAT 6xxx

Doctoral
Required Courses
Theory Requirement
Take one of the following statistics theory sequences for a total of 8 credits:
STAT 4101 - Theory of Statistics I (4.0 cr)
STAT 4102 - Theory of Statistics II (4.0 cr)
or STAT 5101 - Theory of Statistics I (4.0 cr)
STAT 5102 - Theory of Statistics II (4.0 cr)

Statistics Electives
Take at least 6 statistics electives, chosen in consultation with the statistics director of graduate studies.
STAT 5xxx
STAT 8xxx
Twin Cities Campus
Statistics Ph.D.
Statistics, School of
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of School of Statistics, 313 Ford Hall, 224 Church Street SE, Minneapolis, MN 55455 (612-625-8046; fax: 612-624-8868)
Email: info@stat.umn.edu
Website: http://www.stat.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 70
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Statistics is the primary venue at the University for research, teaching, and dissemination of the theory, methodology, and applications of statistical procedures. Students may specialize in any area of statistics. The core program for all students has strong components of both theoretical and applied statistics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
34 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.
Required Courses
Core Courses
STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
STAT 8052 - Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling (3.0 cr)
STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
STAT 8111 - Mathematical Statistics I (3.0 cr)
STAT 8112 - Mathematical Statistics II (3.0 cr)
STAT 8801 - Statistical Consulting (3.0 cr)
STAT 8913 - Literature Seminar (1.0 cr)
Statistics Electives
Courses from other departments with heavy statistical content, and some 5xxx-level statistics courses may be used as electives. Students choose courses in consultation with the director of graduate studies.
Take 12 or more credit(s) from the following:
• STAT 8xxx

Outside Coursework
Take MATH 8651 (3 cr) and MATH 8652 (3 cr). Coursework comparable to MATH 8651 and 8652 may be substituted with approval of the director of graduate studies.
MATH 8651 - Theory of Probability Including Measure Theory (3.0 cr)
MATH 8652 - Theory of Probability Including Measure Theory (3.0 cr)
Electives
Take at least 6 additional credits to complete the 12-credit outside coursework requirement.

Thesis Credits
Take 24 or more credit(s) from the following:
• STAT 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Strategic Communication M.A.
School of Journalism & Mass Communication
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Hubbard School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-625-4054; fax: 612-626-8251)
Email: sjmcgrad@umn.edu
Website: http://sjmc.umn.edu/grad/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 33
- This program requires summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MA in strategic communication is designed to serve working communications professionals in advertising, public relations, corporate communications, nonprofit organizations, and government. The 33-credit program is conceptually and structurally distinct from the existing academic master's degree in mass communication in that it focuses on advanced professional study of communications strategy, media, planning, evaluation, and creative management.

The University of Minnesota is one of only a handful of institutions to offer a professional master's program in strategic communication designed for the busy working professional.

The MA in strategic communication curriculum is tailored to provide the best foundation for future communications leaders, recognizing that the communication industry is changing rapidly and is more volatile than ever. With Internet use moving well beyond its infancy, and massive organizational and global forces reshaping the U.S. economy, communications leaders face significant challenges and can prepare themselves through in-depth study of strategic process management.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Special Application Requirements:
The minimum requirement for admission is a B.A. or equivalent. Professionals in strategic communication--currently employed in advertising, public relations, or marketing firms, or in a communications function within a corporation or nonprofit organization--must have a baccalaureate degree from an accredited U.S. institution or its foreign equivalent and at least two years professional experience. This professional experience should be in any of the following areas: account planning, account management, advertising management, media planning or buying, media sales, promotion marketing, corporate communications, public affairs, public relations, investor relations, direct marketing, sales management, marketing management, brand management, broadcast or print journalism, market research, content creation, or event management.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 33 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The MA in strategic communication is designed to be completed within 24 calendar months.

Students must maintain a GPA of at least 3.00 and achieve a grade of B or better on their final 6-credit individual project. The project is a sequence of two capstone courses (Jour 8206) designed to support completion of individual strategic communication campaign projects that demonstrate mastery of the MA curriculum.

Student progress is evaluated by the academic director, program coordinator, and program faculty. Students must progress each semester to continue in the program, though a student who must temporarily leave the program unexpectedly can return to the program at a later date and resume their studies at the point of departure. All coursework must be taken A-F.

Required Courses
- JOUR 8200 - Strategic Communication Research Methods (3.0 cr)
- JOUR 8201 - Factors Affecting Communication Strategy (3.0 cr)
- JOUR 8202 - Generation and Selection of Communication Strategies (3.0 cr)
- JOUR 8290 - Special Topics in Strategic Communication (3.0 cr)
- JOUR 8203 - Integration of Communication Strategies Across Media (3.0 cr)
- JOUR 8205 - Cases in Strategic Communication (3.0 cr)

Electives
Take at least 6 credits outside the School of Journalism and Mass Communication. The remaining 3 credits of the 9-credit elective requirement can be taken from the following list:
- JOUR 5251 - Strategic Communication Theory (3.0 cr)
- or JOUR 5xxx
- or JOUR 8xxx

Individual Project
Take JOUR 8206 two times (May session and summer session).
Take 6 or more credit(s) from the following:
- JOUR 8206 - Directed Study: Development of an Integrated Strategic Communication Campaign (3.0 cr)
Studies in Africa and African Diaspora Minor

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of African American and African Studies, 810 Social Sciences Building, 267 19th Ave S, Minneapolis, MN 55455 (612-624-9847; fax: 612-624-8383)
Email: www.aaas.umn.edu
Website: http://www.aaas.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 15
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This interdisciplinary graduate minor is administered through the Department of African American & African Studies. The minor program gives students from a variety of disciplines a structured graduate curriculum that offers a systematic understanding of the contemporary and historical experiences of peoples of Africa and of the African diaspora. It is organized around a group of core seminars and focuses on two broad areas: the humanities and the arts, and the social and behavioral sciences.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Admission is contingent upon prior admission to a master's or doctoral degree-granting program.

Special Application Requirements:
Students must complete an application form by the end of spring semester to be considered for acceptance for the following academic year. It is expected that no more than 15 students will be admitted to this minor each year. An undergraduate major or minor in African American and/or African studies is not required for admission to the program, but students are expected to have had sufficient background to begin graduate level study.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Students develop their program in consultation with the director of Graduate Studies in studies in Africa and the African diaspora and in their major. All courses must be outside the student's major field of study.

The master's minor requires a minimum of 9 graduate credits, including the seminar AFRO 5101 - Studies in Africa and the African Diaspora. Remaining courses are selected from one of the following two areas: humanities and the arts or behavioral and social sciences.

The doctoral minor requires a minimum of 15 graduate credits, including the seminar AFRO 5101 - Studies in Africa and the African Diaspora. Students take one additional seminar that focuses on the study of Africa and peoples of African descent. Remaining courses are selected from one of the two areas listed above.
Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Course
AFRO 5101 - Seminar: Introduction to Africa and the African Diaspora (3.0 cr)
Course Electives
All courses must be outside the student's major field of study.
Take 6 or more credit(s) from the following:
• AFRO 5xxx
• AFRO 8xxx

Doctoral
Required Course
AFRO 5101 - Seminar: Introduction to Africa and the African Diaspora (3.0 cr)
Course Electives
All courses must be outside the student's major field of study.
Take 12 or more credit(s) from the following:
• AFRO 5xxx
• AFRO 8xxx
Twin Cities Campus
Studies of Science and Technology Minor
Philosophy Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Studies of Science and Technology, 746 Heller Hall, 271 19th Ave S, Minneapolis, MN 55455; (612-625-6635; fax: 612-626-8380)
Email: mcps@umn.edu
Website: http://www.mcps.umn.edu/grad/program.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Studies of science and technology (SST) deals with a rapidly expanding field that seeks to understand the conceptual foundations, historical development, and social dimensions and context of science and technology. SST faculty are drawn from a number of research and teaching units dedicated in whole or in part to the history, philosophy, and social studies of science and technology.

The graduate SST minor is for students from any major who want to gain a deeper understanding of the nature and development of science and technology. It can be particularly valuable for students who are planning teaching careers in science or engineering, or those majoring in philosophy or history of science and technology. Students admitted to the SST minor will develop individual programs of study in consultation with the faculty and the director of Graduate Studies. Adjustments in program requirements can be made for students with relevant previous course experience.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Admission is contingent upon prior admission to a University of Minnesota master's or doctoral degree-granting program, and is by permission of the director of Graduate Studies in SST.

Special Application Requirements:
Prospective students should contact director of Graduate Studies in SST.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

History Course
All students pursuing the minor take one of the following two courses:
HSCI 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)
or HMED 8112 - Historiography of Science, Technology, and Medicine (3.0 cr)

Philosophy Course
All students pursuing the minor take one of the following three courses:
PHIL 8670 - Seminar: Philosophy of Science (3.0 cr)
or PHIL 8610 - Seminar: History of Modern Physical Sciences (3.0 cr)
or PHIL 8620 - Seminar: Philosophy of the Biological Sciences (3.0 cr)
Colloquium
Master's students pursuing the minor take the following course once. Doctoral students take the following course twice.

**SST 8000 - Colloquium (1.5 cr)**

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Master's students pursuing the minor complete the 7.5 credits noted above.

Doctoral
**Additional Requirements for the Doctoral Minor**
In addition to the 7.5 credits required for the master's minor, doctoral students must take another 1.5 credits of SST 8000, and at least 3 more SST credits.

**SST 8000 - Colloquium (1.5 cr)**
**SST 8100 - Seminar: Models, Theories, and Reality (3.0 cr)**
or **SST 8200 - Seminar: Philosophy of the Physical Sciences (3.0 cr)**
or **SST 8300 - Seminar: The Biological and Biomedical Sciences (3.0 cr)**
or **SST 8400 - Seminar: Science, Technology, and Society (3.0 cr)**
or **SST 8420 - Seminar: Social and Cultural Studies of Science (3.0 cr)**
Twin Cities Campus
Technical Communication Postbaccalaureate Certificate
Writing Studies Department
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Drive SE, Minneapolis, MN 55455; (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: https://cla.umn.edu/writing-studies

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program requires summer semesters for timely completion.
- Degree: Technical Communication PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Certificate courses are taught by graduate faculty who themselves have active research agendas. The program, whenever possible, provides opportunities for students to apply knowledge to solve community and industry problems within the field of technical communication through authentic learning opportunities in the program’s courses. Technical Communication Certificate program credits (15) are transferable to the Scientific and Technical Communication M.S.

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Fall Term Courses
- WRIT 5001 - Introduction to Graduate Studies in Scientific and Technical Communication (3.0 cr)
- WRIT 4662W - Writing With Digital Technologies [WI] (3.0 cr)

Spring Term Courses
- WRIT 4562 - International Professional Communication (3.0 cr)
- WRIT 5112 - Information Design: Theory and Practice (3.0 cr)
Summer Term Course
WRIT 5561 - Editing and Style for Technical Communicators (3.0 cr)
Twin Cities Campus
Theatre Arts M.A.
Theatre Arts & Dance Dept
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Theatre Arts and Dance, 580 Rarig Center, 330 21st Ave S, Minneapolis, MN 55455 (612-625-6699; fax: 612-625-6334)
Email: theatre@umn.edu
Website: http://theatre.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 40
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota offers a unique graduate program drawing from the varied research expertise of its core faculty. Together, the faculty is committed to the study of theatre and performance as practices of social, cultural, and political consequence. The department’s work in theatre historiography and performance criticism examines the stakes of acts of representation, movement, and meaning-production both within and without the discipline of theatre. The curriculum of this program trains students to be rigorous scholars and expert teachers of theatre and performance studies at the college level.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 24 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is written.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.
The MA degree emphasizes academic pursuits and is considered a prerequisite for the PhD. The areas of study for the MA are devised in collaboration with a faculty advisor, and demand original and challenging research in the fields of theatre historiography or performance criticism.

There is an 8 credit limit on practical/performance courses for program credit.

### Field Seminars
Take 6 or more credit(s) from the following:
- **TH 8111** - History and Theory of Western Theatre: Ancient World and Early Medieval (3.0 cr)
- **TH 8112** - History and Theory of Western Theatre: Medieval Through Renaissance (3.0 cr)
- **TH 8113** - History and Theory of Western Theatre: National Theatres to the French Revolution (3.0 cr)
- **TH 8114** - Theatre: Performance and Political Modernity (3.0 cr)
- **TH 8115** - History and Theory of Western Theatre: 20th Century Through World War II (3.0 cr)
- **TH 8116** - History and Theory of Western Theatre: 20th Century From 1945 to the Present (3.0 cr)

### Signature Seminars
Take 6 or more credit(s) from the following:
- **TH 8120** - Seminar (3.0 cr)
- **TH 5117** - Performance and Social Change (3.0 cr)

### Historiography Seminars
Take 3 or more credit(s) from the following:
- **TH 8102** - Theatre Historiography (3.0 cr)

### Professionalization
Take 3 or more credit(s) from the following:
- **TH 8590** - Theatre Technology Practicum (1.0 - 3.0 cr)

### Electives
Take 6 credits in elective coursework either in our outside the department.

### Outside Coursework
Take 6 credits outside the major.

### Plan Options

#### Plan A
**Thesis Credits**
Take 10 or more credit(s) from the following:
- **TH 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

#### Plan B
Consult with the advisor and director of Graduate Studies regarding the required Plan B paper(s).
Twin Cities Campus
Theatre Arts M.F.A.
Theatre Arts & Dance Dept
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Theatre Arts and Dance, 580 Rarig Center, 330 21st Avenue South, Minneapolis, MN 55455 (612-625-6699; fax: 612-625-6334)
Email: theatre@umn.edu
Website: http://theatre.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 60
• This program does not require summer semesters for timely completion.
• Degree: Master of Fine Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MFA in theatre arts, which specialized in design and technical production, is awarded to students who, through the three-year course of study, explore challenges in the areas of scenery/properties, costuming, lighting, sound design, multimedia and technology with an emphasis in at least one of these areas. It is a rigorous program based on the belief that good designers must have a solid understanding of each area of design in order to be able to communicate and collaborate well with the other designers, technicians, and directors. Good designers must also have strong craft skills in order to understand how the design functions in execution. The department believes that technology is an integral tool of design and seeks to balance the education of the student in both areas.

Accreditation
This program is accredited by National Association of Schools of Theatre (NAST)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Admission into the M.F.A. Theatre Arts program is dependent on a portfolio review by the Theatre Arts design/technology faculty.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 54 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: A realized design and technology project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

The three-year, performance-oriented MFA degree specializes in design and technical production. All areas of design are studied to increase understanding in specialization areas, and technology is studied as an essential part of design. Students are expected to achieve proficiency in at least two areas of any combination of design and technology (scenery/properties, costuming, lighting, sound) and a level of expertise in at least one of these areas. Program faculty work with students to identify the final areas for the degree. The MFA degree is considered a terminal degree in these areas of theatre arts. Each program requires a final performance practicum and written record of it. For specific program requirements, contact the director of graduate studies.

**Required Courses**
- TH 5510 - Drawing, Rendering, and Painting for the Theatre Designer I (3.0 cr)
- TH 5520 - Scene Design (3.0 cr)
- TH 5530 - Costume Design (3.0 cr)
- TH 5540 - Lighting Design for the Theatre (3.0 cr)
- TH 5559 - Sound Design for Performance (3.0 cr)
- TH 5560 - Drawing, Rendering, and Painting for the Theatre Designer II (3.0 cr)

**Repeat Primary Design Area**
- TH 5520 - Scene Design (3.0 cr)
  or TH 5530 - Costume Design (3.0 cr)
  or TH 5540 - Lighting Design for the Theatre (3.0 cr)
  or TH 5559 - Sound Design for Performance (3.0 cr)

**MFA Creative Thesis**
Take 3 or more credit(s) from the following:
- TH 8990 - MFA Creative Thesis (3.0 - 4.0 cr)

**Design/Technology Practicums**
Take 6 or more credit(s) from the following:
- TH 5590 - Theatre Technology Practicum (1.0 - 3.0 cr)
  or TH 8590 - Theatre Technology Practicum (1.0 - 3.0 cr)
- Take 3 or more credit(s) from the following:
  - TH 5500 - Theatre Design Practicum (1.0 - 3.0 cr)
  - TH 8500 - Theatre Design Practicum (1.0 - 3.0 cr)

**Electives in Related Fields**
Take 15 or more credit(s) from the following:
- TH 5545 - Stage Lighting Technology (3.0 cr)
- TH 5570 - Properties/Scenery Technology (1.0 - 3.0 cr)
- TH 5580 - Costume Technology (3.0 cr)
- TH 8980 - Internship (1.0 - 5.0 cr)

**Professional Development Class**
Take once a year for 3 years.
Take 3 or more credit(s) from the following:
- TH 8950 - Topics in Theatre (1.0 - 4.0 cr)

**Internship**
(May or may not be taken for credit to apply towards electives.) Confer with advisor regarding internship.
Take 0 - 3 credit(s) from the following:
- TH 8980 - Internship (1.0 - 5.0 cr)

**History of Literature within the Major Field**
Upon consultation with the advisor and program faculty, there may be a substitution for the specific courses listed below for this requirement if it is in the best interest of the student. New coursework must be in the history/literature area.

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Information current as of August 31, 2018
Take 6 or more credit(s) from the following:

- TH 4177W - Survey of Dramatic Literature I: Strategic Interpretation [WI] (3.0 cr)
- TH 4178W - Survey of Dramatic Literature II: Representation and Its Effects [WI] (3.0 cr)

**Outside Coursework**

Take at least 6 credits outside the major.
Twin Cities Campus
Theatre Arts Minor
Theatre Arts & Dance Dept
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Theatre Arts and Dance, 580 Rarig Center, 330 21st Ave S, Minneapolis, MN 55455 (612-625-6699; fax: 612-625-6334)
Email: theatre@umn.edu
Website: http://theatre.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota offers a unique graduate program drawing from the varied research expertise of its core faculty. Together, the faculty is committed to the study of theatre and performance as practices of social, cultural, and political consequence. The department’s work in theatre historiography and performance criticism examines the stakes of acts of representation, movement, and meaning-production both within and without the discipline of theatre. The curriculum of this program trains students to be rigorous scholars and expert teachers of theatre and performance studies at the college level.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Coursework is chosen in consultation with the Theatre Arts director of Graduate Studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Take 9 or more credit(s) from the following:
• THE 5xxx
• THE 8xxx

Doctoral
Required Courses
Take 12 or more credit(s) from the following:
• TH 5xxx
• TH 8xxx
Contact Information:
Department of Theatre Arts and Dance, 580 Rarig Center, 330 21st Ave S, Minneapolis, MN 55455 (612-625-6699; fax: 612-625-6334)
Email: theatre@umn.edu
Website: http://theatre.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 54
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The University of Minnesota offers a unique graduate program drawing from the varied research expertise of its core faculty. Together, the faculty is committed to the study of theatre and performance as practices of social, cultural, and political consequence. The department’s work in theatre historiography and performance criticism examines the stakes of acts of representation, movement, and meaning-production both within and without the discipline of theatre. The curriculum of this program trains students to be rigorous scholars and expert teachers of theatre and performance studies at the college level.

Accreditation
This program is accredited by National Association of Schools of Theatre (NAST).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
In order to be admitted to the M.A./Ph.D. program, you must have a working knowledge/reading proficiency of at least one foreign language (or a sign language).

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
18 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Proficiency in one foreign language.

A minimum GPA of 3.50 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

A. Signature Seminars
Each member of the MA/PhD faculty will offer a "signature seminar" on a two-year rotation. These seminars focus on the faculty member's current primary area of research interest, with an emphasis on articulating the distinct research methodology that the faculty member brings to bear on his/her field. Each member of the MA/PhD faculty will offer a "field seminar" on a two-year rotation. These seminars are designed to give students a level of field expertise that will enable them to teach.

Take 6 or more credit(s) from the following:
- TH 8120 - Seminar (3.0 cr)
- TH 5117 - Performance and Social Change (3.0 cr)

B. Field Seminars
Each member of the MA/PhD faculty will offer a "field seminar" on a two-year rotation. These seminars are designed to give students a level of field expertise that will enable them to teach in the history, literature, and criticism of theatre studies, and each focuses on a distinct period, problematic, or performance tradition. The emphasis here is on mastery of a body of literature and theory pertaining to a specific field.

Take 6 or more credit(s) from the following:
- TH 8111 - History and Theory of Western Theatre: Ancient World and Early Medieval (3.0 cr)
- TH 8112 - History and Theory of Western Theatre: Medieval Through Renaissance (3.0 cr)
- TH 8113 - History and Theory of Western Theatre: National Theatres to the French Revolution (3.0 cr)
- TH 8114 - Theatre: Performance and Political Modernity (3.0 cr)
- TH 8115 - History and Theory of Western Theatre: 20th Century Through World War II (3.0 cr)
- TH 8116 - History and Theory of Western Theatre: 20th Century From 1945 to the Present (3.0 cr)

C. Professionalization
This seminar is taught every second year, over an entire year (meeting every second week, 3 cr). It introduces students to the academic profession through a series of focused workshops on pedagogy (ethics, politics, and practice), professional protocols (publishing, job search, conferences), and forms of professional writing (grants, abstracts, statements of teaching philosophy, etc.).

Take 3 or more credit(s) from the following:
- TH 8590 - Theatre Technology Practicum (1.0 - 3.0 cr)

D. Historiography Seminars
This seminar is taught every second year (3 cr). It focuses on the contested nature of historical (theatre/performance) knowledge, and introduces students to the idea of historiography defined as an ethical exploration of the encounter with the Other (the past, the writing of history, the archive, the event, the fact, the object) that questions relations of knowledge and power, as well as the current apparatus of inquiry and interpretation.

Take 3 or more credit(s) from the following:
- TH 8102 - Theatre Historiography (3.0 cr)

Outside Coursework
Take 12 credits outside the major.

Thesis Credits
Take 24 or more credit(s) from the following:
- TH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Translational Sensory Sciences Minor

Contact Information:
Center for Applied & Translational Sensory Science
S39 Elliott Hall
75 East River Parkway
Minneapolis, MN
Email: catss@umn.edu
Website: http://catss@umn.edu

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Students must be enrolled in a University doctoral program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Required Courses (5 credits)
Take the following courses for a total of 5 credits:
GCC 5022 - The human experience of sensory loss: Seeking equitable and effective solutions [TS] (3.0 cr)
CGSC 8001 - Proseminar in Cognitive Science (2.0 cr)

Program Sub-plans
A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Doctoral
Elective Courses
Select elective courses, in consultation with the Translational Sensory Sciences director of graduate studies, to complete the 12-credit minimum. Courses may be from the following list or with approval of the director of graduate studies.
BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
CSCI 5525 - Machine Learning (3.0 cr)
Twin Cities Campus
Juridical Science S.J.D.
Law School

Link to a list of faculty for this program.

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Juridical Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The SJD program at the University of Minnesota Law School is intended for those who wish to carry on advanced legal study and original research under faculty supervision. SJD students must present research which makes a significant, original contribution of long-term value to legal scholarship. The dissertation must be of publishable quality and provide lawyers, scholars, or governmental officials with a useful understanding, not previously available, of a particular area of the law.

Accreditation
This program is accredited by acquiescence of the American Bar Association.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Applicants must have completed the first degree in law AND must have completed (or are in the process of completing) a US LLM degree at the University of Minnesota or another institution.

Special Application Requirements:
1) Submission of a preliminary dissertation proposal demonstrating that the dissertation will constitute an original and substantial contribution, of publishable quality, to legal scholarship, in a research field in which the Law School has experienced faculty available for advising, and 2) Submission of an extensive, high quality writing sample written in English to demonstrate the ability to engage in advanced research and writing.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.
This program may not be completed with a minor.
Use of 4xxx courses towards program requirements is not permitted.
A minimum GPA of 3.0 is required for students to remain in good standing.
At least 2 semesters must be completed before filing a Degree Program Form.

Coursework Requirements
Legal Research
Take one of the following courses, or another research course approved by your faculty adviser or the director of graduate studies.
LAW 6851 - Practice-Ready Legal Research (2.0 cr)
or LAW 6867 - Practice Ready International Legal Research (2.0 cr)
Elective Courses
The remaining 22 credits are determined through consultation with your faculty advisor or the director of graduate studies.

Thesis Credit Requirement
24 Thesis Credits
Twin Cities Campus
Law Minor
Law School

Link to a list of faculty for this program.

Contact Information:
Law School, Walter F. Mondale Hall, 229 19th Avenue South, Minneapolis, MN 55406 (612-625-1000; fax: 612-625-2011)
Email: lawreg@umn.edu
Website: http://www.law.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A law minor is available to both master's and doctoral students and is individually tailored to their academic interests.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to the law graduate minor is contingent upon prior admission to a University of Minnesota master's or doctoral degree-granting program. Enrollment in Law School courses is on a space-available basis, with preference given to law-degree-seeking candidates. Some Law School courses are open for graduate student registration without need for permission. Other courses require that students request admission by completing a declaration form and the non-law student petition form (found at https://www.law.umn.edu/academics/non-degree-programs/graduate-and-undergraduate-courses), and submitting them to the Law School registrar's office.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A masters minor requires at least 6 graduate credits; a doctoral minor requires at least 12 graduate credits.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Required Courses
Select at least 6 credits from the following, in consultation with the law minor's director of graduate studies.
LAW 5xx
LAW 6xx

Doctoral
Required Courses
Select at least 12 credits from the following, in consultation with the law minor's director of graduate studies.
Twin Cities Campus
Master of Science Patent Law
Law School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota Law School
Master of Science in Patent Law Program
411 Walter F. Mondale Hall
229 19th Avenue South
Minneapolis, MN 55455
Email: patlaw@umn.edu
Website: https://www.law.umn.edu/academics/degree-programs/mspl-program

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science Patent Law

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science in patent law is a professional master's degree for scientists and engineers interested in pursuing a career in the growing field of patent law. The program requirements may be completed in one year of full-time study or in two years (with an optional third year) on a part-time basis. This program is offered through the University of Minnesota Law School. Students in this program will learn practical patent drafting, patent research, portfolio management, and innovation skills. Many courses in this program will be taken jointly with JD students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Applicants with a degree in Science or Engineering are preferred.

Other requirements to be completed before admission:
GRE and LSAT scores are accepted but not required.

Special Application Requirements:
Personal statement, resume, letters of recommendation, interview, patent bar eligibility assessment.

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 30 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.
Capstone Project: Patent Law CAPSTONE: Innovation (3 credits): Students select a technology of interest with the cooperation of their adviser. Using their knowledge of innovation, patent law, patent prosecution, patent research and strategy, they will identify, articulate, and present opportunities for innovation in their chosen technology.
This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Patent Law: Core Curriculum**

Take 20 credits of core coursework and the 3-credit capstone course for a total of 23 credits.

- LAW 5001 - Introduction to the American Legal System (2.0 cr)
- LAW 5002 - MSPL Legal Research and Writing (1.0 cr)
- LAW 5025 - Patent Law Proseminar (1.0 cr)
- LAW 5026 - Intellectual Property and Technology Proseminar (1.0 cr)
- LAW 5075 - Ethics for Patent Agents (1.0 cr)
- LAW 5224 - Patents (3.0 cr)
- LAW 5231 - Patent Prosecution Practice I (2.0 cr)
- LAW 5232 - Patent Prosecution Practice II (3.0 cr)
- LAW 5243 - Patent Research and Writing (2.0 cr)
- LAW 5250 - Patent Portfolio Management (2.0 cr)
- LAW 5707 - Intellectual Property Transactions (2.0 cr)

**Capstone Course**

Students are required to take the 3 credit capstone course.

- LAW 5290 - Patent Law Capstone: Innovation (3.0 cr)

**Electives**

Take at least 7 elective credits in consultation with the program director. Coursework can be from the following list or selected with approval from the program director.

Take 7 or more credit(s) from the following:

- LAW 5062 - Energy Law (3.0 cr)
- LAW 5076 - Essentials of Business for Lawyers (3.0 cr)
- LAW 5103 - Data Privacy Law (3.0 cr)
- LAW 5608 - Trademarks (3.0 cr)
- LAW 5613 - Copyright (3.0 cr)
- LAW 5906 - Independent Research and Writing (1.0 - 2.0 cr)
- LAW 6037 - Emerging Sciences and Technologies: Law, Ethics and Policy (3.0 cr)
- LAW 6133 - Data Compliance Practicum (1.0 cr)
- LAW 6225 - Winning Patent Litigation (2.0 cr)
- LAW 6241 - Patent Remedies (1.0 cr)
- LAW 6402 - Food and Drug Law (3.0 cr)
- LAW 6605 - Health Law (3.0 cr)
- LAW 6609 - International Intellectual Property (3.0 cr)
- LAW 6610 - Unfair Competition (2.0 cr)
- LAW 6622 - International Business Operation and Negotiation (3.0 cr)
- LAW 6705 - Information Governance (2.0 cr)
- LAW 6709 - Current Agriculture-Environment Issues (2.0 cr)
- LAW 6714 - E-Discovery (2.0 cr)
- LAW 6832 - Cybercrime and Cybersecurity (2.0 cr)
- LAW 6853 - Law, Biomedicine and Bioethics (3.0 cr)
- LAW 6876 - Digital Evidence (2.0 cr)
- LAW 6949 - Biotechnology & Patent Law (2.0 cr)
**Twin Cities Campus**  
**Accountancy M.Acc**  
**Accounting**  
**Curtis L. Carlson School of Management**

Link to a list of faculty for this program.

**Contact Information:**  
Master Programs in Accounting, 3-110 Carlson School of Management, 321 19th Avenue S, Minneapolis, MN 55455 (612-624-7511; fax: 612-626-7795)  
Email: macct@umn.edu  
Website: [http://www.carlsonschool.umn.edu/master-accountancy](http://www.carlsonschool.umn.edu/master-accountancy)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30 to 46  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Accountancy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master’s of accountancy (MAcc) program offers a 30-credit track for students with a degree in accounting or finance. It provides these students with an opportunity to enhance their management skills with graduate-level courses in accounting, finance, taxation, information systems, and supply chain and operations. Completing the MAcc program enables them to meet the 150 semester hour requirement for CPA certification. In addition, it provides finance majors the opportunity to take accounting courses, required to sit for the CPA examination, that were not taken in their bachelor's degree program.

The MAcc program also offers a 46-credit track to students with a bachelor's degree in an academic discipline other than accounting or finance. The eight required core courses include the necessary accounting courses needed to sit for the CPA examination.

Elective courses in the MAcc program cover a broad range of topics in accounting, taxation, finance, supply chain and operations, and information systems. The curriculum has been designed and developed by Carlson School of Management faculty with extensive input and ongoing consultation with executives from the professional community. This ensures relevant, practical, and challenging courses that enhance the students' professional development.

Students may choose to complete the program on a full-time or part-time basis. Many of the courses are offered in the evenings (Monday-Thursday, 5:45-9:05 p.m.).

**Program Delivery**  
This program is available:  
• via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
Other requirements to be completed before admission:  
All applicants must have a bachelor's degree from an accredited college or university and a cumulative undergraduate grade point average of 3.0 (on a 4.0 scale) or higher.

Applicants with a bachelor's degree in accounting (or equivalent coursework) or finance are generally eligible for the 30-credit MAcc track.

Students who have a bachelor's degree in an academic discipline other than accounting or finance are eligible to apply for the MAcc program and take the 46-credit track. The following courses (or equivalents) are prerequisites to the MAcc courses: ACCT 2050 Financial Accounting, ACCT 3001 Management Accounting, ACCT 5101 Intermediate Accounting I, FINA 3001 Finance Fundamentals, IDSC 3001 Information Systems. If necessary some of the prerequisite courses can be taken after being admitted to the MAcc program but credits would not apply to the 46-credit requirement. Coursework will be evaluated after applying.

**Special Application Requirements:**  
Summer/Fall application deadline: February 1 priority, followed by rolling admission until program is full.  
Spring application deadline: October 1 priority, followed by rolling admission until program is full.
Applicants must submit all application materials through the University's admission system. Application materials include:

Three letters of recommendation from persons qualified to evaluate most recent work and potential for graduate study.

A GMAT score that is not more than five years old is required. The GMAT score must be sent directly from GMAT to be considered official. Admitted Carlson School of Management undergraduate students will have the GMAT requirement waived.

For international students, the results from one of the following English language tests are required: TOEFL, IELTS, MELAB. TOEFL scores must be received directly from TOEFL. IELTS and MELAB scores must be received directly from the testing center.

For additional application details, review the M.Acc. admissions webpages.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan C:** Plan C requires 30 to 46 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Students in the 30-credit MAcc track are required to have completed the following courses (or equivalent courses) in their undergraduate program or complete them in their MAcc program. If required to take any of these courses in the MAcc program, the number of elective credits is reduced by that number of credits.

- ACCT 5102 Intermediate Accounting II, 4 cr
- ACCT 5125W Auditing, 4 cr
- ACCT 5135 Fundamentals of Federal Income Tax, 4 cr
- BLAW 3058/6158 The Law of Contracts and Agency, 2 cr

**Required Courses (12 Credits)**

All MAcc students must complete the following courses for 12 credits:

- ACCT 6601 - Internal Control (4.0 cr)
- ACCT 6602 - Securities and Exchange Commission (SEC) and Standard Setting (4.0 cr)
- IDSC 6003 - Accounting and Information Systems (4.0 cr)

**Additional Courses Required for the 46-Credit Track (16 Credits)**

Students pursuing the 46-credit track must also complete the following courses for 16 credits:

- ACCT 5102 - Intermediate Accounting II (4.0 cr)
- ACCT 5125W - Auditing Principles and Procedures [WI] (4.0 cr)
- ACCT 5135 - Fundamentals of Federal Income Tax (4.0 cr)
- ACCT 6604 - Advanced Management Accounting (2.0 cr)
- BLAW 6158 - The study of laws affecting private business and publicly-traded companies. (2.0 cr)

**Elective Courses (18 credits)**

All MAcc students must complete at least 18 elective credits, selected in consultation with the advisor, from the following list:

- ACCT 5126 - Internal Auditing (2.0 cr)
- ACCT 5180 - Consolidations and Advanced Reporting (2.0 cr)
- ACCT 5201 - Intermediate Management Accounting (2.0 cr)
- ACCT 5236 - Introduction to Taxation of Business (2.0 cr)
- ACCT 5310 - International Accounting (2.0 cr)
- ACCT 6603 - Advanced Auditing (4.0 cr)
- ACCT 6604 - Advanced Management Accounting (2.0 cr)
- ACCT 6605 - Negotiations for Financial Executives (2.0 cr)
- FINA 6121 - Debt Markets, Interest Rates, and Hedging (2.0 cr)
- FINA 6241 - Corporate Finance Analysis and Decisions (4.0 cr)
- FINA 6242 - Advanced Corporate Finance Analysis and Decisions (4.0 cr)
- FINA 6322 - Financial Modeling (2.0 cr)
- FINA 6341 - World Economy (4.0 cr)
<table>
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<tr>
<th>Course Code</th>
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<th>Credit Hours</th>
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<tr>
<td>FINA 6522</td>
<td>Introduction to Derivatives and Financial Risk Management</td>
<td>2.0 cr</td>
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<tr>
<td>FINA 6621</td>
<td>International Financial Management</td>
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<td>IDSC 6423</td>
<td>Enterprise Systems</td>
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<td>IDSC 6471</td>
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<td>MBA 6120</td>
<td>Data Analysis and Statistics for Managers</td>
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<td>MBT 5200</td>
<td>Tax Accounting Methods I</td>
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<td>Tax Research, Communication, and Practice</td>
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<td>Corporate Taxation I</td>
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<td>Project Management</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>SCO 6056</td>
<td>Managing Supply Chain Operations</td>
<td>4.0 cr</td>
</tr>
</tbody>
</table>
Twin Cities Campus
Business Administration M.B.A.
Graduate Business Career Center
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
M.B.A. Programs Office, 1-110 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455 (612-625-5555; fax: 612-626-7582)
Email: mba@umn.edu
Website: http://www.carlsonschool.umn.edu/MBA

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48 to 64
- This program does not require summer semesters for timely completion.
- Degree: Master of Business Administration

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

At the Carlson School, students tailor their education to meet their career objectives. Supported by outstanding faculty, cutting-edge coursework, and extensive networking opportunities, students compile an impressive record of professional achievements even before they graduate.

The Carlson School offers several pathways to the master of business administration degree: the full-time MBA, the part-time MBA, the online MBA, and the executive MBA. Dual degree programs are only available through the full-time MBA program. Please visit our website at http://www.carlsonschool.umn.edu/mba/ for more information.

The Carlson School's China executive MBA program is offered through a partnership between the Carlson School and Lingnan (University) College of Sun Yat-sen University. The Carlson School's Vienna executive MBA program is offered jointly with the Vienna University of Economics and Business (WU). For additional information on these two programs, please contact cgi@umn.edu.

Accreditation
This program is accredited by AACSB International.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Applicants must have a bachelor's degree from an accredited college or university.

Other requirements to be completed before admission:
Please review the Admissions Checklist online for detailed admissions requirements.

Special Application Requirements:
Applicants must have an acceptable score on the GMAT or GRE. In addition, international students must have an acceptable score on the Test of English as a Foreign Language (TOEFL), the International Language Testing System (IELTS), or the Pearson Test of English Academic (PTE).

Candidates will be required to apply and be admitted to both degree programs separately.

Applicants must submit their test score(s) from the following:
- GMAT
- Pearson Test of English Academic (PTE Academic)
International applicants must submit score(s) from one of the following tests:

- TOEFL
- IELTS

Key to test abbreviations (GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 48 to 64 major credits and up to null credits outside the major. The is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

Joint- or Dual-degree Coursework: The Full-Time MBA program offers the following dual degree program options: MS-Applied Economics/MBA: up to 18 credits in common allowed; MS-Business Analytics/MBA: up to 22 credits in common allowed; MA-HRIR/MBA: up to 24 credits in common allowed; MA/PhD/MBA: up to 24 credits in common allowed; MPP/MBA: up to 24 credits in common allowed; Med/MBA: up to 24 credits in common allowed; and PharmD/MBA: up to 24 credits in common allowed. For full complete Dual Degree information, visit http://carlsonschool.umn.edu/degrees/master-business-administration/dual-degrees

Students may take a total of 24 credits in common among the academic programs.

Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Full-Time Master of Business Administration

The Carlson full-time MBA program offers an intense curriculum that gives students a distinct edge. They start by taking coordinated core courses that provide a sound foundation in essential managerial disciplines, while at the same time, customizing their education to fit their career paths. The full-time program involves a rigorous time commitment. While the amount of time spent on campus varies from 30-50 hours per week, all students are expected to complete the degree in two years with a minimum of 64 credits.

Financial Accounting

Take 1 or more course(s) from the following:
- MBA 6030 - Financial Accounting (3.0 cr)

Data Analysis & Statistics

Take 1 or more course(s) from the following:
- MBA 6120 - Data Analysis and Statistics for Managers (3.0 cr)

Managerial Economics

Take 1 or more course(s) from the following:
- MBA 6140 - Managerial Economics (2.0 cr)

Marketing

Take 1 or more course(s) from the following:
- MBA 6210 - Marketing Management (3.0 cr)

Supply Chain & Operations

Take 1 or more course(s) from the following:
- MBA 6220 - Supply Chain & Operations (3.0 cr)

Financial Management

Take 1 or more course(s) from the following:
- MBA 6230 - Financial Management (3.0 cr)

IT Management

Take 1 or more course(s) from the following:
- MBA 6240 - Competing in a Data-Driven Digital Age (2.0 cr)

Strategic Management

Take 1 or more course(s) from the following:
- MBA 6300 - Strategic Management (3.0 cr)

Business Ethics
Take 1 or more course(s) from the following:
- **MBA 6315** - The Ethical Environment of Business (2.0 cr)

**Leadership Requirement**
The total leadership credit requirement is 4 credits. MBA 6110 is completed in spring of the first year for a total of 2 credits. Additionally, students must complete HRIR 6465 for 2 credits prior to degree completion.
Take exactly 2 course(s) totaling exactly 4 credit(s) from the following:
- **MBA 6110** - Leading Others (2.0 cr)
- **HRIR 6465** - Leadership and Personal Development (2.0 cr)

**Enterprise Requirement**
All full-time MBA students are required to participate in one Enterprise program throughout their time in the program.
Take exactly 8 credit(s) from the following:
- **MBA 6501** - Carlson Funds Enterprise: Growth (1.0 - 4.0 cr)
- **MBA 6502** - Carlson Funds Enterprise: Fixed Income (1.0 - 4.0 cr)
- **MBA 6503** - Carlson Ventures Enterprise (2.0 - 4.0 cr)
- **MBA 6504** - Carlson Consulting Enterprise (2.0 - 4.0 cr)
- **MBA 6505** - Carlson Brand Enterprise (2.0 - 4.0 cr)

**International Experience**
All full-time MBA students must participate in an international study abroad program or complete a course on campus that has been designated to meet this requirement. A minimum of 4 credits is required to fulfill this requirement.
Take 1 or more course(s) totaling 4 or more credit(s) from the following:
- **IBUS 5140** - Vienna Summer Program in International Business (Graduate) (0.0 - 18.0 cr)
- **IBUS 5150** - IBUS 5150: Building on Frugal Innovations to Complete in a Global Environment (4.0 cr)
- **IBUS 5260** - Sustainability: The New Management Paradigm (4.0 cr)
- **IBUS 5300** - International Business: Graduate Exchange BLOCK (0.0 - 18.0 cr)
- **IBUS 5301** - Graduate Exchange in International Business - BLOCK (0.0 - 18.0 cr)
- **IBUS 5302** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5303** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5304** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5305** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5306** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5307** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5308** - International Business: Graduate Exchange (0.0 - 18.0 cr)
- **IBUS 5400** - Global Business Practicum (4.0 cr)
- **IBUS 5605** - Shanghai Summer Program in International Business (Graduate) (0.0 - 18.0 cr)
- **IBUS 6401** - Marketing in the Mayhem: Why Chile Thrives and How Argentina Tries (4.0 cr)
- **IBUS 6402** - Economic Diversification: Moving Beyond Oil in UAE and Oman (4.0 cr)
- **IBUS 6597** - MILI Global Valuation Lab (4.0 cr)
- **IDSC 6465** - Global Sourcing of IT and IT Enabled Services (4.0 cr)
- **MGT 6305** - The International Environment of Business (4.0 cr)
- **MKTG 6072** - International Marketing (4.0 cr)
- **SCO 6081** - Global Operations Strategy (4.0 cr)
- **MILI 6997** - MILI Global Valuation Lab (4.0 cr)

**Full-Time MBA Electives**
Electives not on this list must be approved by MBA Programs Office in order to count for degree requirements.
Take 24 or more credit(s) from the following:
- **ACCT 5180** - Consolidations and Advanced Reporting (2.0 cr)
- **ACCT 6100** - Financial Statement Analysis (4.0 cr)
- **APEC 5831** - Food and Agribusiness Marketplace (2.0 cr)
- **BLAW 6158** - The study of laws affecting private business and publicly-traded companies. (2.0 cr)
- **ENTR 6020** - Business Formation (4.0 cr)
- **ENTR 6021** - Preparing and Implementing the Business Plan (2.0 cr)
- **ENTR 6026** - Managing the Growing Business (2.0 cr)
- **ENTR 6037** - Corporate Venturing (2.0 cr)
- **ENTR 6041** - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
- **ENTR 6042** - Implementing New Product Design and Business Development (4.0 cr)
- **ENTR 6090** - Topics in Entrepreneurship (2.0 - 4.0 cr)
- **FINA 6121** - Debt Markets, Interest Rates, and Hedging (2.0 cr)
- **FINA 6122** - Financial Management of Depository Institutions (2.0 cr)
- **FINA 6123** - Financial Services Industry (2.0 cr)
- **FINA 6222** - Mergers and Acquisitions (2.0 cr)
- **FINA 6241** - Corporate Finance Analysis and Decisions (4.0 cr)
- **FINA 6242** - Advanced Corporate Finance Analysis and Decisions (4.0 cr)
- **FINA 6321** - Portfolio Analysis and Management (2.0 cr)
- **FINA 6322** - Financial Modeling (2.0 cr)
- **FINA 6323** - Advanced Financial Modeling (2.0 cr)
• FINA 6324 - Securitization Markets (2.0 cr)
• FINA 6325 - Behavioral Finance (2.0 cr)
• FINA 6341 - World Economy (4.0 cr)
• FINA 6522 - Introduction to Derivatives and Financial Risk Management (2.0 cr)
• FINA 6529 - Advanced Topics in Fixed Income and Derivatives (2.0 cr)
• FINA 6621 - International Financial Management (2.0 cr)
• FINA 6801 - Finance Independent Study (1.0 - 6.0 cr)
• GCC 5023 - Grand Challenge: Leading Across Sectors to Address Grand Challenges [CIV] (3.0 cr)
• IDSC 6050 - Information Technologies and Solutions (2.0 cr)
• IDSC 6423 - Enterprise Systems (2.0 cr)
• IDSC 6442 - E-Sourcing and E-Auctions (2.0 cr)
• IDSC 6444 - Business Analytics for Managers I (2.0 cr)
• IDSC 6446 - Business Analytics for Managers II (2.0 cr)
• IDSC 6455 - Web 2.0: The Business of Social Media (2.0 cr)
• IDSC 6465 - Global Sourcing of IT and IT Enabled Services (4.0 cr)
• IDSC 6471 - Knowledge Management (2.0 cr)
• IDSC 6481 - Managerial Decision Making (2.0 cr)
• MBA 6235 - Managerial Accounting (2.0 cr)
• MBA 6403 - Energy Industry (2.0 cr)
• MBA 6990 - MBA Topics (2.0 cr)
• MCOM 5500 - Enhancing Your Executive Image in Business Communications (2.0 cr)
• MCOM 5510 - Persuasive Writing in Business (2.0 cr)
• MCOM 5530 - Strategies and Skills for Managerial Presentations (2.0 cr)
• MGMT 5102 - StartUp: Customer Development and Testing (2.0 cr)
• MGMT 6004 - Negotiation Strategies (2.0 cr)
• MGMT 6031 - Industry Analysis and Competitive Strategy (4.0 cr)
• MGMT 6032 - Strategic Alliances (2.0 cr)
• MGMT 6033 - Managing the Strategy Process (2.0 cr)
• MGMT 6034 - Strategic Leadership (2.0 cr)
• MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
• MGMT 6040 - International Strategy and Organization (2.0 cr)
• MGMT 6050 - Management of Innovation and Change (2.0 cr)
• MGMT 6084 - Management of Groups (2.0 cr)
• MGMT 6085 - Corporate Strategy (4.0 cr)
• MGMT 6100 - Topics in Management (1.0 - 4.0 cr)
• MGMT 6305 - The International Environment of Business (4.0 cr)
• MGMT 6307 - Cross-Cultural Management: Developing Intercultural Competence (2.0 cr)
• MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
• MGMT 6410 - Corporate Responsibility (2.0 cr)
• MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
• MILI 6421 - Healthcare Law: Strategic and Business Implications (2.0 cr)
• MILI 6562 - Information Technology in Health Care (2.0 cr)
• MILI 6589 - Medical Technology Evaluation and Market Research (2.0 cr)
• MILI 6726 - Medical Device Industry: Business and Public Policy (2.0 cr)
• MILI 6963 - Healthcare Analytics (2.0 cr)
• MILI 6990 - The Health Care Marketplace (2.0 cr)
• MILI 6991 - Anatomy and Physiology for Managers (2.0 cr)
• MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
• MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
• MILI 6997 - MILI Global Valuation Lab (4.0 cr)
• MILI 6998 - MILI Fellows (0.0 - 2.0 cr)
• MILI 6999 - Independent Study (0.0 - 8.0 cr)
• MKTG 6050 - Business Research Methods (2.0 cr)
• MKTG 6051 - Marketing Research (4.0 cr)
• MKTG 6055 - Buyer Behavior (4.0 cr)
• MKTG 6060 - Marketing Channels (2.0 cr)
• MKTG 6072 - International Marketing (4.0 cr)
• MKTG 6073 - Marketing in High Tech Settings (2.0 cr)
• MKTG 6075 - Pricing Strategy (4.0 cr)
• MKTG 6078 - Advertising & Promotion (4.0 cr)
• MKTG 6082 - Brand Strategy (2.0 cr)
• MKTG 6084 - Persuasion and Influence (2.0 cr)
• MKTG 6085 - Harnessing Consumer Irrationality (2.0 cr)
• MKTG 6086 - Digital Marketing (2.0 cr)
• MKTG 6088 - Strategic Marketing (2.0 cr)
Part-Time Master of Business Administration

The Carlson part-time MBA curriculum, which can be completed online, includes core courses that offer an in-depth study of the foundational and functional areas of business. Advanced electives, international study options, and specializations allow students to tailor a program that meets their long-term career goals. To graduate, students must earn 52 credits. Students may be waived as determined at the time of admission based on prior coursework and/or waiver exams taken prior to the end of the first semester of enrollment.

Strategic Management
Recommended to be taken in first semester of MBA program
Take exactly 1 course(s) from the following:
• MBA 6300 - Strategic Management (3.0 cr)

Data Analysis & Statistics
Take exactly 1 course(s) from the following:
• MBA 6120 - Data Analysis and Statistics for Managers (3.0 cr)

Financial Accounting
Take exactly 1 course(s) from the following:
• MBA 6030 - Financial Accounting (3.0 cr)

Operations
Take exactly 1 course(s) from the following:
• MBA 6220 - Supply Chain & Operations (3.0 cr)

Finance
Take exactly 1 course(s) from the following:
• MBA 6230 - Financial Management (3.0 cr)

Marketing
Take exactly 1 course(s) from the following:
• MBA 6210 - Marketing Management (3.0 cr)

Managerial Accounting
Take exactly 1 course(s) from the following:
• MBA 6035 - Managerial Accounting (3.0 cr)

Leading Others/Org Behavior
Take exactly 1 course(s) from the following:
• MBA 6110 - Leading Others (2.0 cr)

Business Ethics
Take exactly 1 course(s) from the following:
• MBA 6315 - The Ethical Environment of Business (2.0 cr)

IT Requirement
Choose 1 of the following (if both taken, 1 will count as elective)
Take 1 or more course(s) from the following:
• IDSC 6040 - Information Technology Management (2.0 cr)
• IDSC 6050 - Information Technologies and Solutions (2.0 cr)

Economics Requirement
Choose 1 of the following (if both taken, 1 will count as elective). If choosing MBA 6140, it must be taken for 2 credits.
Take 1 or more course(s) from the following:
• MBA 6140 - Managerial Economics (2.0 cr)
• FINA 6341 - World Economy (4.0 cr)

International Experience

Choose 1 of the following (if more than 1 course completed, remainder will count as elective credit(s)):
Take 4 or more credit(s) from the following:
• MGMT 6305 - The International Environment of Business (4.0 cr)
• IDSC 6465 - Global Sourcing of IT and IT Enabled Services (4.0 cr)
• SCO 6081 - Global Operations Strategy (4.0 cr)
• MKTG 6072 - International Marketing (4.0 cr)
• MILI 6997 - MILI Global Valuation Lab (4.0 cr)
• IBUS 5140 - Vienna Summer Program in International Business (Graduate) (0.0 - 18.0 cr)
• IBUS 5150 - IBUS 5150: Building on Frugal Innovations to Complete in a Global Environment (4.0 cr)
• IBUS 5260 - Sustainability: The New Management Paradigm (4.0 cr)
• IBUS 5400 - Global Business Practicum (4.0 cr)
• IBUS 5605 - Shanghai Summer Program in International Business (Graduate) (0.0 - 18.0 cr)
• IBUS 6997 - MILI Global Valuation Lab (4.0 cr)
• IBUS 5300 - International Business: Graduate Exchange BLOCK (0.0 - 18.0 cr)
• IBUS 5301 - Graduate Exchange in International Business - BLOCK (0.0 - 18.0 cr)
• IBUS 5302 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5303 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5304 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5305 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5306 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5307 - International Business: Graduate Exchange (0.0 - 18.0 cr)
• IBUS 5308 - International Business: Graduate Exchange (0.0 - 18.0 cr)

Electives

Electives not on this list must be approved by MBA Programs Office to count towards degree requirements.
Take 19 or more credit(s) from the following:
• ACCT 5180 - Consolidations and Advanced Reporting (2.0 cr)
• ACCT 6100 - Financial Statement Analysis (4.0 cr)
• APEC 5831 - Food and Agribusiness Marketplace (2.0 cr)
• BLAW 6158 - The study of laws affecting private business and publicly-traded companies. (2.0 cr)
• ENTR 6020 - Business Formation (4.0 cr)
• ENTR 6021 - Preparing and Implementing the Business Plan (2.0 cr)
• ENTR 6026 - Managing the Growing Business (2.0 cr)
• ENTR 6037 - Corporate Venturing (2.0 cr)
• ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
• ENTR 6042 - Implementing New Product Design and Business Development (4.0 cr)
• ENTR 6090 - Topics in Entrepreneurship (2.0 - 4.0 cr)
• FINA 6121 - Debt Markets, Interest Rates, and Hedging (2.0 cr)
• FINA 6122 - Financial Management of Depository Institutions (2.0 cr)
• FINA 6123 - Financial Services Industry (2.0 cr)
• FINA 6222 - Mergers and Acquisitions (2.0 cr)
• FINA 6241 - Corporate Finance Analysis and Decisions (4.0 cr)
• FINA 6242 - Advanced Corporate Finance Analysis and Decisions (4.0 cr)
• FINA 6321 - Portfolio Analysis and Management (2.0 cr)
• FINA 6322 - Financial Modeling (2.0 cr)
• FINA 6323 - Advanced Financial Modeling (2.0 cr)
• FINA 6324 - Securitization Markets (2.0 cr)
• FINA 6325 - Behavioral Finance (2.0 cr)
• FINA 6341 - World Economy (4.0 cr)
• FINA 6522 - Introduction to Derivatives and Financial Risk Management (2.0 cr)
• FINA 6529 - Advanced Topics in Fixed Income and Derivatives (2.0 cr)
• FINA 6621 - International Financial Management (2.0 cr)
• FINA 6801 - Finance Independent Study (1.0 - 6.0 cr)
• GCC 5023 - Grand Challenge: Leading Across Sectors to Address Grand Challenges [CIV] (3.0 cr)
• HRIR 5465 - Leadership and Personal Development (2.0 cr)
• IDSC 6040 - Information Technology Management (2.0 cr)
• IDSC 6050 - Information Technologies and Solutions (2.0 cr)
• IDSC 6423 - Enterprise Systems (2.0 cr)
• IDSC 6442 - E-Sourcing and E-Auctions (2.0 cr)
• IDSC 6444 - Business Analytics for Managers I (2.0 cr)
• IDSC 6446 - Business Analytics for Managers II (2.0 cr)
• IDSC 6455 - Web 2.0: The Business of Social Media (2.0 cr)
• IDSC 6465 - Global Sourcing of IT and IT Enabled Services (4.0 cr)
• IDSC 6471 - Knowledge Management (2.0 cr)
• IDSC 6481 - Managerial Decision Making (2.0 cr)
• MBA 6403 - Energy Industry (2.0 cr)
• MBA 6990 - MBA Topics (2.0 cr)
• MCOM 5500 - Enhancing Your Executive Image in Business Communications (2.0 cr)
• MCOM 5510 - Persuasive Writing in Business (2.0 cr)
• MCOM 5530 - Strategies and Skills for Managerial Presentations (2.0 cr)
• MGMT 5102 - StartUp: Customer Development and Testing (2.0 cr)
• MGMT 6004 - Negotiation Strategies (2.0 cr)
• MGMT 6031 - Industry Analysis and Competitive Strategy (4.0 cr)
• MGMT 6032 - Strategic Alliances (2.0 cr)
• MGMT 6033 - Managing the Strategy Process (2.0 cr)
• MGMT 6034 - Strategic Leadership (2.0 cr)
• MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
• MGMT 6040 - International Strategy and Organization (2.0 cr)
• MGMT 6050 - Management of Innovation and Change (2.0 cr)
• MGMT 6084 - Management of Groups (2.0 cr)
• MGMT 6085 - Corporate Strategy (4.0 cr)
• MGMT 6100 - Topics in Management (1.0 - 4.0 cr)
• MGMT 6305 - The International Environment of Business (4.0 cr)
• MGMT 6310 - Cross-Cultural Management: Developing Intercultural Competence (2.0 cr)
• MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
• MGMT 6410 - Corporate Responsibility (2.0 cr)
• MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
• MILI 6421 - Healthcare Law: Strategic and Business Implications (2.0 cr)
• MILI 6552 - Information Technology in Health Care (2.0 cr)
• MILI 6589 - Medical Technology Evaluation and Market Research (2.0 cr)
• MILI 6726 - Medical Device Industry: Business and Public Policy (2.0 cr)
• MILI 6963 - Healthcare Analytics (2.0 cr)
• MILI 6990 - The Health Care Marketplace (2.0 cr)
• MILI 6991 - Anatomy and Physiology for Managers (2.0 cr)
• MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
• MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
• MILI 6997 - MILI Global Valuation Lab (4.0 cr)
• MILI 6998 - MILI Fellows (0.0 - 2.0 cr)
• MILI 6999 - Independent Study (0.0 - 8.0 cr)
• MKTG 6050 - Business Research Methods (2.0 cr)
• MKTG 6051 - Marketing Research (4.0 cr)
• MKTG 6055 - Buyer Behavior (4.0 cr)
• MKTG 6060 - Marketing Channels (2.0 cr)
• MKTG 6072 - International Marketing (4.0 cr)
• MKTG 6073 - Marketing in High Tech Settings (2.0 cr)
• MKTG 6075 - Pricing Strategy (4.0 cr)
• MKTG 6078 - Advertising & Promotion (4.0 cr)
• MKTG 6082 - Brand Strategy (2.0 cr)
• MKTG 6084 - Persuasion and Influence (2.0 cr)
• MKTG 6085 - Harnessing Consumer Irrationality (2.0 cr)
• MKTG 6086 - Digital Marketing (2.0 cr)
• MKTG 6088 - Strategic Marketing (2.0 cr)
• MKTG 6090 - Marketing Topics (1.0 - 4.0 cr)
• SCO 6041 - Project Management (2.0 cr)
• SCO 6045 - Strategic Sourcing (2.0 cr)
• SCO 6048 - Logistics and Transportation (2.0 cr)
• SCO 6051 - Service Management (2.0 cr)
• SCO 6056 - Managing Supply Chain Operations (4.0 cr)
• SCO 6072 - Managing Technologies in the Supply Chain (2.0 cr)
• SCO 6081 - Global Operations Strategy (4.0 cr)
• SCO 6090 - Sales, Inventory, and Operations Planning (2.0 cr)
• SCO 6091 - Process Improvement Methods (2.0 cr)
• SCO 6092 - Supply Chain Risk and Security (2.0 cr)
• SCO 6094 - Responsible Supply Chain Management (2.0 cr)
• SCO 6095 - Supply Chain Management in the Food and Agribusiness Sector (2.0 cr)
• SCO 6096 - Supply Chain Management in the Health Care and Medical Devices Sector (2.0 cr)
• SCO 6097 - Supply Chain Management in the Retail Sector (2.0 cr)
• SCO 6098 - Operations Excellence via Lean Thinking (2.0 cr)
Carlson Executive Master of Business Administration

The Carlson executive MBA is built on a foundation of time-tested business principles. By emphasizing a global perspective, the rigorous curriculum helps students develop a deeper understanding of theory and practice. Each class moves through the program together as a cohort, following set schedules. From orientation to graduation, it takes about 21 months to complete the program. Classes are held Fridays and Saturdays, predominantly on alternate weekends, 7:30 a.m. to 4:30 p.m., and do not meet during the summer.

CEMBA Program Requirements

The CEMBA program has a 49.5 credit program requirement.

CMBA 5810 - Introduction to Statistics and Business Analytics (3.0 cr)
CMBA 5811 - Financial Accounting (3.0 cr)
CMBA 5812 - Organizational Behavior (3.0 cr)
CMBA 5813 - Competing In The Digital Age (1.5 cr)
CMBA 5814 - Economics (1.5 cr)
CMBA 5815 - Marketing Management (3.0 cr)
CMBA 5816 - Strategic Management (3.0 cr)
CMBA 5817 - Financial Management (3.0 cr)
CMBA 5818 - Supply Chain and Operations (3.0 cr)
CMBA 5820 - Negotiation Strategies: Creative Solutions for Difficult Problems (3.0 cr)
CMBA 5821 - Managerial Accounting (3.0 cr)
CMBA 5822 - Applied Leadership (1.5 cr)
CMBA 5823 - Competing Globally (3.0 cr)
CMBA 5824 - Corporate Responsibility & Ethics (1.5 cr)
CMBA 5825 - Strategic Marketing (3.0 cr)
CMBA 5826 - Corporate Strategy (1.5 cr)
CMBA 5827 - Advanced Financial Management (3.0 cr)
CMBA 5828 - International Residency - Study Abroad (1.5 cr)
CMBA 5829 - International Residency Global Virtual Team Project (1.5 cr)

Choose 2 courses from the following:

Take exactly 2 course(s) from the following:
•CMBA 5830 - Advanced Management Topic Elective: Power & Influence (1.5 cr)
•CMBA 5831 - Advanced Management Topic Elective (1.5 cr)
•CMBA 5832 - Advanced Management Topic Elective (1.5 cr)
•CMBA 5833 - Advanced Management Topics Elective (1.5 cr)

Industry Master of Business Administration

The Industry MBA is a one-year, predominantly online program designed for working professionals to obtain the fundamental business knowledge crucial for leading careers in the complex, rapidly evolving and highly regulated healthcare, energy, technology and finance industries. Courses will be taught by our nationally renowned expert faculty and executive-level professionals. Targeting the Washington DC area, this 48 credit program will deliver sophisticated management and leadership education for students immersed in legislative and policy matters.

Industry MBA Course Requirements

Take exactly 48 credit(s) from the following:

•IMBA 6004 - Negotiations (2.0 cr)
•IMBA 6030 - Financial Accounting (3.0 cr)
•IMBA 6110 - Leading Others (2.0 cr)
•IMBA 6120 - Data Analysis & Statistics (3.0 cr)
•IMBA 6140 - Managerial Economics (3.0 cr)
•IMBA 6210 - Marketing Management (3.0 cr)
•IMBA 6220 - Supply Chain Management (3.0 cr)
•IMBA 6230 - Financial Management (3.0 cr)
•IMBA 6240 - Data Analytics (3.0 cr)
•IMBA 6300 - Strategic Management (3.0 cr)
•IMBA 6315 - The Ethical Environment of Business (2.0 cr)
•IMBA 6401 - Industry Overview & Business Law (2.0 cr)
•IMBA 6402 - Industry Vertical: Technology (2.0 cr)
•IMBA 6403 - Industry Vertical: Energy (2.0 cr)
•IMBA 6404 - Industry Vertical: Finance (2.0 cr)
•IMBA 6405 - Industry Vertical: Health (2.0 cr)
•IMBA 6500 - Virtual Team Project (4.0 cr)
China Executive M.B.A.

China Executive MBA Courses
51 credits required.
- CHMB 5800 - Organizational Behavior (3.0 cr)
- CHMB 5801 - Financial Accounting (3.0 cr)
- CHMB 5802 - Statistics and Decision Making (3.0 cr)
- CHMB 5803 - Operations Management (3.0 cr)
- CHMB 5804 - Managerial Accounting (3.0 cr)
- CHMB 5805 - Financial Management (3.0 cr)
- CHMB 5806 - Marketing Management (3.0 cr)
- CHMB 5807 - Business Strategy (3.0 cr)
- CHMB 5808 - Strategic Marketing (3.0 cr)
- CHMB 5809 - Advanced Financial Management (3.0 cr)
- CHMB 5810 - International Environment (1.5 cr)
- CHMB 5811 - Information Technology Management (3.0 cr)
- CHMB 5813 - Ethics and Leadership (3.0 cr)
- CHMB 5815 - International Human Resources Management (3.0 cr)
- CHMB 5816 - International Residency (6.0 cr)
- CHMB 5817 - China's Economy (1.5 cr)
- CHMB 5818 - Law and Business (3.0 cr)

Vienna Masters of Business Administration

Vienna MBA Coursework Requirements
58 credits required
- VMBA 5700 - Managerial Accounting (4.0 cr)
- VMBA 5701 - Data Analysis and Decision Making (4.0 cr)
- VMBA 5702 - Financial Management (4.0 cr)
- VMBA 5703 - Marketing Management (4.0 cr)
- VMBA 5704 - Managing People and Organizations (4.0 cr)
- VMBA 5705 - Operations Management (4.0 cr)
- VMBA 5706 - Business, Government, and Macroeconomics (4.0 cr)
- VMBA 5707 - Economics in Transition (4.0 cr)
- VMBA 5709 - Info Tech Mgmt (4.0 cr)
- VMBA 5711 - Managing Globalization (Guangzhou) (4.0 cr)
- VMBA 5712 - Strategies for a Global Company: an Integrative Perspective (6.0 cr)
- VMBA 5713 - Negotiations and Conflict Management (4.0 cr)
- VMBA 5714 - Financial Accounting (4.0 cr)
- VMBA 5715 - Corporate and Entrepreneurial Strategy (4.0 cr)

India

Online Master of Business Administration
Not accepting students to this track at this time.
Twin Cities Campus

Business Administration Minor
Curtis L. Carlson School of Management - Adm
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
PhD Program in Business Administration, Carlson School of Management, Suite 4-205, 321 19th Avenue South, Minneapolis, MN 55455 (612-624-0875 or 612-624-5065; fax 612-624-8221)
Email: csom-phd@umn.edu
Website: http://carlsonschool.umn.edu/degrees/phd

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 16
- This program does not require summer semesters for timely completion.
- None.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD program in business administration offers full-time advanced graduate education for students seeking academic placement at leading universities or research-oriented positions in business or government. The program is for individuals who have the intellectual capacity for advanced study, enjoy independent research and analytical thinking, and who wish to master a discipline within business administration.

Non-business administration doctoral students working toward a minor within the business administration program must complete a cohesive program of study in one of seven areas of specialization: accounting; finance; information and decision sciences; marketing; supply chain and operations; strategic management and entrepreneurship, and work and organizations.

Accreditation
This program is accredited by AACSB International

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
University of Minnesota PhD student in a field other than business administration.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

For each of the seven areas of concentration, a minimum of 16 credits is required. Coursework is selected in consultation with the PhD program office or the PhD coordinator of the student's chosen concentration area. Courses should be 8xxx-level, although up to 8 credits of 5xxx- and 7xxx-level coursework can be taken with the approval of the PhD and master's program offices.

Areas of Concentration

Accounting
Take 16 or more credit(s) from the following:
- ACCT 8801 - Topics in Empirical Research I (2.0 cr)
- ACCT 8802 - Topics in Empirical Research II (2.0 cr)
- **ACCT 8803** - Topics in Empirical Research III (2.0 cr)
- **ACCT 8811** - Information Economics I (2.0 cr)
- **ACCT 8812** - Information Economics II (4.0 cr)
- **ACCT 8813** - Information Economics III (2.0 cr)
- **ACCT 8821** - Capital Markets I (2.0 cr)
- **ACCT 8822** - Capital Markets II (2.0 cr)
- **ACCT 8823** - Capital Markets III (2.0 cr)
- **ACCT 8831** - Analytical Research Topics I (2.0 cr)
- **ACCT 8832** - Analytical Research Topics II (2.0 cr)
- **ACCT 8833** - Topics in Analytical Research III (2.0 cr)

- **OR-**

**Finance**

Take 16 or more credit(s) from the following:
- **FINA 8802** - Theory of Capital Markets I: Discrete Time (2.0 cr)
- **FINA 8803** - Theory of Capital Markets II: Continuous Time (2.0 cr)
- **FINA 8804** - Advanced Continuous Time Finance (2.0 cr)
- **FINA 8810** - Topics in Asset Pricing (2.0 cr)
- **FINA 8812** - Corporate Finance I (2.0 cr)
- **FINA 8813** - Corporate Finance II (2.0 cr)
- **FINA 8820** - Topics in Corporate Finance (2.0 cr)
- **FINA 8822** - Empirical Methods in Finance (2.0 cr)
- **FINA 8823** - Empirical Corporate Finance (2.0 cr)
- **FINA 8890** - Seminar: Finance Topics (2.0 - 4.0 cr)

- **OR-**

**Information and Decision Sciences**

Take 16 or more credit(s) from the following:
- **IDSC 8511** - Conceptual Topics and Research Methods in Information and Decision Sciences (3.0 cr)
- **IDSC 8521** - System Development (3.0 cr)
- **IDSC 8531** - Organizational Theory and Research in Information Systems (3.0 cr)
- **IDSC 8541** - Introduction to Economics of Information Systems (3.0 cr)
- **IDSC 8620** - Data Mining and Personalization (3.0 cr)
- **IDSC 8721** - Behavioral Decision Theory (3.0 cr)
- **IDSC 8801** - Research Seminar in Information and Decision Sciences (2.0 cr)

- **OR-**

**Marketing**

Take 16 or more credit(s) from the following:
- **MKTG 8809** - Consumer Behavior Research Methods (2.0 cr)
- **MKTG 8810** - Consumer Behavior Special Topics (2.0 cr)
- **MKTG 8811** - Consumer Attitudes and Persuasion I (2.0 cr)
- **MKTG 8812** - Consumer Attitudes and Persuasion II (2.0 cr)
- **MKTG 8813** - Consumer Judgment and Decision Making I (2.0 cr)
- **MKTG 8814** - Consumer Judgment and Decision Making II (2.0 cr)
- **MKTG 8831** - Seminar: Inter-Organizational Relations (4.0 cr)
- **MKTG 8842** - Quantitative Modeling I (2.0 cr)
- **MKTG 8843** - Quantitative Modeling II (2.0 cr)
- **MKTG 8851** - Seminar: Marketing Management and Strategy I (2.0 cr)
- **MKTG 8852** - Marketing Management & Strategy II (2.0 cr)
- **MKTG 8890** - Seminar: Marketing Topics (1.0 - 4.0 cr)

- **OR-**

**Strategic Management and Entrepreneurship**

Take 16 or more credit(s) from the following:
- **MGMT 8101** - Theory Building and Research Design (4.0 cr)
- **MGMT 8202** - Seminar in International Management (4.0 cr)
- **MGMT 8301** - Seminar in Organizational Behavior (4.0 cr)
- **MGMT 8302** - Seminar in Organizations Theory (4.0 cr)
- **MGMT 8401** - Seminar in Strategy Content (2.0 - 4.0 cr)
- **MGMT 8402** - Seminar in Behavioral Strategy (2.0 - 4.0 cr)
- **MGMT 8501** - Seminar in Entrepreneurship (4.0 cr)
Supply Chain and Operations
Take 16 or more credit(s) from the following:
• SCO 8651 - Experimental Design (3.0 cr)
• SCO 8652 - Regression Analysis (3.0 cr)
• SCO 8711 - Research in Operations Strategy (3.0 cr)
• SCO 8721 - Management of Technological Operations (3.0 cr)
• SCO 8735 - Supply Chain Management (3.0 cr)
• SCO 8745 - Research on Quality Management (3.0 cr)
• SCO 8755 - Behavioral Operations (3.0 cr)

-OR-

Work and Organizations
Take 16 or more credit(s) from the following:
• HRIR 8801 - Core Seminar: Fundamentals of Economic Analysis for Work and Organizations (4.0 cr)
• HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
• HRIR 8803 - Core Seminar: Fundamentals of HR Research (4.0 cr)
• HRIR 8812 - Core Seminar: Research Methods in Work and Organizations (4.0 cr)
• HRIR 8820 - Seminar: Special Topics in Work and Organizations Research (2.0 cr)
• HRIR 8825 - Research Practicum/Workshop (1.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
Twin Cities Campus
Business Administration Ph.D.
Curtis L. Carlson School of Management - Adm
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Carlson School of Management, Business Administration PhD Program, Suite 4-205, 321 19th Avenue South, Minneapolis, MN 55455
(612-624-0875; fax: 612-624-8221)
Email: csom-phd@umn.edu
Website: http://carlsonschool.umn.edu/degrees/phd

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 64 to 68
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program offers full-time advanced graduate education for students seeking academic placement at leading universities or research-oriented positions in business or government. The program is for individuals who have the intellectual capacity for advanced study, enjoy independent research and analytical thinking, and who wish to master a discipline within business administration.

Students choose to concentrate in one of seven areas of specialization: accounting; finance; information and decision sciences; marketing; supply chain and operations; strategic management and entrepreneurship; and work and organizations.

Accreditation
This program is accredited by Association to Advance Collegiate Schools of Business (AACSB)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have completed a four-year undergraduate degree in any relevant field of study.

Other requirements to be completed before admission:
Admission depends on the applicant's grades, test scores (GMAT or GRE), and strength of both the letters of recommendation and the statement of purpose.

Preferred minimum test scores are 650 total on the GMAT or 320 total on the GRE general test.

Special Application Requirements:
Applicants should submit the following items to the Carlson School of Management PhD program office: (1) an official copy of the GMAT or GRE scores taken within the last five years; and (2) official TOEFL or IELTS scores (international applicants only) from a test taken within the last two years. All other application materials (official application, application fee, statement of purpose, resume/vita, three letters of recommendation and transcripts) should be entered directly or uploaded into the online application system. The application deadline for all areas of concentration is December 15 each year for fall admission consideration. Applications are evaluated on a rolling basis beginning in mid-January. Admission decisions continue until available positions are filled.

Applicants must submit their test score(s) from the following:
• GRE
• GMAT
  - Total score: 650
International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Speaking Score: 25
• IELTS
  - Total Score: 7

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 to 28 credits are required in the major.
16 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.30 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Degree requirements vary by area of concentration. Each student's coursework is determined in consultation with an advisor. Some areas may require a first-year examination or presentation.

Areas of Concentration

Accounting
Students pursuing the accounting concentration work under one of two accounting research paradigms: analytic or empirical.

Required Accounting Coursework
Take all of the following for 24 credits:
ACCT 8801 - Topics in Empirical Research I (2.0 cr)
ACCT 8802 - Topics in Empirical Research II (2.0 cr)
ACCT 8803 - Topics in Empirical Research III (2.0 cr)
ACCT 8811 - Information Economics I (2.0 cr)
ACCT 8812 - Information Economics II (4.0 cr)
ACCT 8813 - Information Economics III (2.0 cr)
ACCT 8821 - Capital Markets I (2.0 cr)
ACCT 8822 - Capital Markets II (2.0 cr)
ACCT 8823 - Capital Markets III (2.0 cr)
ACCT 8831 - Analytical Research Topics I (2.0 cr)
ACCT 8832 - Analytical Research Topics II (2.0 cr)
ACCT 8833 - Topics in Analytical Research III (2.0 cr)

Supporting/Methodology Coursework
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
Take 16 or more credit(s) from the following:
• APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
• APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
• APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
• APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
• ECON 8003 - Microeconomic Analysis (2.0 cr)
• ECON 8004 - Microeconomic Analysis (2.0 cr)
• ECON 8205 - Applied Econometrics (2.0 cr)
• FINA 8802 - Theory of Capital Markets I: Discrete Time (2.0 cr)
Finance
Finance is viewed as a subfield of economics. Students achieve a strong foundation in economic theory and empirical methods.

Required Finance Coursework
Take at least 20 credits from the following list. FINA 8810, 8820, and 8890 may be taken more than once.

- FINA 8802 - Theory of Capital Markets I: Discrete Time (2.0 cr)
- FINA 8803 - Theory of Capital Markets II: Continuous Time (2.0 cr)
- FINA 8804 - Advanced Continuous Time Finance (2.0 cr)
- FINA 8810 - Topics in Asset Pricing (2.0 cr)
- FINA 8812 - Corporate Finance I (2.0 cr)
- FINA 8813 - Corporate Finance II (2.0 cr)
- FINA 8820 - Topics in Corporate Finance (2.0 cr)
- FINA 8822 - Empirical Methods in Finance (2.0 cr)
- FINA 8823 - Empirical Corporate Finance (2.0 cr)

Additional Required Finance Coursework (8 credits)
Take the following sequence of economics courses for at least 8 credits.

8101-04 Sequence
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)

Supporting/Methodology Coursework (16 credits)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.

- ACCT 8812 - Information Economics II (4.0 cr)
- ACCT 8831 - Analytical Research Topics I (2.0 cr)
- ACCT 8832 - Analytical Research Topics II (2.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- ECON 8003 - Microeconomic Analysis (2.0 cr)
- ECON 8004 - Microeconomic Analysis (2.0 cr)
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)
- ECON 8105 - Macroeconomic Theory (2.0 cr)
- ECON 8106 - Macroeconomic Theory (2.0 cr)
- ECON 8107 - Macroeconomic Theory (2.0 cr)
- ECON 8108 - Macroeconomic Theory (2.0 cr)
- ECON 8181 - Advanced Topics in Microeconomics (2.0 cr)
- ECON 8182 - Advanced Topics in Microeconomics (2.0 cr)
- ECON 8185 - Advanced Topics in Macroeconomics (2.0 cr)
- ECON 8191 - Workshop in Mathematical Economics (1.0 - 3.0 cr)
- ECON 8201 - Econometric Analysis (2.0 cr)
- ECON 8205 - Applied Econometrics (2.0 cr)
- ECON 8206 - Applied Econometrics (2.0 cr)
- ECON 8207 - Applied Econometrics (2.0 cr)
- ECON 8208 - Applied Econometrics (2.0 cr)
- ECON 8211 - Econometrics (2.0 cr)
- ECON 8212 - Econometrics (2.0 cr)
Information and Decision Sciences

Required IDSc PhD Coursework (15 credits)
Take the following courses:
- IDSC 8511 - Conceptual Topics and Research Methods in Information and Decision Sciences (3.0 cr)
- IDSC 8521 - System Development (3.0 cr)
- IDSC 8531 - Organizational Theory and Research in Information Systems (3.0 cr)
- IDSC 8541 - Introduction to Economics of Information Systems (3.0 cr)
- IDSC 8721 - Behavioral Decision Theory (3.0 cr)

Additional IDSc Required Coursework (2 credits)
Take a minimum of 2 credits from the following. 8801 may be repeated.
Take 2 or more credit(s) from the following:
- IDSC 8620 - Data Mining and Personalization (3.0 cr)
- IDSC 8801 - Research Seminar in Information and Decision Sciences (2.0 cr)

Additional Required Coursework (8 credits minimum)
Take the following courses for a total of 8 credits:
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
Take 16 or more credit(s) from the following:
- APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
- APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
- CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
- CSCI 8551 - Intelligent Agents (3.0 cr)
- CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
- CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
- ECON 8581 - Advanced Topics in Labor Economics (2.0 cr)
- ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
- ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- MGMT 8101 - Theory Building and Research Design (4.0 cr)
- MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
- MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
- PSY 5018H - Mathematical Models of Human Behavior (3.0 cr)
- PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
- PSY 5993 - Research Laboratory in Psychology (3.0 cr)
- PSY 8201 - Social Cognition (3.0 cr)
- PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
- PUBH 6470 - SAS Procedures and Data Analysis (3.0 cr)
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
- SCO 8652 - Regression Analysis (3.0 cr)
- SCO 8721 - Management of Technological Operations (3.0 cr)
- IDSC 8892 - Readings in Information and Decision Sciences (1.0 - 8.0 cr)
- IDSC 8894 - Graduate Research in Information and Decision Sciences (1.0 - 8.0 cr)
Thesis Credits (24 credits minimum)
Take at least 24 doctoral thesis credits.
BA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

-OR-

Marketing
Students pursuing the marketing concentration focus on one of two tracks: consumer behavior or marketing quantitative/marketing strategy.

Consumer Behavior Concentration (24 credits minimum)
Take all of the following courses, including at least 8 credits of MKTG 8810, for a total of 18 credits. In addition, take at least 6 credits from the quantitative/marketing strategy concentration course list.
Take 18 or more credit(s) from the following:
• MKTG 8809 - Consumer Behavior Research Methods (2.0 cr)
• MKTG 8810 - Consumer Behavior Special Topics (2.0 cr)
• MKTG 8811 - Consumer Attitudes and Persuasion I (2.0 cr)
• MKTG 8812 - Consumer Attitudes and Persuasion II (2.0 cr)
• MKTG 8813 - Consumer Judgment and Decision Making I (2.0 cr)
• MKTG 8814 - Consumer Judgment and Decision Making II (2.0 cr)

or Quantitative/Marketing Strategy Concentration (24 credits minimum)
Take 12 credits, which can include up to 4 credits of MKTG 8890, from the following list. In addition, take at least 12 credits from the consumer behavior concentration course list.
Take 12 or more credit(s) from the following:
• MKTG 8831 - Seminar: Inter-Organizational Relations (4.0 cr)
• MKTG 8842 - Quantitative Modeling I (2.0 cr)
• MKTG 8843 - Quantitative Modeling II (2.0 cr)
• MKTG 8851 - Seminar: Marketing Management and Strategy I (2.0 cr)
• MKTG 8852 - Marketing Management & Strategy II (2.0 cr)
• MKTG 8890 - Seminar: Marketing Topics (1.0 - 4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below.
ACCT 8811 - Information Economics I (2.0 cr)
ACCT 8831 - Analytical Research Topics I (2.0 cr)
APEC 8211 - Econometric Analysis I (4.0 cr)
APEC 8212 - Econometric Analysis II (4.0 cr)
CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
ECON 8003 - Microeconomic Analysis (2.0 cr)
ECON 8004 - Microeconomic Analysis (2.0 cr)
ECON 8101 - Microeconomic Theory (2.0 cr)
ECON 8103 - Microeconomic Theory (2.0 cr)
ECON 8104 - Microeconomic Theory (2.0 cr)
ECON 8118 - Noncooperative Game Theory (2.0 cr)
ECON 8119 - Cooperative Game Theory (2.0 cr)
ECON 8191 - Workshop in Mathematical Economics (1.0 - 3.0 cr)
ECON 8205 - Applied Econometrics (2.0 cr)
ECON 8206 - Applied Econometrics (2.0 cr)
ECON 8207 - Applied Econometrics (2.0 cr)
ECON 8208 - Applied Econometrics (2.0 cr)
ECON 8211 - Econometrics (2.0 cr)
ECON 8212 - Econometrics (2.0 cr)
ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
ECON 8603 - Industrial Organization and Government Regulation (2.0 cr)
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
EPSY 5245 - Advanced Survey Data Analysis for Categorical and Rating Scale Data (1.0 cr)
EPSY 5261 - Introductory Statistical Methods (3.0 cr)
EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
IDSC 8721 - Behavioral Decision Theory (3.0 cr)
MSBA 6440 - Data-Driven Experimentation and Measurement (3.0 cr)
PSY 5202 - Attitudes and Social Behavior (3.0 cr)
PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
PSY 5207 - Personality and Social Behavior (3.0 cr)
PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
PSY 8203 - Impression Management (3.0 cr)
PSY 8208 - Social Psychology: The Self (3.0 cr)
PSY 8209 - Research Methods in Social Psychology (3.0 cr)
PSY 8935 - Readings in Behavioral Genetics and Individual Differences Psychology (1.0 cr)
PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)
STAT 5303 - Designing Experiments (4.0 cr)
MKTG 8892 - Readings in Marketing (1.0 - 8.0 cr)
MKTG 8894 - Graduate Research in Marketing (1.0 - 8.0 cr)

**Thesis Credits**
Take at least 24 doctoral thesis credits.
BA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

-OR-

**Supply Chain and Operations**
Students complete coursework in the areas of operations and supply chain management.

**Required SCO Coursework (25 credits minimum)**
Take the following courses for a total of 25 credits:
- SCO 8651 - Experimental Design (3.0 cr)
- SCO 8652 - Regression Analysis (3.0 cr)
- SCO 8711 - Research in Operations Strategy (3.0 cr)
- SCO 8721 - Management of Technological Operations (3.0 cr)
- SCO 8735 - Supply Chain Management (3.0 cr)
- SCO 8745 - Research on Quality Management (3.0 cr)
- SCO 8755 - Behavioral Operations (3.0 cr)
- MGMT 8101 - Theory Building and Research Design (4.0 cr)

**Supporting/Methodology Coursework (16 credits minimum)**
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
Take 16 or more credit(s) from the following:
- APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- APEC 8602 - Economics of the Environment (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
- MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
- MKTG 8842 - Quantitative Modeling I (2.0 cr)
- MKTG 8843 - Quantitative Modeling II (2.0 cr)
- PA 5032 - Applied Regression (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
- PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
- PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
- PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)
- SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5022 - Theory of Statistics I (4.0 cr)
- STAT 5023 - Theory of Statistics II (4.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)
- STAT 5701 - Statistical Computing (3.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- STAT 8311 - Linear Models (4.0 cr)
- SCO 8892 - Readings in Operations and Management Science (1.0 - 8.0 cr)
- SCO 8894 - Graduate Research in Operations and Management Science (1.0 - 8.0 cr)

**Thesis Credits (24 credits minimum)**
Take at least 24 doctoral thesis credits.
BA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Strategic Management and Entrepreneurship
Students focus on leadership, strategy, and entrepreneurship connecting the external worlds of competition and collaboration.

Required SME Coursework (12 credits minimum)
Take all of the following courses, including 4 credits of MGMT 8401.
MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
MGMT 8401 - Seminar in Strategy Content (2.0 - 4.0 cr)
MGMT 8402 - Seminar in Behavioral Strategy (2.0 - 4.0 cr)

Additional Required Coursework (11 credits)
Take 11 or more credit(s) from the following:
- APEC 8211 - Econometric Analysis I (4.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- MGMT 8101 - Theory Building and Research Design (4.0 cr)

SME Electives (4 credits)
Take one of the following courses:
- MGMT 8202 - Seminar in International Management (4.0 cr)
- or MGMT 8501 - Seminar in Entrepreneurship (4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
Take 16 or more credit(s) from the following:
- APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
- CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- FINA 8823 - Empirical Corporate Finance (2.0 cr)
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
- MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
- MGMT 8892 - Readings in Management Theory and Administration (1.0 - 8.0 cr)
- MGMT 8894 - Graduate Research in Management Theory and Administration (1.0 - 8.0 cr)
- MKTG 8831 - Seminar: Inter-Organizational Relations (4.0 cr)
- PA 8302 - Applied Policy Analysis (4.0 cr)
- POL 8106 - Quantitative Political Science I (3.0 cr)
- PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)
- PUBH 8811 - Research Methods in Health Care (3.0 cr)
- SOC 8412 - Social Network Analysis: Theory and Methods (3.0 cr)
- SOC 8701 - Sociological Theory (4.0 cr)
- SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)
- SOC 8735 - Sociology of Culture (3.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)
- SOC 8811 - Advanced Social Statistics (4.0 cr)
- SOC 8890 - Advanced Topics in Research Methods (2.0 - 3.0 cr)
- STAT 8031 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)

Thesis Credits (24 credits minimum)
Take at least 24 doctoral thesis credits.
BA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Work and Organizations
Students complete multidisciplinary coursework covering organizational behavior, human resource management, organizational economics, personnel economics, labor relations, and related areas.

Required WOrg Coursework (24-28 credits)
Take 24-28 credits from the following list. Take HRIR 8820 2-4 times for a total of 4-8 credits. Take HRIR 8825 4 times for a total of 4 credits.
Take 24 - 28 credit(s) from the following:
- HRIR 8801 - Core Seminar: Fundamentals of Economic Analysis for Work and Organizations (4.0 cr)
• HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
• HRIR 8803 - Core Seminar: Fundamentals of HR Research (4.0 cr)
• HRIR 8812 - Core Seminar: Research Methods in Work and Organizations (4.0 cr)
• HRIR 8820 - Seminar: Special Topics in Work and Organizations Research (2.0 cr)
• HRIR 8825 - Research Practicum/Workshop (1.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)

• Supporting/Methodology Coursework (16 credits minimum)
  Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
  Take 16 or more credit(s) from the following:
  • APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
  • APEC 8211 - Econometric Analysis I (4.0 cr)
  • APEC 8212 - Econometric Analysis II (4.0 cr)
  • APEC 8501 - Labor Economics I (2.0 cr)
  • APEC 8502 - Labor Economics II (2.0 cr)
  • CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
  • ECON 8205 - Applied Econometrics (2.0 cr)
  • ECON 8206 - Applied Econometrics (2.0 cr)
  • EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
  • EPSY 5261 - Introductory Statistical Methods (3.0 cr)
  • EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
  • EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
  • EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
  • EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
  • MGMT 8101 - Theory Building and Research Design (4.0 cr)
  • MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
  • PSY 8208 - Social Psychology: The Self (3.0 cr)
  • PSY 8664 - Personality Assessment (3.0 cr)
  • PSY 8701 - Seminar in Industrial and Organizational Psychology I (3.0 cr)
  • PSY 8702 - Seminar in Industrial and Organizational Psychology II (3.0 cr)
  • PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
  • PUBH 6724 - The Health Care System and Public Health (3.0 cr)
  • PUBH 6832 - Economics of the Health Care System (3.0 cr)
  • PUBH 6861 - Health Insurance (2.0 cr)
  • SOC 8590 - Topics in Life Course Sociology (3.0 cr)
  • HRIR 8991 - Independent Study in Human Resources and Industrial Relations (1.0 - 8.0 cr)

• Thesis Credits (24 credits minimum)
  Take at least 24 doctoral thesis credits.
  • BA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
**Twin Cities Campus**

**Business Analytics M.S.**

*Information & Decision Sciences*

*Curtis L. Carlson School of Management*

Link to a list of faculty for this program.

**Contact Information:**
Phone: 612-625-5555  
Email: msba@umn.edu  
Website: [https://carlsonschool.umn.edu/degrees/master-science-in-business-analytics](https://carlsonschool.umn.edu/degrees/master-science-in-business-analytics)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 45  
- This program requires summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The MS in Business Analytics (MSBA) program provides a strong foundation in data analytics by bringing together a diverse body of knowledge from consumer behavior, risk management, operations research, optimization, information systems, computer science, applied statistics, and decision theory for the purpose of data-driven business decision making in both public and private sectors.

Students who graduate from this 45-credit program will have the deep quantitative capabilities and technical expertise to create business and social value by extracting useful insights and applying them in a variety of career settings. The Business Analytics MS can be completed in one year of full-time study, or in two years part-time.

**Dual MBA-MSBA Degree**  
The Carlson School of Management offers a dual MBA-MSBA degree option. The MBA curriculum provides a rigorous business education while MSBA courses teach students how to collect and analyze data for business value. The combination of the two programs prepares graduates to identify business opportunities and advantages using data-derived insights. The MBA-MSBA dual degree can be completed in 2.5 years and culminates in the completion of two graduate degree programs.

**Accreditation**  
This program is accredited by AACSB International. The M.S. program in Business Analytics is STEM designated.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
Applicants must have a bachelor's degree from an accredited college or university.

Other requirements to be completed before admission:
- Demonstrated proficiency in computer programming is required. The following programming languages satisfy the requirement: Python, R, C, C++, C#, VB, Java, Pascal, and Fortran.  
- Applicants must have completed at least one semester college-level Calculus course with a grade of "C" or better (or grade equivalent).  
- Work experience is not required, but preferred.

**Special Application Requirements:**
MSBA Application Requirements:
Applicants must submit all application materials through the University's admissions system. Application materials include:
- A GMAT or GRE General Test that is not more than five years old, with an acceptable score. PT MSBA applicants: A GMAT/GRE waiver is available for qualified candidates.  
- For international students, an acceptable score on the Test of English as a Foreign Language (TOEFL) International Language Testing System (IELTS).  
- Three letters of recommendations need to be submitted through the online application.
- A personal statement of career goals, and objectives for pursuing a Business Analytics M.S. degree. The personal statement questions are the following:
  Briefly describe your short-term and long-term career goals. Why are you choosing to pursue a Business Analytics M.S. degree at this time in your career, and what are you hoping to accomplish by doing so? Why are you interested in pursuing a Business Analytics M.S. degree at the Carlson School of Management? What do you feel makes you a strong candidate for the program? How will you contribute to the Business Analytics M.S. Program overall? Applicants must submit a current resume that includes job responsibilities and accomplishments in the online application.
- Applicants may choose to submit an essay to comment on any item(s) in their application they consider worthy of further explanation.
- Applicants may be required to complete an admissions interview, which are by invitation only.

MSBA/MBA Dual Degree Application Requirements:
Students must be admitted to the MSBA and MBA programs separately. Students will take either the GRE or the GMAT as part of this process, and follow all other admissions criteria set by either program.

Applicants must submit their test score(s) from the following:
- GRE
- GMAT

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 45 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: Students will engage in an experiential learning application of the analytics methodologies, techniques, and tools learned throughout the program to a real-world problem. The final project will consist of the development and presentation of results, interpretations, insights, and recommendations.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Some business/basic technical requirements can be waived for students with degrees in related business areas/computer science.

Business/Management Fundamentals (15 credits)

MBA 6030 - Financial Accounting (3.0 cr)
MBA 6210 - Marketing Management (3.0 cr)
MSBA 6250 - Analytics for Competitive Advantage (3.0 cr)
MSBA 6120 - Introduction to Statistics for Data Scientists (3.0 cr)
MSBA 6345 - Project Management of Analytics Projects (1.5 cr)
MSBA 6355 - Building and Managing Teams (0.0 - 1.5 cr)

Technical Fundamentals (9 credits)

MSBA 6310 - Programming for Data Science (3.0 cr)
MSBA 6320 - Data Management, Databases, and Data Warehousing (3.0 cr)
MSBA 6330 - Big Data Analytics (3.0 cr)

Specialty Courses (15 credits)

MSBA 6410 - Exploratory Data Analytics and Visualization (3.0 cr)
MSBA 6420 - Predictive Analytics (3.0 cr)
MSBA 6430 - Advanced Issues in Business Analytics (3.0 cr)
MSBA 6440 - Data-Driven Experimentation and Measurement (3.0 cr)
MSBA 6450 - Modeling and Heuristics for Decision Making and Support (3.0 cr)

Capstone Experience (6 credits)

MSBA 6510 - Business Analytics Experiential Learning (6.0 cr)
Twin Cities Campus
Business Management Minor
CSOM Financial Services Office
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
MBA & MS Programs Office
Carlson School of Management
321 19th Ave S Suite 1-110
Minneapolis, MN 55455
Email: mbasa@umn.edu
Website: http://TBD

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.
- Coursework is delivered through the Carlson School of Management via the following delivery methods: in-person courses on the Twin Cities campus, courses utilizing a hybrid of in-person meetings and online content delivery, or coursework delivered completely online.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The free-standing graduate-level minor in business management will enhance the preparation of graduate students to enter into organizations with a solid foundation of knowledge in key business disciplines. The business management minor program is flexible and designed to suit the particular needs and interests of the student through completion of a broad range of business core (foundation) and elective courses.

Note: Students enrolled in the master of business administration program or the business administration PhD program are not eligible for this minor.

Accreditation
This program is accredited by AACSB International

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Prior admission into an established master's or doctoral degree program at the University of Minnesota - Twin Cities, is required. Students must be in good academic standing within their own program to be admitted to the business minor. Students enrolled in the master of business administration program or the business administration PhD program are not eligible for this minor.

Students should first consult with their major program advisor about the advisability of a business minor and whether it is permitted by their program. They may then contact graduate program coordinator, Christina Wiencke (choldvog@umn.edu or 612) 625-7582) for more information on the minor.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Master’s Business Minor
Take 8 or more credit(s) from the following:
• ACCT 5180 - Consolidations and Advanced Reporting (2.0 cr)
• ACCT 6100 - Financial Statement Analysis (4.0 cr)
• BLAW 6158 - The study of laws affecting private business and publicly-traded companies. (2.0 cr)
• ENTR 6020 - Business Formation (4.0 cr)
• ENTR 6021 - Preparing and Implementing the Business Plan (2.0 cr)
• ENTR 6036 - Managing the Growing Business (2.0 cr)
• ENTR 6037 - Corporate Venturing (2.0 cr)
• ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
• ENTR 6042 - Implementing New Product Design and Business Development (4.0 cr)
• FINA 6121 - Debt Markets, Interest Rates, and Hedging (2.0 cr)
• FINA 6122 - Financial Management of Depository Institutions (2.0 cr)
• FINA 6123 - Financial Services Industry (2.0 cr)
• FINA 6222 - Mergers and Acquisitions (2.0 cr)
• FINA 6241 - Corporate Finance Analysis and Decisions (4.0 cr)
• FINA 6242 - Advanced Corporate Finance Analysis and Decisions (4.0 cr)
• FINA 6321 - Portfolio Analysis and Management (2.0 cr)
• FINA 6322 - Financial Modeling (2.0 cr)
• FINA 6323 - Advanced Financial Modeling (2.0 cr)
• FINA 6324 - Securitization Markets (2.0 cr)
• FINA 6325 - Behavioral Finance (2.0 cr)
• FINA 6341 - World Economy (4.0 cr)
• FINA 6522 - Introduction to Derivatives and Financial Risk Management (2.0 cr)
• FINA 6529 - Advanced Topics in Fixed Income and Derivatives (2.0 cr)
• FINA 6621 - International Financial Management (2.0 cr)
• FINA 6801 - Finance Independent Study (1.0 - 6.0 cr)
• HRIR 6465 - Leadership and Personal Development (2.0 cr)
• IDSC 6040 - Information Technology Management (2.0 cr)
• IDSC 6050 - Information Technologies and Solutions (2.0 cr)
• IDSC 6423 - Enterprise Systems (2.0 cr)
• IDSC 6442 - E-Sourcing and E-Auctions (2.0 cr)
• IDSC 6444 - Business Analytics for Managers I (2.0 cr)
• IDSC 6446 - Business Analytics for Managers II (2.0 cr)
• IDSC 6455 - Web 2.0: The Business of Social Media (2.0 cr)
• IDSC 6465 - Global Sourcing of IT and IT Enabled Services (4.0 cr)
• IDSC 6471 - Knowledge Management (2.0 cr)
• IDSC 6481 - Managerial Decision Making (2.0 cr)
• MBA 6030 - Financial Accounting (3.0 cr)
• MBA 6035 - Managerial Accounting (3.0 cr)
• MBA 6110 - Leading Others (2.0 cr)
• MBA 6120 - Data Analysis and Statistics for Managers (3.0 cr)
• MBA 6140 - Managerial Economics (2.0 cr)
• MBA 6210 - Marketing Management (3.0 cr)
• MBA 6220 - Supply Chain & Operations (3.0 cr)
• MBA 6230 - Financial Management (3.0 cr)
• MBA 6300 - Strategic Management (3.0 cr)
• MBA 6403 - Energy Industry (2.0 cr)
• MBA 6990 - MBA Topics (2.0 cr)
• MCOM 5500 - Enhancing Your Executive Image in Business Communications (2.0 cr)
• MCOM 5510 - Persuasive Writing in Business (2.0 cr)
• MCOM 5530 - Strategies and Skills for Managerial Presentations (2.0 cr)
• MGMT 5102 - StartUp: Customer Development and Testing (2.0 cr)
• MGMT 6004 - Negotiation Strategies (2.0 cr)
• MGMT 6031 - Industry Analysis and Competitive Strategy (4.0 cr)
• MGMT 6032 - Strategic Alliances (2.0 cr)
• MGMT 6033 - Managing the Strategy Process (2.0 cr)
• MGMT 6034 - Strategic Leadership (2.0 cr)
• MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
• MGMT 6040 - International Strategy and Organization (2.0 cr)
• MGMT 6050 - Management of Innovation and Change (2.0 cr)
• MGMT 6084 - Management of Groups (2.0 cr)
• MGMT 6085 - Corporate Strategy (4.0 cr)
• MGMT 6100 - Topics in Management (1.0 - 4.0 cr)
• MGMT 6305 - The International Environment of Business (4.0 cr)
• MGMT 6310 - Cross-Cultural Management: Developing Intercultural Competence (2.0 cr)
• MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
• MGMT 6410 - Corporate Responsibility (2.0 cr)
• MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
• MILI 6421 - Healthcare Law: Strategic and Business Implications (2.0 cr)
• MILI 6562 - Information Technology in Health Care (2.0 cr)
• MILI 6589 - Medical Technology Evaluation and Market Research (2.0 cr)
• MILI 6726 - Medical Device Industry: Business and Public Policy (2.0 cr)
• MILI 6963 - Healthcare Analytics (2.0 cr)
• MILI 6990 - The Health Care Marketplace (2.0 cr)
• MILI 6991 - Anatomy and Physiology for Managers (2.0 cr)
• MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
• MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
• MILI 6997 - MILI Global Valuation Lab (4.0 cr)
• MILI 6998 - MILI Fellows (0.0 - 2.0 cr)
• MILI 6999 - Independent Study (0.0 - 8.0 cr)
• MKTG 6050 - Business Research Methods (2.0 cr)
• MKTG 6051 - Marketing Research (4.0 cr)
• MKTG 6055 - Buyer Behavior (4.0 cr)
• MKTG 6060 - Marketing Channels (2.0 cr)
• MKTG 6072 - International Marketing (4.0 cr)
• MKTG 6073 - Marketing in High Tech Settings (2.0 cr)
• MKTG 6075 - Pricing Strategy (4.0 cr)
• MKTG 6078 - Advertising & Promotion (4.0 cr)
• MKTG 6082 - Brand Strategy (2.0 cr)
• MKTG 6084 - Persuasion and Influence (2.0 cr)
• MKTG 6085 - Harnessing Consumer Irrationality (2.0 cr)
• MKTG 6086 - Digital Marketing (2.0 cr)
• MKTG 6088 - Strategic Marketing (2.0 cr)
• MKTG 6090 - Marketing Topics (1.0 - 4.0 cr)
• SCO 6041 - Project Management (2.0 cr)
• SCO 6045 - Strategic Sourcing (2.0 cr)
• SCO 6048 - Logistics and Transportation (2.0 cr)
• SCO 6051 - Service Management (2.0 cr)
• SCO 6056 - Managing Supply Chain Operations (4.0 cr)
• SCO 6072 - Managing Technologies in the Supply Chain (2.0 cr)
• SCO 6081 - Global Operations Strategy (4.0 cr)
• SCO 6090 - Sales, Inventory, and Operations Planning (2.0 cr)
• SCO 6091 - Process Improvement Methods (2.0 cr)
• SCO 6092 - Supply Chain Risk and Security (2.0 cr)
• SCO 6094 - Responsible Supply Chain Management (2.0 cr)
• SCO 6095 - Supply Chain Management in the Food and Agribusiness Sector (2.0 cr)
• SCO 6096 - Supply Chain Management in the Health Care and Medical Devices Sector (2.0 cr)
• SCO 6097 - Supply Chain Management in the Retail Sector (2.0 cr)
• SCO 6098 - Operations Excellence via Lean Thinking (2.0 cr)
• SCO 6191 - Big Data Analytics in Supply Chains (2.0 cr)
• SCO 6192 - Supply Chain Finance (2.0 cr)
• SCO 6850 - Topics in Operations and Management Science (2.0 - 4.0 cr)

Doctoral

Doctoral Business Minor

Take 12 or more credit(s) from the following:

• ACCT 5180 - Consolidations and Advanced Reporting (2.0 cr)
• ACCT 6100 - Financial Statement Analysis (4.0 cr)
• BLAW 6158 - The study of laws affecting private business and publicly-traded companies. (2.0 cr)
• ENTR 6020 - Business Formation (4.0 cr)
• ENTR 6021 - Preparing and Implementing the Business Plan (2.0 cr)
• ENTR 6036 - Managing the Growing Business (2.0 cr)
• MILI 6963 - Healthcare Analytics (2.0 cr)
• MILI 6990 - The Health Care Marketplace (2.0 cr)
• MILI 6991 - Anatomy and Physiology for Managers (2.0 cr)
• MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
• MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
• MILI 6997 - MILI Global Valuation Lab (4.0 cr)
• MILI 6998 - MILI Fellows (0.0 - 2.0 cr)
• MILI 6999 - Independent Study (0.0 - 8.0 cr)
• MKTG 6050 - Business Research Methods (2.0 cr)
• MKTG 6051 - Marketing Research (4.0 cr)
• MKTG 6055 - Buyer Behavior (4.0 cr)
• MKTG 6060 - Marketing Channels (2.0 cr)
• MKTG 6072 - International Marketing (4.0 cr)
• MKTG 6073 - Marketing in High Tech Settings (2.0 cr)
• MKTG 6075 - Pricing Strategy (4.0 cr)
• MKTG 6078 - Advertising & Promotion (4.0 cr)
• MKTG 6082 - Brand Strategy (2.0 cr)
• MKTG 6084 - Persuasion and Influence (2.0 cr)
• MKTG 6085 - Harnessing Consumer Irrationality (2.0 cr)
• MKTG 6086 - Digital Marketing (2.0 cr)
• MKTG 6088 - Strategic Marketing (2.0 cr)
• MKTG 6090 - Marketing Topics (1.0 - 4.0 cr)
• SCO 6041 - Project Management (2.0 cr)
• SCO 6045 - Strategic Sourcing (2.0 cr)
• SCO 6048 - Logistics and Transportation (2.0 cr)
• SCO 6051 - Service Management (2.0 cr)
• SCO 6055 - Managing Supply Chain Operations (4.0 cr)
• SCO 6072 - Managing Technologies in the Supply Chain (2.0 cr)
• SCO 6081 - Global Operations Strategy (4.0 cr)
• SCO 6090 - Sales, Inventory, and Operations Planning (2.0 cr)
• SCO 6091 - Process Improvement Methods (2.0 cr)
• SCO 6092 - Supply Chain Risk and Security (2.0 cr)
• SCO 6094 - Responsible Supply Chain Management (2.0 cr)
• SCO 6095 - Supply Chain Management in the Food and Agribusiness Sector (2.0 cr)
• SCO 6096 - Supply Chain Management in the Health Care and Medical Devices Sector (2.0 cr)
• SCO 6097 - Supply Chain Management in the Retail Sector (2.0 cr)
• SCO 6098 - Operations Excellence via Lean Thinking (2.0 cr)
• SCO 6191 - Big Data Analytics in Supply Chains (2.0 cr)
• SCO 6192 - Supply Chain Finance (2.0 cr)
• SCO 6850 - Topics in Operations and Management Science (2.0 - 4.0 cr)
Twin Cities Campus
Business Research M.S.
Curtis L. Carlson School of Management - Adm
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Business Administration PhD Program, Suite 4-205, 321-19th Avenue South, Minneapolis, MN 55455 (Phone: 612-624-0875; Fax: 612-624-8221)
Email: csom-phd@umn.edu
Website: http://www.carlsonschool.umn.edu/phd-ba/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 40 to 44
- This program does not require summer semesters for timely completion.
- No
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The business research MS is a terminal master's degree option restricted to eligible business administration PhD students who do not complete the doctoral degree. Applications to the business research MS are not otherwise considered.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must be current business administration PhD students who have completed all required core, concentration, and supporting coursework for the doctoral degree. The preliminary written examination must have been passed at the master's level, based on a set of criteria approved by the Carlson School PhD Committee comprising members from all seven areas of concentration.

Applicants must submit their test score(s) from the following:
• GRE
• GMAT
  - Total score: 650

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100

Key to test abbreviations (GRE, GMAT, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 24 to 28 major credits and 16 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
A minimum GPA of 3.3 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Areas of Concentration
Students select one of seven areas of concentration. Concentration areas may require a first-year examination/presentation in addition to other program requirements.

Accounting
Students pursuing the accounting concentration must work under one of two accounting research paradigms: analytic or empirical.

Required Accounting Coursework (24 credits minimum)
Take the following 24 credits:
- ACCT 8801 - Topics in Empirical Research I (2.0 cr)
- ACCT 8802 - Topics in Empirical Research II (2.0 cr)
- ACCT 8803 - Topics in Empirical Research III (2.0 cr)
- ACCT 8811 - Information Economics I (2.0 cr)
- ACCT 8812 - Information Economics II (4.0 cr)
- ACCT 8813 - Information Economics III (2.0 cr)
- ACCT 8821 - Capital Markets I (2.0 cr)
- ACCT 8822 - Capital Markets II (2.0 cr)
- ACCT 8823 - Capital Markets III (2.0 cr)
- ACCT 8831 - Analytical Research Topics I (2.0 cr)
- ACCT 8832 - Analytical Research Topics II (2.0 cr)
- ACCT 8833 - Topics in Analytical Research III (2.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.
Take 16 or more credit(s) from the following:
- APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
- APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
- ECON 8003 - Microeconomic Analysis (2.0 cr)
- ECON 8004 - Microeconomic Analysis (2.0 cr)
- ECON 8205 - Applied Econometrics (2.0 cr)
- FINA 8802 - Theory of Capital Markets I: Discrete Time (2.0 cr)
- FINA 8812 - Corporate Finance I (2.0 cr)
- FINA 8813 - Corporate Finance II (2.0 cr)
- FINA 8822 - Empirical Methods in Finance (2.0 cr)
- FINA 8823 - Empirical Corporate Finance (2.0 cr)
- MATH 4603 - Advanced Calculus I (4.0 cr)
- MATH 4604 - Advanced Calculus II (4.0 cr)
- MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
- PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
- STAT 5101 - Theory of Statistics I (3.0 cr)
- ACCT 8892 - Readings in Accounting (1.0 - 8.0 cr)
- ACCT 8894 - Research in Accounting (1.0 - 8.0 cr)

-OR-

Finance
Finance is viewed as a subfield of economics. Students achieve a strong foundation in economic theory and empirical methods.

Required Finance Coursework (20 credits minimum)
Take at least 20 credits from the following list. FINA 8810, 8820, and 8890 may be taken more than once.
- FINA 8802 - Theory of Capital Markets I: Discrete Time (2.0 cr)
- FINA 8803 - Theory of Capital Markets II: Continuous Time (2.0 cr)
- FINA 8804 - Advanced Continuous Time Finance (2.0 cr)
- FINA 8810 - Topics in Asset Pricing (2.0 cr)
- FINA 8812 - Corporate Finance I (2.0 cr)
- FINA 8813 - Corporate Finance II (2.0 cr)
- FINA 8820 - Topics in Corporate Finance (2.0 cr)
- FINA 8822 - Empirical Methods in Finance (2.0 cr)
- FINA 8823 - Empirical Corporate Finance (2.0 cr)
FINA 8890 - Seminar: Finance Topics (2.0 - 4.0 cr)

Additional Required Finance Coursework (8 credits required)

Take the following sequence of economics courses:

8101-04 Sequence
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)

Supporting/Methodology Coursework (16 credits minimum)

Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below. Take 16 or more credit(s) from the following:
- ACCT 8812 - Information Economics II (4.0 cr)
- ACCT 8831 - Analytical Research Topics I (2.0 cr)
- ACCT 8832 - Analytical Research Topics II (2.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- ECON 8003 - Microeconomic Analysis (2.0 cr)
- ECON 8004 - Microeconomic Analysis (2.0 cr)
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)
- ECON 8105 - Macroeconomic Theory (2.0 cr)
- ECON 8106 - Macroeconomic Theory (2.0 cr)
- ECON 8107 - Macroeconomic Theory (2.0 cr)
- ECON 8108 - Macroeconomic Theory (2.0 cr)
- ECON 8181 - Advanced Topics in Microeconomics (2.0 cr)
- ECON 8182 - Advanced Topics in Microeconomics (2.0 cr)
- ECON 8185 - Advanced Topics in Macroeconomics (2.0 cr)
- ECON 8191 - Workshop in Mathematical Economics (1.0 - 3.0 cr)
- ECON 8201 - Econometric Analysis (2.0 cr)
- ECON 8205 - Applied Econometrics (2.0 cr)
- ECON 8206 - Applied Econometrics (2.0 cr)
- ECON 8207 - Applied Econometrics (2.0 cr)
- ECON 8208 - Applied Econometrics (2.0 cr)
- ECON 8211 - Econometrics (2.0 cr)
- ECON 8212 - Econometrics (2.0 cr)
- ECON 8501 - Wages and Employment (2.0 cr)
- ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
- ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
- ECON 8701 - Monetary Economics (2.0 cr)
- ECON 8702 - Monetary Economics (2.0 cr)
- ECON 8704 - Financial Economics (2.0 cr)
- ECON 8705 - Financial Economics (2.0 cr)
- MATH 8601 - Real Analysis (3.0 cr)
- FINA 8892 - Independent Study in Finance (1.0 - 8.0 cr)
- FINA 8894 - Directed Research in Finance (1.0 - 8.0 cr)

-OR-

Information and Decision Sciences

Required IDsc Coursework (15 credits)

Take all of the following courses.
- IDSC 8511 - Conceptual Topics and Research Methods in Information and Decision Sciences (3.0 cr)
- IDSC 8521 - System Development (3.0 cr)
- IDSC 8531 - Organizational Theory and Research in Information Systems (3.0 cr)
- IDSC 8541 - Introduction to Economics of Information Systems (3.0 cr)
- IDSC 8721 - Behavioral Decision Theory (3.0 cr)

Additional IDsc Required Coursework

Take a minimum of 2 credits from the following
- Take 2 or more credit(s) from the following:
  - IDSC 8620 - Data Mining and Personalization (3.0 cr)
  - IDSC 8801 - Research Seminar in Information and Decision Sciences (2.0 cr)

Additional Required Coursework (8 credits)

Take the following courses for a total of 8 credits:
- APEC 8211 - Econometric Analysis I (4.0 cr)

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Information current as of August 31, 2018
APEC 8212 - Econometric Analysis II (4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below. Take 16 or more credit(s) from the following:
• APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
• APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
• APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
• APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• CSCI 8551 - Intelligent Agents (3.0 cr)
• CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
• ECON 8581 - Advanced Topics in Labor Economics (2.0 cr)
• ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
• ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• MGMT 8101 - Theory Building and Research Design (4.0 cr)
• MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
• MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
• PSY 5018H - Mathematical Models of Human Behavior (3.0 cr)
• PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
• PSY 5993 - Research Laboratory in Psychology (3.0 cr)
• PSY 8201 - Social Cognition (3.0 cr)
• PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
• PUBH 6470 - SAS Procedures and Data Analysis (3.0 cr)
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
• PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
• SCO 8652 - Regression Analysis (3.0 cr)
• SCO 8721 - Management of Technological Operations (3.0 cr)
• IDSC 8892 - Readings in Information and Decision Sciences (1.0 - 8.0 cr)
• IDSC 8894 - Graduate Research in Information and Decision Sciences (1.0 - 8.0 cr)

-OR-

Marketing
Students pursuing the marketing concentration choose one of two focus areas: consumer behavior or quantitative/ marketing strategy.

Consumer Behavior Concentration (24 credits minimum)
Take all of the following courses, including at least 8 credits of MKTG 8810, for a total of 18 credits. In addition, take at least 6 credits from the quantitative/marketing strategy concentration course list. Take 18 or more credit(s) from the following:
• MKTG 8809 - Consumer Behavior Research Methods (2.0 cr)
• MKTG 8810 - Consumer Behavior Special Topics (2.0 cr)
• MKTG 8811 - Consumer Attitudes and Persuasion I (2.0 cr)
• MKTG 8812 - Consumer Attitudes and Persuasion II (2.0 cr)
• MKTG 8813 - Consumer Judgment and Decision Making I (2.0 cr)
• MKTG 8814 - Consumer Judgment and Decision Making II (2.0 cr)

or Quantitative/Marketing Strategy Concentration (24 credits minimum)
Take 12 credits, which can include up to 4 credits of MKTG 8890, from the following list. In addition, take at least 12 credits from the consumer behavior concentration course list. Take 12 or more credit(s) from the following:
• MKTG 8831 - Seminar: Inter-Organizational Relations (4.0 cr)
• MKTG 8842 - Quantitative Modeling I (2.0 cr)
• MKTG 8843 - Quantitative Modeling II (2.0 cr)
• MKTG 8851 - Seminar: Marketing Management and Strategy I (2.0 cr)
• MKTG 8852 - Marketing Management & Strategy II (2.0 cr)
• MKTG 8890 - Seminar: Marketing Topics (1.0 - 4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below.
• ACCT 8811 - Information Economics I (2.0 cr)
• ACCT 8831 - Analytical Research Topics I (2.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
ECON 8003 - Microeconomic Analysis (2.0 cr)
ECON 8004 - Microeconomic Analysis (2.0 cr)
ECON 8101 - Microeconomic Theory (2.0 cr)
ECON 8103 - Microeconomic Theory (2.0 cr)
ECON 8104 - Microeconomic Theory (2.0 cr)
ECON 8118 - Noncooperative Game Theory (2.0 cr)
ECON 8119 - Cooperative Game Theory (2.0 cr)
ECON 8191 - Workshop in Mathematical Economics (1.0 - 3.0 cr)
ECON 8205 - Applied Econometrics (2.0 cr)
ECON 8206 - Applied Econometrics (2.0 cr)
ECON 8207 - Applied Econometrics (2.0 cr)
ECON 8208 - Applied Econometrics (2.0 cr)
ECON 8211 - Econometrics (2.0 cr)
ECON 8212 - Econometrics (2.0 cr)
ECON 8601 - Industrial Organization and Government Regulation (2.0 cr)
ECON 8602 - Industrial Organization and Government Regulation (2.0 cr)
ECON 8603 - Industrial Organization and Government Regulation (2.0 cr)
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
EPSY 5245 - Advanced Survey Data Analysis for Categorical and Rating Scale Data (1.0 cr)
EPSY 5261 - Introductory Statistical Methods (3.0 cr)
EPSY 5262 - Intermediate Statistical Methods (3.0 cr)
EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
IDS 8721 - Behavioral Decision Theory (3.0 cr)
MSBA 6440 - Data-Driven Experimentation and Measurement (3.0 cr)
PSY 5202 - Attitudes and Social Behavior (3.0 cr)
PSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
PSY 5207 - Personality and Social Behavior (3.0 cr)
PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
PSY 8203 - Impression Management (3.0 cr)
PSY 8208 - Social Psychology: The Self (3.0 cr)
PSY 8209 - Research Methods in Social Psychology (3.0 cr)
PSY 8935 - Readings in Behavioral Genetics and Individual Differences Psychology (1.0 cr)
PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)
STAT 5303 - Designing Experiments (4.0 cr)
MKTG 8892 - Readings in Marketing (1.0 - 8.0 cr)
MKTG 8894 - Graduate Research in Marketing (1.0 - 8.0 cr)

-OR-

Supply Chain and Operations
Students complete coursework in the areas of operations and supply chain management.

Required SCO Coursework (25 credits minimum)
Take the following courses for a total of 25 credits:
SCO 8651 - Experimental Design (3.0 cr)
SCO 8652 - Regression Analysis (3.0 cr)
SCO 8711 - Research in Operations Strategy (3.0 cr)
SCO 8721 - Management of Technological Operations (3.0 cr)
SCO 8735 - Supply Chain Management (3.0 cr)
SCO 8745 - Research on Quality Management (3.0 cr)
SCO 8755 - Behavioral Operations (3.0 cr)
MGMT 8101 - Theory Building and Research Design (4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below. Take 16 or more credit(s) from the following:
• APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• APEC 8602 - Economics of the Environment (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
• MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
• MKTG 8842 - Quantitative Modeling I (2.0 cr)
• MKTG 8843 - Quantitative Modeling II (2.0 cr)
• PA 5032 - Applied Regression (2.0 cr)
• PA 5033 - Multivariate Techniques (2.0 cr)
• PUBH 7405 - Biostatistics: Regression (4.0 cr)
• PUBH 7406 - Advanced Regression and Design (4.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
• PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)
• SOC 5811 - Social Statistics for Graduate Students [MATH] (4.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5421 - Analysis of Categorical Data (3.0 cr)
• STAT 5701 - Statistical Computing (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• STAT 8311 - Linear Models (4.0 cr)
• SCO 8892 - Readings in Operations and Management Science (1.0 - 8.0 cr)
• SCO 8894 - Graduate Research in Operations and Management Science (1.0 - 8.0 cr)

-OR-

Strategic Management and Entrepreneurship

Students focus on leadership, strategy, and entrepreneurship connecting the external worlds of competition and collaboration.

Required SME Coursework (12 credits minimum)

Take all of the following courses, including 4 credits of MGMT 8401.

MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
MGMT 8401 - Seminar in Strategy Content (2.0 - 4.0 cr)
MGMT 8402 - Seminar in Behavioral Strategy (2.0 - 4.0 cr)

Additional Required Coursework (11 credits)

At least 7 credits from the following list, and 4 elective credits, are required.

Take 7 or more credit(s) from the following:
• APEC 8211 - Econometric Analysis I (4.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• MGMT 8101 - Theory Building and Research Design (4.0 cr)

SME Electives (4 credits)

Take one of the following courses:

MGMT 8202 - Seminar in International Management (4.0 cr)
or MGMT 8501 - Seminar in Entrepreneurship (4.0 cr)

Supporting/Methodology Coursework (16 credits minimum)

Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested courses are listed below.

Take 16 or more credit(s) from the following:
• APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
• APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
• APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)
• APEC 8211 - Econometric Analysis I (4.0 cr)
• APEC 8212 - Econometric Analysis II (4.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)
• EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
• EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
• FINA 8823 - Empirical Corporate Finance (2.0 cr)
• HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
• MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
• MGMT 8892 - Readings in Management Theory and Administration (1.0 - 8.0 cr)
• MGMT 8894 - Graduate Research in Management Theory and Administration (1.0 - 8.0 cr)
• MKTG 8831 - Seminar: Inter-Organizational Relations (4.0 cr)
• PA 8302 - Applied Policy Analysis (4.0 cr)
• POL 8106 - Quantitative Political Science I (3.0 cr)
Work and Organizations
Students complete multidisciplinary coursework covering organizational behavior, human resource management, organizational economics, personnel economics, labor relations, and related areas.

Required WOrg Coursework (24-28 credits minimum)
Take 24-28 credits from the following list. Take HRIR 8820 2-4 times for a total of 4-8 credits. Take HRIR 8825 4 times for a total of 4 credits.

Take 24 - 28 credit(s) from the following:
- HRIR 8801 - Core Seminar: Fundamentals of Economic Analysis for Work and Organizations (4.0 cr)
- HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
- HRIR 8803 - Core Seminar: Fundamentals of HR Research (4.0 cr)
- HRIR 8812 - Core Seminar: Research Methods in Work and Organizations (4.0 cr)
- HRIR 8820 - Seminar: Special Topics in Work and Organizations Research (2.0 cr)
- HRIR 8825 - Research Practicum/Workshop (1.0 cr)
- PSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)

Supporting/Methodology Coursework (16 credits minimum)
Courses must be chosen in consultation with the advisor or PhD coordinator. Suggested coursework is listed below.

Take 16 or more credit(s) from the following:
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- APEC 8501 - Labor Economics I (2.0 cr)
- APEC 8502 - Labor Economics II (2.0 cr)
- CSOM 8101 - Methods and Topics in Applied Economics (2.0 - 4.0 cr)
- ECON 8205 - Applied Econometrics (2.0 cr)
- ECON 8206 - Applied Econometrics (2.0 cr)
- EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- MGMT 8101 - Theory Building and Research Design (4.0 cr)
- MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
- PSY 8208 - Social Psychology: The Self (3.0 cr)
- PSY 8664 - Personality Assessment (3.0 cr)
- PSY 8701 - Seminar in Industrial and Organizational Psychology I (3.0 cr)
- PSY 8702 - Seminar in Industrial and Organizational Psychology II (3.0 cr)
- PSY 8960 - Graduate Seminar in Psychology (1.0 - 4.0 cr)
- PUBH 6724 - The Health Care System and Public Health (3.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 6861 - Health Insurance (2.0 cr)
- SOC 8590 - Topics in Life Course Sociology (3.0 cr)
- HRIR 8991 - Independent Study in Human Resources and Industrial Relations (1.0 - 8.0 cr)
Twin Cities Campus
Business Taxation M.B.T.
Accounting
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Masters Programs in Accounting, 3-110 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455 (612-624-7511; fax: 612-626-7795).
Email: mbt@umn.edu
Website: http://www.carlsonschool.umn.edu/master-business-taxation

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Business Taxation

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

As one of the premier graduate tax programs in the nation, the Carlson School Master of Business Taxation (MBT) program helps students acquire a conceptual understanding of taxation, and develop technical competence in the practical application of the rules of taxation in business. In addition, courses in government and economic tax policy, tax negotiations, and tax technology and analytics provide breadth to complement the technical tax courses.

The program gives students a chance to learn from world-class faculty who are distinguished professionals with extensive real-life experience. The faculty have in-depth knowledge of the tax industry and work closely with the Twin Cities business community. Combining rigorous coursework and top faculty from the tax community brings a broad perspective into the relationship between tax and business issues, which helps prepare graduates for greater responsibilities in business management and consulting.

Historically, more than 80 percent of students are employed in the business community and take courses on a part-time basis. The classroom based program offers courses in the evenings, Monday-Thursday, 5:45-9:05 p.m., accommodating both part-time and full-time students. For added flexibility, a fully online MBT program is available beginning fall 2018. Students in the classroom based program may also choose to take some courses online. To free tax professionals from coursework responsibilities during the busiest part of tax season, no courses are offered during the spring semester from early March through April 15. Students enrolled part-time can expect to complete the program in approximately three years. Students enrolled full-time can complete the program in a shorter period.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Required prerequisites
Introduction to Accounting
ACCT 2050 - Introduction to Financial Reporting (4.0 cr)
or equivalent course taken at another institution

Introduction to Federal Income Tax
ACCT 5135 - Fundamentals of Federal Income Tax (4.0 cr)
or equivalent course at another institution

Other requirements to be completed before admission:
Applicants must have a bachelor's degree from an accredited college or university.

The following required prerequisite courses may be taken after being admitted to the MBT program, but must be taken before being eligible to take any MBT courses: ACCT 2050 and ACCT 5135. Equivalent courses may be substituted with approval of the director of
graduate studies.

Special Application Requirements:

Fall application deadline: June 15  
Spring application deadline: October 15  
Summer application deadline: March 15

Applicants must submit all application materials through the University's admission system.

A GMAT or LSAT (Law School Admission Test) score that is not more than five years old is required. The GMAT score must be sent directly from GMAT to be considered official. The GMAT requirement will be waived for domestic students in the following cases: 1) applicant has a CPA license (either active or inactive), 2) applicant has at least two years of relevant U.S. based tax-related work experience within the prior five years, or 3) applicant is a Carlson School accounting graduate within the prior five years. In order for the waiver to apply, the applicant must have a minimum 3.0 undergraduate GPA from an accredited university.

Applicants may submit their copy of their LSAT score to the MBT office.

For international applicants, the results from one of the following English language tests are required: TOEFL, IELTS, MELAB. TOEFL scores must be received directly from TOEFL. IELTS and MELAB scores must be received directly from the testing center.

For additional application details, review the M.B.T. admissions webpages.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 30 major credits and up to null credits outside the major. The is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Business Taxation Courses (12 credits)

- MBT 5200 - Tax Accounting Methods I (2.0 cr)
- MBT 5201 - Tax Accounting Methods II (2.0 cr)
- MBT 5220 - Tax Research, Communication, and Practice (4.0 cr)
- MBT 5230 - Corporate Taxation I (2.0 cr)
- MBT 5340 - Taxation of Partners and Partnerships (2.0 cr)

Elective Business Taxation Courses (18 credits)

In some cases, other graduate-level courses may be taken in place of an MBT elective course with prior approval from the MBT director.

Take exactly 18 credit(s) from the following:

- MBT 5223 - Tax-exempt Organizations (2.0 cr)
- MBT 5226 - Negotiation Techniques in Taxation (2.0 cr)
- MBT 5323 - Mergers and Acquisitions I (2.0 cr)
- MBT 5333 - Tax Aspects of Consolidated Returns (2.0 cr)
- MBT 5335 - Taxation of the Small Business Corporation (2.0 cr)
- MBT 5346 - ASC 740 Computations and Analysis (2.0 cr)
- MBT 5347 - Tax Technology and Analytics Fundamentals (2.0 cr)
- MBT 5348 - Advanced ASC 740 Concepts (2.0 cr)
- MBT 5350 - Wealth Transfer I (Estates and Gifts) (2.0 cr)
- MBT 5353 - Trusts and Estates (2.0 cr)
- MBT 5360 - State and Local Taxation (2.0 cr)
- MBT 5363 - Compensation and Benefits (2.0 cr)
- MBT 5370 - Taxation of Property Transactions (2.0 cr)
- MBT 5380 - Tax Aspects of International Business I (2.0 cr)
- MBT 5381 - Tax Aspects of International Business II (2.0 cr)
- MBT 5382 - Transfer Pricing (2.0 cr)
- MBT 5500 - Business, Government, and Economic Tax Policy (2.0 cr)
Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.
Twin Cities Campus
Finance M.S.
Finance
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Phone: 612-625-5555
Email: msf@umn.edu
Website: https://carlsonschool.umn.edu/degrees/master-science-in-finance

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 39
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The 39-credit master of science program in finance provides students with an advanced understanding of the tools and methods used in businesses and in financial markets. The program focuses on combining financial theory with quantitative and computational methods and real-world applications. Students can complete this full-time graduate program in 12 or 16 months. Graduates will be able to analyze and interpret complex financial data and communicate its implications. Successful applicants begin their MS studies in summer (July).

Accreditation
This program is accredited by AACSB International. The M.S. in Finance is STEM designated.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
- University level courses in calculus and statistics are required.
- Linear algebra is recommended, but not required.
- Work experience is not required, but preferred.

Special Application Requirements:
Applicants must submit all application materials through the University's admissions system. Application materials include:
- A GMAT or GRE General Test that is not more than five years old, with an acceptable score.
- For international students, an acceptable score on the Test of English as a Foreign Language (TOEFL) International Language Testing System (IELTS).
- Three letters of recommendations need to be submitted through the online application.
- A personal statement of career goals, and objectives for pursuing a M.S. Finance degree. The personal statement questions are the following: Briefly describe your short-term and long-term career goals. Why are you choosing to pursue an M.S. in Finance at this time in your career, and what are you hoping to accomplish by doing so? Why are you interested in pursuing an M.S. degree in Finance at the Carlson School of Management? What do you feel makes you a strong candidate for the program? How will you contribute to the M.S. in Finance program overall? Applicants must submit a current resume that includes job responsibilities and accomplishments in the online application.
- Applicants may choose to submit an essay to comment on any item(s) in their application they consider worthy of further explanation.
- Applicants may be required to complete an admissions interview, which are by invitation only.

Applicants must submit their test score(s) from the following:
- GRE
- GMAT
International applicants must submit score(s) from one of the following tests:

- TOEFL
- IELTS

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 39 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

Required Courses: Summer (9 credits)

- MSF 6421 - Computing for Finance: Excel/VBA I & II (2.0 cr)
- MSF 6221 - Fundamentals of Finance I (2.0 cr)
- MSF 6031 - Financial Accounting (3.0 cr)
- MSF 6920 - Introduction to Python (2.0 cr)

Required Courses: Fall (16 credits)

- MSF 6422 - Financial Econometrics and Computational Methods I (2.0 cr)
- MSF 6223 - Fundamentals of Finance III (2.0 cr)
- MSF 6022 - Financial Statement Analysis (2.0 cr)
- MSF 6021 - Communications for Finance (2.0 cr)
- MSF 6423 - Financial Econometrics and Computational Methods II (2.0 cr)
- MSF 6621 - Finance within the Macroeconomy (2.0 cr)
- MSF 6322 - Corporate Valuation and Modeling (2.0 cr)
- MSF 6222 - Fundamentals of Finance II (2.0 cr)

Required Courses: Spring (10 credits)

- MSF 6821 - Experiential Learning (4.0 cr)
- MSF 6522 - Derivatives and Risk Management (2.0 cr)
- MSF 6321 - Quantitative Portfolio Analysis (2.0 cr)
- MSF 6121 - Fixed Income and Securities (2.0 cr)

Electives (4 credits)

Students can select from the following electives or graduate courses offered by other departments in the business school upon approval.

- FINA 6325 - Behavioral Finance (2.0 cr)
- FINA 6621 - International Financial Management (2.0 cr)
- FINA 6222 - Mergers and Acquisitions (2.0 cr)
- FINA 6324 - Securitization Markets (2.0 cr)
- FINA 6341 - World Economy (4.0 cr)

Non-Credit Courses

Noncredit 1: On occasion, external speakers will be brought in to enhance the experiential learning component of the MS finance program. Students are required to attend such meetings, and their participation will be assessed on a pass/fail basis.

Noncredit 2: Students will be required to pass the online ethics module from the Chartered Financial Analyst Institute by the end of the summer. Successful completion will be a requirement of the Fundamentals of Finance II course.
Human Resources and Industrial Relations M.A.
CSOM Work & Organizations
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Center for Human Resources and Labor Studies, Suite 3-300 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455 (612-624-2500; fax: 612-624-8360)
Email: hrirgrad@umn.edu
Website: http://www.csom.umn.edu/master-human-resources

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Master of Arts

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Human resources and industrial relations (HRIR) students study the employment relationship. Teaching and research are guided by the belief that the employment relationship must be investigated through the lenses of different disciplines using systems thinking. The professional master of arts degree is for individuals interested in private and public sector careers in human resource management, labor relations, and related fields.

The curriculum is structured around the core HRIR areas of staffing, training, and development; compensation and benefits; and labor relations and collective bargaining. It is rooted in key concepts from the social and behavioral sciences and business, such as organizational behavior and theory, labor market analysis, leadership, and strategy. Quantitative analysis of employment problems and issues are also included. Master's candidates are encouraged to choose electives to support a generalist orientation with key business knowledge.

Accreditation
This program is accredited by Association to Advance Collegiate Schools of Business (AACSB).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Entering students have undergraduate degrees in many subjects ranging from the fine arts to engineering. The most common undergraduate majors of incoming students are in the areas of psychology, business, economics, human resources management, human resource development, and speech communication.

An undergraduate course in microeconomics must be completed with a grade of at least C before matriculating.

Special Application Requirements:
Applicants must submit three letters of recommendation, a complete set of transcripts, a résumé, personal statements, and GRE or GMAT scores. Applicants whose native language is not English must also submit score results from the TOEFL or IELTS.

Students may enter the full-time M.A. program in the fall and the part-time M.A. program in either the fall or spring semesters. The application deadlines are June 15 for fall admission and October 15 for spring admission. The M.A. financial aid deadline for fall semester is February 1. Applicants are encouraged to apply early.

Applicants must submit their test score(s) from the following:
- GRE
- GMAT
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

Key to **test abbreviations** (GRE, GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 40 major credits and 8 credits outside the major. The is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The MA is offered as a coursework-only program with day (full-time) and evening (part-time) options. Major coursework includes 6001, 6111, 6301, 6401, 6441, 6501, 6701, 6801, and elective credits in HRIR. At least 8 credits must be earned in related fields. Commonly selected related fields include accounting, finance, operations management, managerial communications, economics, human resource development, law, psychology, public affairs, sociology, and research methods.

**Core Courses**

- **24 credits required**
  - HRIR 6001 - Business Principles for the HRIR Professional (4.0 cr)
  - HRIR 6111 - Using Data and Metrics in Human Resources and Industrial Relations (4.0 cr)
  - HRIR 6301 - Staffing, Training, and Development (4.0 cr)
  - HRIR 6401 - Organizational Theory Foundations of High-Impact HRIR (2.0 cr)
  - HRIR 6441 - Organizational Behavior Foundations of High-Impact HRIR (2.0 cr)
  - HRIR 6501 - Compensation and Benefits (4.0 cr)
  - HRIR 6701 - Labor Relations and Collective Bargaining (4.0 cr)

**Capstone**

- HRIR 6801 - HRIR in Practice: Strategy, Execution, and Ethics (2.0 cr)

**Economic Issues Analysis**

- **2 credits required**
  - HRIR 5655 - Public Policies on Work and Pay (3.0 cr)
  - or HRIR 5662 - Personnel Economics (2.0 cr)

**Electives**

- **Take 20 or more credit(s) including 2 or more sub-requirements(s) from the following:**

  **Related Field**

  - Take 8 or more credit(s) from the following:
    - MCOM 5400 - Managerial Communications for the HR Professional (2.0 cr)
    - MBA 6030 - Financial Accounting (3.0 cr)
    - MBA 6220 - Supply Chain & Operations (3.0 cr)
    - MBA 6230 - Financial Management (3.0 cr)
    - MBA 6210 - Marketing Management (3.0 cr)
    - MBA 6300 - Strategic Management (3.0 cr)
    - MBA 6315 - The Ethical Environment of Business (2.0 cr)
• MCOM 5510 - Persuasive Writing in Business (2.0 cr)
• MCOM 5530 - Strategies and Skills for Managerial Presentations (2.0 cr)
• MGMT 6004 - Negotiation Strategies (2.0 cr)
• MGMT 6033 - Managing the Strategy Process (2.0 cr)
• MGMT 6040 - International Strategy and Organization (2.0 cr)
• MGMT 6050 - Management of Innovation and Change (2.0 cr)
• OLDP 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
• OLDP 5201 - Strategies for Teaching Adults (3.0 cr)
• OLDP 5202 - Perspectives of Adult Learning and Development (3.0 cr)
• OLDP 5611 - Facilitation and Meeting Skills (1.0 cr)
• OLDP 5616 - Training on the Internet (3.0 cr)
• OLDP 5619 - Planning and Decision-Making Skills (1.0 cr)
• OLDP 5816 - Distance Learning in Adult Education and Training (3.0 cr)
• OLDP 5829 - Course Development for Business and Industry (2.0 cr)
• OLDP 5033 - Foundations of Individual/Organizational Career Development (3.0 cr)
• IDSC 6471 - Knowledge Management (2.0 cr)
• IDSC 6040 - Information Technology Management (2.0 cr)
• IDSC 6481 - Managerial Decision Making (2.0 cr)
• LAW 6203 - Labor Law (2.0 cr)
• LAW 6631 - Employment Discrimination (3.0 cr)
• LAW 6632 - Employment Law (3.0 cr)
• LAW 6833 - Alternative Dispute Resolution (2.0 - 3.0 cr)
• MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
• PUBH 6102 - Issues in Environmental Health (2.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
• PUBH 6542 - Management of Health Care Organizations (3.0 cr)
• SCO 6041 - Project Management (2.0 cr)
• IBUS 5xxx
• MGMT 6035 - Complex and Cross-Cultural Negotiations (2.0 cr)
• IBUS 6xxx
• MSBA 6250 - Analytics for Competitive Advantage (3.0 cr)
• OLDP 5501 - Principles and Methods of Evaluation (3.0 cr)

**HRIR Electives**

Take 12 or more credit(s) from the following:

• HRIR 5000 - Topics in HRIR (2.0 cr)
• HRIR 5222 - Managing Diversity (2.0 cr)
• HRIR 5252 - Employment and Labor Law for the HRIR Professional (2.0 cr)
• HRIR 5442 - Employee Performance Management: Strategies, Systems, and Skills (2.0 cr)
• HRIR 5443 - Principles of Effective Coaching (2.0 cr)
• HRIR 6000 - Graduate Topics in Human Resources and Industrial Relations (1.0 - 8.0 cr)
• HRIR 6114 - Human Resource Information Systems (2.0 cr)
• HRIR 6223 - International Human Resource Management (2.0 cr)
• HRIR 6302 - Staffing and Selection: Strategic and Operational Concerns (2.0 cr)
• HRIR 6303 - Employee Training: Creating a Learning Organization (2.0 cr)
• HRIR 6304 - Employee Development: Creating a Competitive Advantage (2.0 cr)
• HRIR 6444 - Employee Motivation, Engagement, and Well-being (2.0 cr)
• HRIR 6465 - Leadership and Personal Development (2.0 cr)
• HRIR 6484 - Management of Groups (2.0 cr)
• HRIR 6502 - Compensation Theory and Applications (2.0 cr)
• HRIR 6503 - Employer-Sponsored Employee Benefit Programs (2.0 cr)
• HRIR 6504 - Executive Compensation (2.0 cr)
• HRIR 5992 - Independent Study in Human Resources and Industrial Relations (1.0 - 8.0 cr)

**Joint- or Dual-degree Coursework:** MBA/MA-HRIR Student may take a total of 24 credits in common among the academic programs.

**Program Sub-plans**

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Evening**
Twin Cities Campus
Supply Chain Management M.S.
Supply Chain & Operations
Curtis L. Carlson School of Management

Link to a list of faculty for this program.

Contact Information:
Phone: 612-625-5555
Email: msscm@umn.edu
Website: https://carlsonschool.umn.edu/degrees/master-science-in-supply-chain-management

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 32
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The one-year, 32-credit MS degree in supply chain management will provide students with an end-to-end view of supply chain and will develop both their strategic and analytical capabilities needed to manage supply chains. The hallmarks of this MS degree will include leadership development as a programmatic theme, global immersion, corporate social responsibility and the flexibility to focus on supply chain management in specific industry sectors that are foundational to the economy of the State of Minnesota such as health care and medical devices, food and agribusiness, and retail.

Accreditation
This program is accredited by AACSB International. The M.S. in Supply Chain Management is STEM designated.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Applicants must have a bachelor's degree from an accredited college or university.

Other requirements to be completed before admission:
A minimum of 3 years of work experience is required.

Special Application Requirements:
Applicants must submit all application materials through the University's admissions system. Application materials include:
- A GMAT or GRE General Test that is not more than five years old, with an acceptable score. A GMAT/GRE waiver is available for qualified candidates.
- For international students, an acceptable score on the Test of English as a Foreign Language (TOEFL) International Language Testing System (IELTS).
- Three letters of recommendations need to be submitted through the online application.
- A personal statement of career goals, and objectives for pursuing a M.S. degree in Supply Chain Management. The personal statement questions are the following: Briefly describe your short-term and long-term career goals. Why are you choosing to pursue an M.S. in Supply Chain Management at this time in your career, and what are you hoping to accomplish by doing so? Why are you interested in pursuing an M.S. degree in Supply Chain Management at the Carlson School of Management? What do you feel makes you a strong candidate for the program? How will you contribute to the M.S. in Supply Chain Management program overall? Applicants must submit a current resume that includes job responsibilities and accomplishments in the online application.
- Applicants may choose to submit an essay to comment on any item(s) in their application they consider worthy of further explanation.
- Applicants may be required to complete an admissions interview, which are by invitation only.

Applicants must submit their test score(s) from the following:
- GRE
- GMAT

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Information current as of August 31, 2018
International applicants must submit score(s) from one of the following tests:

- TOEFL
- IELTS

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan C**: Plan C requires 32 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

**Core Courses: Fall (12 credits)**
- SCO 6290 - Managing Supply Chain Operations (4.0 cr)
- SCO 6190 - Statistics (2.0 cr)
- SCO 6191 - Big Data Analytics in Supply Chains (2.0 cr)
- SCO 6098 - Operations Excellence via Lean Thinking (2.0 cr)
- SCO 6090 - Sales, Inventory, and Operations Planning (2.0 cr)

**Core Courses: Spring (8 credits)**
- SCO 6072 - Managing Technologies in the Supply Chain (2.0 cr)
- SCO 6094 - Responsible Supply Chain Management (2.0 cr)
- SCO 6045 - Strategic Sourcing (2.0 cr)
- SCO 6048 - Logistics and Transportation (2.0 cr)

**Core Courses: Summer (6 credits)**
- SCO 6192 - Supply Chain Finance (2.0 cr)
- SCO 6292 - Global Operations Capstone (4.0 cr)

**Core Course: Leadership Development - All Year (Fall, Spring and Summer) (2 credits)**
- SCO 6291 - Leadership Development (0.0 - 2.0 cr)

**Spring Electives (4 credits)**
- SCO 6095 - Supply Chain Management in the Food and Agribusiness Sector (2.0 cr)
- SCO 6096 - Supply Chain Management in the Health Care and Medical Devices Sector (2.0 cr)
- SCO 6097 - Supply Chain Management in the Retail Sector (2.0 cr)
- SCO 6041 - Project Management (2.0 cr)
- SCO 6092 - Supply Chain Risk and Security (2.0 cr)
- SCO 6093 - Negotiations in Supply Chain (2.0 cr)
- MGMT 6004 - Negotiation Strategies (2.0 cr)
Twin Cities Campus
Integrative Biology and Physiology M.S.
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5902; fax: 612-625-5149)
Email: ibpdept@umn.edu
Website: http://physiology.med.umn.edu/graduate-program/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students enter the Twin Cities M.S. program in integrative biology and physiology only for exceptional reasons. Most Twin Cities graduate work is performed at the Ph.D. level. See the Integrative Biology and Physiology Ph.D. program for more information.

The graduate programs in the Twin Cities have a cardiovascular emphasis, although other areas of specialization are represented.

On the Duluth campus, students can enroll in coursework and participate in research in several basic areas.

The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.
Plan B: Plan B requires 14 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project focuses on some aspect of Physiology. Plan B students complete a project under the direction of a faculty member and present the work to their faculty committee in an oral exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Duluth campus: All course requirements for the M.S. degree can be completed on the Duluth campus. Students are expected to fulfill all degree requirements over a period of two to three calendar years. The program includes at least 20 credits in physiology and 6 credits in a minor or related field of study. Incoming students are encouraged to undertake at least two laboratory rotations in faculty research laboratories of their choice. Fulfillment of degree requirements also includes the presentation and defense of a thesis (Plan A). The final written examination and oral defense of the thesis takes place with participation of faculty from both campuses.

Twin Cities campus: Plan A or B degrees are awarded only in exceptional circumstances. A Plan A M.S. degree requires 14 credits in physiology and 6 credits outside of physiology. The degree is based on laboratory research off or on campus, and requires a written thesis or written project and an oral presentation of the work for the final exam. The M.S. degree is Plan A, unless there are special circumstances requiring a Plan B. For Plan B, the final exam is oral.
Twin Cities Campus

Integrative Biology and Physiology Minor

Integrative Biology and Physiology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street S.E., Minneapolis, MN 55455 (612-625-5902; fax: 612-301-1543)
Email: ibpdept@umn.edu
Website: http://physiology.med.umn.edu/graduate-program/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a "hybrid" field in which expertise from many other disciplines is ordinarily required and combined. The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals.

The graduate program in the Twin Cities has a cardiovascular emphasis, although many other areas of specialization are represented.

The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
For the minor, a background in mathematics, physics, chemistry, and biology acceptable to the graduate faculty is required.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum of 6 graduate credits in physiology is required (with approval by the director of graduate studies) for the master's minor. Ph.D. students seeking a doctoral minor are expected to take PHSL 5101 or the equivalent, plus additional courses for a total of 12 credits. Approval is required by the director of graduate studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Twin Cities Campus

Integrative Biology and Physiology Ph.D.

Integrated Biology and Physiology

Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Integrative Biology and Physiology, Jackson Hall 6-125, 321 Church Street SE, Minneapolis, MN 55455 (612-625-5902; fax: 612-301-1543)
Email: ibpdept@umn.edu
Website: http://z.umn.edu/ibpgradprog

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Physiology may be defined as the application of mathematics, physics, and chemistry to the study of structure and function in living systems. As such, physiology is a "hybrid" field in which expertise from many other disciplines is ordinarily required and combined.

The program emphasizes a quantitative approach to understanding the functions of cells, organs, and systems in living animals. PhD students take a core concentration that provides a broad background in the physiology of membranes, cells, transport, and organ systems. Individualized programs are structured to build on the student's strengths and to fill in gaps that would otherwise be an impediment to specific problem solving. Teaching experience is also available to all students.

The graduate program in the Twin Cities has cardiovascular, hypertension and metabolism emphases, although many other areas of specialization are represented.

Students can enter the PhD program from the Twin Cities or Duluth campus. Highly qualified individuals with solid quantitative backgrounds are encouraged to apply. In the Twin Cities, prospective students also include people with previous medical training who are already at the University of Minnesota or are considering the University of Minnesota Medical School for residency or fellowship training.

Entering PhD students are expected to take a series of laboratory rotations to familiarize themselves with active areas of research within the degree program. The program includes faculty and corresponding research laboratories from the Department of Integrative Biology and Physiology and also the Departments of Medicine; Surgery; Neuroscience; Neurosurgery; Biochemistry, Molecular Biology, and Biophysics; Pharmacology; Physical Medicine and Rehabilitation; Kinesiology; and Animal Science.

Program Delivery

This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

Other requirements to be completed before admission:
An undergraduate degree with at least one year (three quarters or two semesters) of calculus, one year of physics, one year of biology, and two years of chemistry is required. For the minor, a background in mathematics, physics, chemistry and biology acceptable to the graduate faculty is required.

Special Application Requirements:

For the Ph.D., applicants must take the General Test of the GRE. There is no minimum GPA or GRE score requirements to apply. In addition, all applicants need three letters of recommendation. Admission to the program begins in the Fall semester.

International applicants must submit score(s) from one of the following tests:
• TOEFL
Program Requirements
24 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

The PhD program requires courses in cellular physiology and medical physiology. Coursework is tailored to the student's interests with input from the director of graduate studies and the student's advisor. During the first year, students rotate through three to four laboratories, attend weekly seminars, choose an advisor, and begin a research project. A preliminary written exam in physiology is given after the first year and examines the ability of the student to apply concepts learned in core courses. By the end of the second year, students have completed their coursework including a grant-writing class, and selected a laboratory for their thesis research. A preliminary oral exam is given at the end of the second year and tests the student's ability to apply principles of both physiology and the minor or supporting program to a proposed research-based thesis. A minimum of 12 credits must be completed in the minor field or supporting program.

Required Coursework
Take all of the following coursework. Take 2-8 credits of PHSL 8294, and at least 4 credits of PHSL 5096. Take PHSL 8232 (Journal Club) in conjunction with PHSL 5101 (Medical Physiology).

- ANSC 5700 - Cell Physiology (4.0 cr)
- PHSL 8294 - Research in Physiology (1.0 - 18.0 cr)
- PHSL 5096 - Integrative Biology and Physiology Research Advances (1.0 cr)
- PHSL 5101 - Human Physiology (5.0 cr)
- PHSL 8232 - Critical Reading of Journal Articles in Physiology (2.0 cr)
- BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
- PHSL 8242 - Professional Skills Development for Biomedical Scientists (2.0 cr)
- PHSL 5701 - Physiology Laboratory (1.0 - 2.0 cr)
- PHSL 5197 - Stress Physiology (1.0 cr)

Molecular Biology/Genetics Options
Take at least 3 credits of molecular biology/genetics coursework, chosen in consultation with the advisor.

- BIOL 4003 - Genetics (3.0 cr)
- or BIOL 4004 - Cell Biology (3.0 cr)
- or BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
- or BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
- or BIOC 6021 - Biochemistry (3.0 cr)

Biostatistics Options
Take at least 3 credits of biostatistics coursework, chosen in consultation with the advisor.

- STAT 5021 - Statistical Analysis (4.0 cr)
- or PUBH 6450 - Biostatistics I (4.0 cr)
- or PUBH 6451 - Biostatistics II (4.0 cr)

Outside Coursework
Take at least 12 credits of coursework outside the major, in consultation with the advisor.
BMEN 5001 - Advanced Biomaterials (3.0 cr)
or BMEN 5041 - Tissue Engineering (3.0 cr)
or BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
or BMEN 5351 - Cell Engineering (3.0 cr)
or CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
or GCD 4134 - Endocrinology (3.0 cr)
or NSC 5540 - Survey of Biomedical Neuroscience (2.0 cr)
or BIOL 8100 - Improvisation for Scientists (1.0 cr)
or NUTR 8620 - Advances in Nutrition (2.0 cr)

Supporting Major Optional Coursework
PHSL 4021 - Advanced Physiology and Bioengineering: Bionic Human (3.0 cr)
PHSL 5095 - Problems in Physiology (1.0 - 5.0 cr)
PHSL 5444 - Muscle (3.0 cr)
PHSL 5510 - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
PHSL 5525 - Anatomy and Physiology of the Pelvis and Urinary System (1.0 - 2.0 cr)
PHSL 8222 - Central Regulation of Autonomic Function (3.0 cr)

Thesis Credits
Take 24 credits of doctoral thesis credits.
PHSL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Medical Physics M.S.
Radiation Oncology Administration, Radiology
Medical School

Link to a list of faculty for this program.

Contact Information:
Radiation Oncology, Mayo Mail Code 494, 420 Delaware Street S.E., Minneapolis, MN 55455 (phone: 612-626-6505; fax: 612-626-7060)
Email: alaei001@umn.edu
Website: https://www.radiationoncology.umn.edu/medical-physics-graduate-program

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- no
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program is made up of faculty members with primary appointments in the departments of radiation oncology and radiology. Affiliate faculty have primary appointments in other departments. The goal of the program is to prepare students (1) for further education, teaching, and research in medical physics, (2) to qualify to enter a medical physics residency program in radiation therapy or imaging, and (3) to provide the mathematical and technical knowledge needed to succeed in the field of medical physics.

Accreditation
This program is accredited by Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A degree in physics or engineering or other physical science. Equivalent of an undergraduate physics minor—at least 2 semesters of calculus based physics and at least 3 upper level physics courses.

Other requirements to be completed before admission:
All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by coursework completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

Special Application Requirements:
Three letters of recommendation and the general GRE test are required. If the GRE was taken more than two years prior to application, the applicant may need to retake the examination. We have no absolute GRE cutoff score, but the score is taken into consideration along with other factors in the evaluation of each application. Applicants with a graduate degree from a US institution are waived the GRE requirement. Applicants are considered for admission in fall semester only.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
- MELAB

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Information current as of August 31, 2018
Program Requirements

Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Required Courses (24 Credits)
Take all of the following courses. Take MPH 5138 for 1 credit.

- MPH 5138 - Research Seminar (1.0 - 5.0 cr)
- MPH 5160 - Advanced Radiation Physics and Dosimetry (3.0 cr)
- MPH 5170 - Basic Radiological Physics (3.0 cr)
- MPH 5171 - Medical and Health Physics of Imaging I (3.0 cr)
- MPH 5172 - Radiation Biology (3.0 cr)
- MPH 5173 - Medical and Health Physics of Radiation Therapy (3.0 cr)
- MPH 5174 - Medical and Health Physics of Imaging II (3.0 cr)
- PHSL 5061 - Principles of Physiology for Biomedical Engineering (4.0 cr)
- PHAR 5201 - Applied Medical Terminology (2.0 cr)

Electives (6 Credits)
Take at least 6 electives credits, in consultation with the advisor, to complete the 30-credit requirement.

- MPH 5177 - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
- MPH 5178 - Physical Principles of Magnetic Resonance Imaging (3.0 cr)
- MPH 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
- MPH 8148 - Advanced Digital Imaging Science (3.0 cr)
- MPH 8149 - Advanced Topics in Radiation Therapy Physics (2.0 cr)

ADDITIONAL REQUIREMENTS (NOT FOR CREDIT)
In the fall semester of their first year, students must take the University ethics training: Responsible Conduct of Research (RCR), Parts 1 (a 3-hour session offered about 4 times/year) and 2.
Twin Cities Campus
Medical Physics Ph.D.
Radiation Oncology Administration, Radiology
Medical School

Link to a list of faculty for this program.

Contact Information:
Radiation Oncology, Dept of MMC 494 Mayo 8494A 420 Delaware St SE Minneapolis, MN 55455
Email: alaei001@umn.edu
Website: https://www.radiationoncology.umn.edu/medical-physics-graduate-program

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- no
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program is made up of faculty members with primary appointments in the departments of radiation oncology and radiology. Affiliate faculty have primary appointments in other departments. The goal of the program is to prepare students (1) for further education, teaching, and research in medical physics, (2) to qualify to enter a medical physics residency program in radiation therapy or imaging, and (3) to provide the mathematical and technical knowledge needed to succeed in the field of medical physics.

Accreditation
This program is accredited by Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A degree in physics or engineering or other physical science. Equivalent of an undergraduate physics minor-at least 2 semesters of calculus based physics and at least 3 upper level physics courses.

Special Application Requirements:
Three letters of recommendation and the general GRE test are required. If the GRE was taken more than two years prior to application, the applicant may need to retake the examination. There are no absolute GRE cutoff score, but the score is taken into consideration along with other factors in the evaluation of each application. Applicants with a graduate degree from a US institution are waived the GRE requirement. Applicants are considered for admission in fall semester only.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Courses (24 Credits)
Take the following required courses. Take MPHY 5138 for 1 credit.
MPHY 5138 - Research Seminar (1.0 - 5.0 cr)
MPHY 5160 - Advanced Radiation Physics and Dosimetry (3.0 cr)
MPHY 5170 - Basic Radiological Physics (3.0 cr)
MPHY 5171 - Medical and Health Physics of Imaging I (3.0 cr)
MPHY 5172 - Radiation Biology (3.0 cr)
MPHY 5173 - Medical and Health Physics of Radiation Therapy (3.0 cr)
MPHY 5174 - Medical and Health Physics of Imaging II (3.0 cr)
PHAR 5201 - Applied Medical Terminology (2.0 cr)
PHSL 5061 - Principles of Physiology for Biomedical Engineering (4.0 cr)

Electives
Take additional electives as needed, based on the focus of program objectives. Select courses in consultation with the advisor.
MPHY 5177 - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
MPHY 5178 - Physical Principles of Magnetic Resonance Imaging (3.0 cr)
MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
MPHY 8148 - Advanced Digital Imaging Science (3.0 cr)
MPHY 8149 - Advanced Topics in Radiation Therapy Physics (2.0 cr)

ADDITIONAL REQUIREMENTS (NOT FOR CREDIT)
In the fall semester of their first year, students must take the University ethics training:
Responsible Conduct of Research (RCR), Parts 1 (a 3-hour session offered about 4 times/year) and 2.
**Twin Cities Campus**  
**Microbiology, Immunology, and Cancer Biology M.S.**

**Medical School - Adm**  
**Medical School**

Link to a [list of faculty](#) for this program.

**Contact Information:**  
Department of Microbiology and Immunology, 689 23rd Avenue SE, Minneapolis, MN  55455, 612-624-5947  
Email: micab@umn.edu  
Website: [http://micab.umn.edu](http://micab.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

Note: Students are not admitted directly into the master's program; it is available only by special arrangement with the program.

Students prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
Applicants must have a bachelor's degree (BS preferred).

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Total Score: 96  
  - Paper Based - Total Score: 600  
- IELTS  
  - Total Score: 7  
- MELAB  
  - Final score: 85

Key to [test abbreviations](#) (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**  
**Plan A:** Plan A requires 12 to 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.
At least 2 semesters must be completed before filing a Degree Program Form.

Students are not admitted directly into the master's program; it is available only by special arrangement with the program. Students complete 14 MICA course credits, 6 credits in the minor or related field, and 10 thesis credits. Students must write and defend a thesis based on original research.
Twin Cities Campus
Microbiology, Immunology, and Cancer Biology Minor
Medical School - Adm
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Microbiology and Immunology
689 23rd Avenue SE, Minneapolis, MN 55455
612-624-5947
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.
- No

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Applicants must have a bachelor's degree (BS preferred).

Other requirements to be completed before admission:
Required courses include calculus, general chemistry, organic chemistry, and physics. A minimum of two upper-level biology courses, which may include biochemistry, genetics, cell biology, molecular biology, microbiology, or immunology, etc. are also required.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 96

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Students enrolled in a University master's or doctoral program are eligible for the MICaB minor. Requirements for the master's- and doctoral-level MICaB minor include: completion of 8 MICaB credits from 2 of the following 4-credit courses: MICA 8002, MICA 8003, MICA 8004; and the approval of the MICaB director of graduate studies. Doctoral students must also complete at least 4, but no more than 10, additional MICAB credits in consultation with the MICaB director of graduate studies.

MICaB minor requirements
Minimum requirement of 12-18 credits to include: two or three of the following MICa 8002, 8003 or 8004; and other MICa 8000-level 2, 3 or 4 credit courses to total 12-18 credits (excluding MICa 8012).

Program Sub-plans
Students are required to complete one of the following sub-plans,
Students may not complete the program with more than one sub-plan.

Masters
Course Group 0

Doctoral
Twin Cities Campus
Microbiology, Immunology, and Cancer Biology Ph.D.
Medical School - Adm

Link to a list of faculty for this program.

Contact Information:
Microbiology, Immunology and Cancer Biology PhD Program
689 23rd Avenue SE, Room 1-109 MRF
Minneapolis, MN 55455
612-624-5947
Email: micab@umn.edu
Website: http://micab.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 48
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students prepare for careers in biomedical research and teaching by completing broad training in molecular biology or biological sciences, and focused specialization in one of three concentrations (microbiology, immunology, or cancer biology). The program offers exceptional research opportunities for graduate training in autoimmunity, biotechnology, cancer biology and therapy, environmental microbiology, genetic engineering of microorganisms, lymphocyte activation and development, microbial pathogenesis, molecular genetics of disease, tumor immunology, vaccine development, and vascular biology and inflammation.

Accreditation
This program is accredited by NA

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Applicants must have a bachelor's degree (BS preferred).

Other requirements to be completed before admission:
Required courses include calculus, general chemistry, organic chemistry, and physics. A minimum of two upper-level biology courses, which may include biochemistry, genetics, cell biology, molecular biology, microbiology, or immunology, etc., are also required.

Research experience is required. Relevant undergraduate experience includes honors thesis work, paid or volunteer work in a research laboratory and summer internships. It does not include laboratory courses that accompany science courses such as biology. Postbaccalaureate research experience is preferred but not required.

Special Application Requirements:
The program evaluates applications based on four equally weighted criteria: academics, letters (3) of recommendation, a personal statement, and research experience. The average GPA scores of accepted applicants are typically 3.50. We do not accept or require GRE scores. Letters of recommendation from research advisers or mentors are preferred as these individuals can comment knowledgeably on the student's potential in biomedical research. Applicants' personal statements should describe their research in general and their specific contribution to it, their rationale for seeking a doctoral degree, and any information they wish to share regarding their backgrounds and interest in the MiCaB Program. Finally, applicants should provide specific details of their research experiences (project titles, mentors, dates, locations, etc.), along with a list of relevant abstracts, publications, etc.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 96
- Paper Based - Total Score: 600
  • IELTS - Total Score: 7
  • MELAB - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
11 to 12 credits are required in the major.
12 to 13 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Beginning study in the fall, students spend their first year on major coursework, identifying an advisor by doing laboratory rotations, selecting a focus area, and initiating their thesis research project. In the fall semester of their second year, all students take MICA 8012, which highlights the integrated nature of the three foci and helps prepare the students for their written and oral qualifying examinations (taken in the spring semester of the second year). Students also take courses that support studies in their focus area during their first two years.

In addition to coursework and research, students have opportunities to participate in laboratory meetings, journal clubs, and student research seminars, and to assist in laboratory courses. Most students complete the PhD in five years.

Required Coursework
Take 8 credits from the following list. Take MICA 8094 during the fall and spring semesters of the first year for a total of 2 credits.

While students are required to take only one of the three core courses (MICA 8002, 8003, and 8004), they are encouraged to take all three.

- MICA 5000 - Practicum: Teaching (0.0 cr)
- MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- MICA 8003 - Immunity and Immunopathology (4.0 cr)
- MICA 8004 - Cellular and Cancer Biology (4.0 cr)
- MICA 8012 - Writing and Reviewing a Research Proposal (2.0 cr)
- MICA 8094 - Research in Microbiology, Immunology, and Cancer Biology (1.0 cr)
- MICA 8910 - Seminar: Faculty Research Topics (0.0 cr)
- MICA 8920 - Seminar: Student Research Topics (0.0 cr)

Focus Area and Elective Coursework
Take one 3-credit, 5xxx-level or higher focus area science course in the first and second years. Select a focus area course from the following list, or another course related to the area of interest. MICA 8002, 8003 or 8004 can be used as a focus area course, if not taken as a required course. Elective courses also can be chosen from this list or selected in consultation with the advisor. No more than one 4xxx-level course can be applied towards credit requirements.

Take 16 or more credit(s) from the following:

- BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
- BIOC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
- BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
- BIOC 5960 - Special Topics in Biochemistry (3.0 cr)
- BIOC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
- BTHX 5610 - Research & Publication Seminar (1.0 cr)
- CHEM 8412 - Chemical Biology of Enzymes (4.0 cr)
• CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CHEN 8995 - Special Topics (1.0 - 4.0 cr)
• CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• ESCI 4801 - Geomicrobiology (3.0 cr)
• GCD 5005 - Computer Programming for Biology (3.0 cr)
• GCD 6103 - Human Histology (3.0 - 8.0 cr)
• GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
• GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
• GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
• GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
• GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
• GCD 8920 - Special Topics (1.0 - 4.0 cr)
• GEOG 8260 - Seminar: Physical Geography (2.0 cr)
• GRAD 5102 - Preparation for University Teaching for Nonnative English Speakers (2.0 cr)
• GRAD 8101 - Teaching in Higher Education (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• HINF 5502 - Python Programming Essentials for the Health Sciences (1.0 cr)
• LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
• MICA 8009 - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
• MICA 8010 - Microbial Pathogenesis (3.0 cr)
• MICA 8011 - Current Topics in Immunology (3.0 cr)
• MICA 8013 - Translational Cancer Research (2.0 cr)
• MICA 8014 - Small RNA Biology (2.0 cr)
• MICA 8371 - Mucosal Immunobiology (3.0 cr)
• PHCL 5111 - Pharmacogenomics (3.0 cr)
• PUBH 6182 - Professional Skills Development for Biomedical Scientists (2.0 cr)
• PUBH 6341 - Epidemicologic Methods I (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
• SCB 8181 - Stem Cell Biology (3.0 cr)
• VMED 5180 - Ecology of Infectious Disease (3.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
MICA 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Neuroscience M.S.
Medical School

Contact Information:
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)
Email: neurosci@umn.edu
Website: http://www.neuroscience.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 26 major credits, 12 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

The course requirements for a master's degree are the same as those for a Ph.D. degree. See the Program Requirements of the Neuroscience Ph.D.
Twin Cities Campus

Neuroscience Minor

Neuroscience
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)
Email: neurosci@umn.edu
Website: http://www.neuroscience.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 16
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A doctoral minor program is developed in consultation with the director of graduate studies for neuroscience. Students are required to take one of the following core courses.

Function/Structure: NSC 5561 - Systems Neuroscience (4 cr) or
Cellular/Molecular: NSC 5461 - Cellular and Molecular Neuroscience (4 cr)

In addition, students are required to take elective neuroscience courses for a total minimum of 12 credits (including the core courses).
Twin Cities Campus
Neuroscience Ph.D.
Neuroscience
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Neuroscience, 6-145 Jackson Hall, 321 Church Street SE, Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)
Email: neurosci@umn.edu
Website: http://www.neuroscience.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 51
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Neuroscience is an interdisciplinary field of inquiry. The objects of this inquiry, the brain and nervous system, are sufficiently complex and unique among biological systems to require experimental and analytical approaches that cross the traditional boundaries of molecular and cell biology, behavioral biology, biochemistry, genetics, pharmacology, physiology, and psychology. In some instances, neuroscientific inquiry may also encompass computer science, information processing, engineering, physics, and mathematics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Applicants are required to take the GRE General Test. Students whose native language is not English are required to take the TOEFL and obtain a minimum score of 625 (paper) or 107 (Internet); or obtain 6.5 on the IELTS examination. There are no minimum GPA or GRE score requirements to apply.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 107
  - Paper Based - Total Score: 625
- IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
21 credits are required in the major.
6 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The neuroscience PhD curriculum begins in the summer session with the intensive laboratory course in cellular and molecular neurobiology (NSC 5551), held at the Itasca Biological Station and Laboratories.

The core curriculum continues on the Twin Cities campus with NSC 5461, 5561, 5661, and 8211. While taking these courses, students explore research opportunities in the faculty’s laboratories and thereby select a thesis advisor.

Students will also participate in journal clubs (NSC 8320) to discuss work in the field of Neuroscience. Elective courses totaling 6 credits are required and selected in consultation with the advisor.

Students with sufficient background and previous course experience may apply for a waiver of specific requirements. A student, if they so choose, must take at least 12 elective credits to receive a minor (typical minors include cell biology, physiology, statistics, and psychology). Students are also expected to participate in teaching neuroscience and to attend the weekly colloquiums, as well as neuroscience seminars and sessions devoted to professional development. Students are strongly encouraged to attend seminars in other areas and departments that may interest them.

**Summer - First Year**
- NSC 5551: Cell & Molecular Neurobiology Lab at Itasca (4 cr)

**Fall - First Year**
- NSC 5461: Cellular & Molecular Neuroscience (4 cr)
- NSC 5561: Systems Neuroscience (4 cr)
- NSC 8321: Career Skills and Understanding Responsibilities as a Neuroscientist (0.5 cr)

**Spring - First Year**
- NSC 5661: Behavioral Neuroscience (3 cr)
- NSC 8211: Developmental Neurobiology (3 cr)
- NSC 8320: Neuroscience Seminar Series Journal Club (Section 2) (1 cr)
- NSC 8321: Career Skills and Understanding Responsibilities as a Neuroscientist (0.5 cr)

**Fall - Second Year**
- NSC 8321: Career Skills and Understanding Responsibilities as a Neuroscientist (0.5 cr)

**Spring - Second Year**
- NSC 8320: Neuroscience Seminar Series Journal Club (Section 2) (1 cr)

**Electives**
During the course of PhD studies, take at least 6 credits of electives. Electives are chosen in consultation with the advisor.
Orthoptics Post-baccalaureate Certificate

**Medical School**

Twin Cities Campus

Link to a list of faculty for this program.

**Contact Information:**
Minnesota Lions Children's Eye Clinic
(University of Minnesota Physicians and University of Minnesota Amplatz Children's Hospital)
701 25th Ave S. Ste 300
Minneapolis, MN 55454
612-365-8365
612-365-8351 (Fax)
Email: kmerrill@umphysicians.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program requires summer semesters for timely completion.
- Degree: Orthoptics PostBaccalaureate Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Orthoptic Certificate program is a vital part of the ophthalmic health care profession. This is a specialized profession, the focus of which is the evaluation and treatment of disorders of vision, eye movements, and eye alignment in children and adults. The study of orthoptics follows a logical sequence of studies vital to the understanding of the visual system. The didactic education is integrated with practical clinical experience. Orthoptists work with ophthalmologists, eye physicians and surgeons, as part of the medical team. They are employed in a variety of settings, including university and teaching hospitals, children's hospitals, and solo or multi-specialty group medical practices. An orthoptist sees a variety of patients of all ages, although due to the nature of their visual disorders, the majority of the patients are young children; some individuals with multiple health concerns are also evaluated as they commonly have ocular/binocular problems. After completing an Orthoptic Certificate, a student earns national certification as an orthoptist through written and practical examinations administered by the American Orthoptic Council.

This program requires two semesters and a summer term of coursework.

**Accreditation**
This program is accredited by American Association of Certified Orthoptists

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 2.00.

**Required prerequisites**

**Course Group 0**

Other requirements to be completed before admission:
Requirements for entry into the Orthoptics Certificate Program include the following:
1. Completion of baccalaureate degree with GPA at least 2.0.
2. Successful completion of one year in a hospital/clinic-based ophthalmic technician training program (e.g., Regions Hospital)

For an online application or for more information about graduate education admissions, see the General Information section of the

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Information current as of August 31, 2018
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

The 2.8 GPA requirement complies with University of Minnesota policy.

Orthoptics Required Courses
- OPH 5501 - Orthoptics I (4.0 cr)
- OPH 5601 - Orthoptics II (5.0 cr)
- OPH 5701 - Orthoptics III (5.0 cr)

Required Core

Orthoptic Certificate
Twin Cities Campus
Otolaryngology Ph.D. Otol.
Otolaryngology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Otolaryngology, MMC 396, 420 Delaware Street SE, Minneapolis, MN 55455 (612-625-7692; fax: 612-625-2101)
Website: http://www.ent.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 48
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy in Otolaryngology

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program prepares students in both clinical and experimental aspects of otolaryngology. The Ph.D.Otol. degree requires a publishable thesis. Rotations at University of Minnesota Medical Center-Fairview, Minneapolis Veterans Administration Medical Center, Regions Hospital, Minneapolis Children's Hospital, and Hennepin County Medical Center provide a wide range of opportunity for clinical education and surgical experience.

Opportunities for independent research are provided in the areas of audiology, auditory electrophysiology, auditory neurophysiology, basic sciences research, biochemistry, cancer biology, cell biology and genetics, chemical senses, clinical epidemiology, education research, electron microscopy, electrophysiology, histochemistry, laryngeal physiology, mandibular bone physiology, microvascular tissue transfer, morphometry, outcomes research, psychoacoustics, psychometrics, skin-flap physiology, temporal bone pathology, tumor immunology, and vestibular physiology. Graduates of the program have careers in teaching, research, and professional practice.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Requires an M.D. degree.

Other requirements to be completed before admission:
Doctorate will be completed in conjunction with otolaryngology residency.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Coursework will vary depending on preparation and the research undertaken. An advisory committee, including the student, the advisor, and the director of graduate studies, determines coursework. Understanding and application of basic statistics and experimental methodology are expected. Statistics coursework is usually necessary. Choice of statistics courses is made with the
guidance of the director of graduate studies.

All students are expected to publish a research paper in a peer-reviewed journal. Students are concurrently in otolaryngology residency and usually take five to six years to complete research, course, and dissertation requirements.

**Thesis Credits**
- Take 24 doctoral thesis credits.
- OTOL 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Pharmacology M.S.
Pharmacology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-626-1248; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 36
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

A four-year BA or BS degree (or its equivalent) in a basic science program is generally required.

Other requirements to be completed before admission:
Candidates for admission are evaluated on the basis of undergraduate record, previous research experience, and letters of recommendation.

Special Application Requirements:
Applicants must submit three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.
Plan B: Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: A research project approved by the advisor and Director of Graduate Studies.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students are required to maintain a GPA of 3.00. Students who fail to maintain this standard must petition the director of graduate studies for permission to remain in the program.
Twin Cities Campus
Pharmacology Minor
Pharmacology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-625-9997; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 9
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A master's minor requires a minimum of 9 credits in pharmacology approved by the director of graduate studies. A doctoral minor requires a minimum of 12 credits in pharmacology approved by the director of graduate studies. There are no special requirements (e.g., specific courses, written examination).
Twin Cities Campus
Pharmacology Ph.D.
Pharmacology
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Pharmacology, 6-120 Jackson Hall, 321 Church Street S.E., Minneapolis MN 55455 (612-626-1248; fax: 612-625-8408)
Email: phclgrad@umn.edu
Website: http://www.pharmacology.med.umn.edu/graduate.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Pharmacology is the study of the interactions of chemicals with biological systems. Courses and research training in biochemistry, biophysics, genetics, and molecular biology provide a solid foundation for performing original research in pharmacology, neuropharmacology, and cancer chemotherapy.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

A four-year BA or BS degree (or its equivalent) in a basic science program is generally required.

Other requirements to be completed before admission:
Candidates for admission are evaluated on the basis of undergraduate record, previous research experience, and letters of recommendation.

Special Application Requirements:
Applicants must submit three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students are required to maintain a GPA of 3.00. Students who fail to maintain this standard must petition the director of graduate studies for permission to remain in the program.

For more detailed information, contact the director of graduate studies in pharmacology.

**Joint- or Dual-degree Coursework:** Joint Degree Program in Law, Health and the Life Sciences. Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Physical Therapy D.P.T.
Rehabilitation Medicine Administration
Medical School

Link to a list of faculty for this program.

Contact Information:
Division of Physical Therapy, 420 Delaware Street SE, MMC 388, Minneapolis, MN 55455, (612-624-2662; fax: 612-625-4274)
Email: goebe005@umn.edu
Website: https://www.rehabmedicine.umn.edu/education-training/physical-therapy

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 139
- This program requires summer semesters for timely completion.
- Courses for the DPT are taught on the Twin Cities campus for the first 7 semesters, with numerous off-site clinic visits scheduled throughout semesters 2 through 7. The remaining 2 semesters of the program consist of 4 full-time clinical internships, which occur off-campus in physical therapy clinics.
- Degree: Doctor of Physical Therapy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Division of Physical Therapy Program, a division within the Department of Rehabilitation Medicine, offers a professional doctoral degree in physical therapy (DPT). Physical therapy is a healthcare discipline involved with the study and rehabilitation of movement impairments such as muscular weakness, impaired coordination, joint stiffness, and pain, which can lead to functional problems affecting self care, employment, ambulation, etc. Graduates are prepared to promote proper health care and quality of living by maximizing human movement following disease or injury or by preventing its loss. The program requires three years of year-round, full-time graduate study. Academic coursework and research activity are completed during the first seven semesters. The final two semesters are devoted to clinical internships.

Accreditation
This program is accredited by Commission on Accreditation in Physical Therapy Education (CAPTE) (APTA).

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The University of Minnesota Division of Physical Therapy has no required or preferred undergraduate major. Any baccalaureate degree or equivalent from an accredited institution is accepted.

Other requirements to be completed before admission:
To be eligible for admission, the student must complete a baccalaureate degree, or its foreign equivalent, from an accredited institution by June 1st of the year of admission, including the required prerequisite courses or their equivalents.

Applicant must complete at least 100 hours of volunteer or work experience in a clinical physical therapy setting. Exposure to multiple and varied areas of practice in physical therapy and additional health care exposure are considered an important preparation. The GRE General exam is required. TOEFL is required for international students. Two letters of recommendation are also required. One letter must be from a physical therapist that applicant has shadowed.

Special Application Requirements:
Below is a list of required prerequisite coursework to be taken before entering the program. Courses must be taken A-F, unless receiving a score of 4 or above for Advanced Placement (AP) credit. AP score report must be submitted to Program office for AP credit given in prerequisite coursework. A minimum grade of C is required in all prerequisite coursework. It is recommended but not required that these courses be taken within the previous five years. Courses may be taken at any accredited college. Students are expected to be skillful with computer applications for word processing and creating spreadsheets.
- General biology, with on-site lab
- A second biology course of the student's choice, with on-site lab
- Human anatomy (lab strongly recommended)
- Human physiology
- General chemistry or inorganic chemistry - minimum two courses, with on-site lab
- General physics, which includes mechanics and electricity - minimum two courses, with on-site lab
- General psychology
- Abnormal psychology
- Statistics - ANOVA and regression analysis content strongly recommended
- Introductory calculus (pre-calculus not acceptable; Intro to Calculus or Short Calculus acceptable)
- Medical terminology

For all AP courses on the transcript, a score must be entered. This will be the score issued by the College Board. Students must also forward an unofficial copy of the College Board Report to the admissions coordinator to keep on file.

If distance learning courses are taken from an accredited college or university for college credit, there is no limit to the number that may be taken through distance education. Labs must be taken on-site unless prior approval is given by Admissions Chair.

All prerequisite courses and an undergraduate degree must be completed before the student enrolls in the professional program. Students may apply with two remaining prerequisites in progress. Past students have found that biochemistry, and animal biology classes have been helpful preparati

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
139 credits are required in the major.
This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.8 is required for students to remain in good standing.

At least 6 semesters must be completed before filing a Degree Program Form.

Year 1 Summer (6 Credits)
PT 6058 - Anatomy for Physical Therapy (6.0 cr)

Year 1 Fall (18 Credits)
PT 6002 - Ethics in Public Health: Research and Policy (1.0 cr)
PT 6213 - Clerkship I (2.0 cr)
PT 6231 - Clinical Biomechanics (5.0 cr)
PT 6280 - Clinical Assessment (4.0 cr)
PT 6281 - Scientific Foundations I: Theory of Therapeutic Exercise (3.0 cr)
PT 6340 - Human Growth and Development (3.0 cr)

Year 1 Spring (17 Credits)
NSCI 6112 - Medical Neuroscience for Professional Students (5.0 cr)
PT 8132 - Research Seminar (1.0 cr)
PT 6310 - Physiology for Physical Rehabilitation (5.0 cr)
PT 6214 - Clerkship II (2.0 cr)
PT 6221 - Therapeutic Procedures (4.0 cr)

Year 2 Summer (14 Credits)
Take PT 8193 for 2 credits.
PT 6813 - Cardiopulmonary Physical Therapy (3.0 cr)
PT 6250 - Acute Care in Physical Therapy (2.0 cr)
PT 6251 - Integument (2.0 cr)
PT 6252 - Pathophysiology (3.0 cr)
PHAR 6800 - Rehabilitation Pharmacotherapy (2.0 cr)
PT 8193 - Research Problems (2.0 - 6.0 cr)

Year 2 Fall (14 Credits)
Take PT 8193 for 2 credits.
PT 6283 - Musculoskeletal I (7.0 cr)
PT 6293 - Essentials of Rehabilitation Research (4.0 cr)
PT 6215 - Clerkship III (1.0 cr)
PT 8193 - Research Problems (2.0 - 6.0 cr)

Year 2 Spring (18 Credits)
Take PT 8193 for 2 credits.
PT 6282 - Scientific Foundations II: Neuromotor Control (3.0 cr)
PT 6287 - Neurorehabilitation (8.0 cr)
PT 6284 - Musculoskeletal Rehabilitation II (4.0 cr)
PT 6216 - Clerkship IV (1.0 cr)
PT 8193 - Research Problems (2.0 - 6.0 cr)

Year 3 Summer (12 Credits)
PT 6288 - Pediatric Rehabilitation (8.0 cr)
PT 6290 - Administration (4.0 cr)

Year 3 Fall (20 Credits)
PT 6295 - Clinical Internship I (10.0 cr)
PT 6296 - Clinical Internship II (10.0 cr)

Year 3 Spring (20 Credits)
PT 6297 - Clinical Internship III (10.0 cr)
PT 6298 - Clinical Internship IV (10.0 cr)
Twin Cities Campus
Rehabilitation Science M.S.
Rehabilitation Medicine Administration
Medical School

Link to a list of faculty for this program.

Contact Information:
Division of Rehabilitation Science, 420 Delaware Street SE - MMC 388, Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: https://www.rehabmedicine.umn.edu/rehabilitation-science

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 33
- This program does not require summer semesters for timely completion.
- No
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Division of Rehabilitation Science offers post-professional degrees designed to train rehabilitation scientists and academicians. Rehabilitation Science is interdisciplinary, including occupational and physical therapists, physiologists, engineers and students with other backgrounds interested in rehabilitation research. The Division's philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience specifically tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

Note: Rehabilitation Science prefers PhD applicants over MS applicants. The MS often applies to students who are in need of a trial program to determine whether or not the PhD is a good fit. In addition, the MS is used for students who initially begin the PhD, but find that the PhD is not the best fit and subsequently switch to the MS.

Accreditation
This program is accredited by NA

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.30.

University of Minnesota BME bachelor's degree.

Required prerequisites

BME BS / RSC MS Course List for Admissions
By the time BME BS students apply to this integrated BME BS/RSC MS degree, the student must have completed the following 13 B.Bm.E classes: BMEN 2101, 2401, 2501, 3011, 3015, 3111, 3115, 3211, 3215, 3311, 3315, 3411, 3415. Completion of these classes will satisfy all necessary prerequisites required for admission and Rehabilitation Science graduate courses. Students who have not completed these 13 courses (or BME approved equivalents) are not eligible to apply.

Take 13 or more course(s) from the following:

Special Application Requirements:
In addition to the University's application (including personal statement and fee), applicants must submit the following materials: unofficial transcripts; two reference names with email address and phone number, one reference must be from BME. Student must also have an agreed-upon faculty adviser at the time of applying. Compatibility of research interests is a major determinant in the student/adviser relationship.
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 14 major credits, 9 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 14 major credits and 16 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The Plan B project is determined in consultation with the advisor.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Plan A Requirements**
Take at least 14 RSC credits to meet the major field requirement; 3 statistics credits and 6 credits of electives for the outside credit requirement; and 10 master's thesis credits.

Take 14 or more credit(s) from the following:
- RSC 5058 - Anatomy for Rehabilitation Science (6.0 cr)
- RSC 5101 - Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences (1.0 cr)
- RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 5200 - Introduction to Transcranial Magnetic Stimulation (3.0 cr)
- RSC 5206 - Academic Ethos (1.0 cr)
- RSC 5231 - Clinical Biomechanics (2.0 - 5.0 cr)
- RSC 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
- RSC 5281 - Scientific Foundations: Exercise Theory (3.0 cr)
- RSC 5294 - Independent Study in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 5306 - Scientific and Professional Presentation (1.0 cr)
- RSC 5310 - Physiology for Physical Rehabilitation (1.0 - 5.0 cr)
- RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- RSC 5841 - Applied Data Acquisition and Processing (4.0 cr)
- RSC 5901 - Scholarly Inquiry in Health Sciences (4.0 cr)
- RSC 8106 - Critical Analysis of Scientific Literature (1.0 - 2.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- RSC 8135 - Advanced Kinesiology (3.0 cr)
- RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8185 - Problems in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8188 - Teaching Practicum (1.0 - 5.0 cr)
- RSC 8192 - Research Design in Rehabilitation Science (4.0 cr)
- RSC 8206 - Grant Writing (2.0 cr)
- RSC 8235 - Human Kinetics (3.0 cr)
- RSC 8282 - Problems in Human Movement (4.0 cr)
- RSC 8306 - Peer Review and Publication (2.0 cr)

**Statistics Requirement**
Take at least 3 credits of statistics from the following list, or chosen in consultation with the adviser.
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- EPSY 8251 - Statistical Methods in Education I (3.0 cr)
- EPSY 8252 - Statistical Methods in Education II (3.0 cr)

**Electives**
Take 6 elective RSC and/or non-RSC credits, selected in consultation with the advisor.
- RSC 5xxx
- RSC 8xxx

**Thesis Credits**
Take at least 10 master's thesis credits.
- RSC 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Plan B Requirements
Take at least 14 RSC credits to meet the major field requirement; and 3 statistics credits and 13 credits of electives for the outside credit requirement.

Take 14 or more credit(s) from the following:
• RSC 5058 - Anatomy for Rehabilitation Science (6.0 cr)
• RSC 5101 - Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences (1.0 cr)
• RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
• RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
• RSC 5200 - Introduction to Transcranial Magnetic Stimulation (3.0 cr)
• RSC 5206 - Academic Ethos (1.0 cr)
• RSC 5231 - Clinical Biomechanics (2.0 - 5.0 cr)
• RSC 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
• RSC 5281 - Scientific Foundations: Exercise Theory (3.0 cr)
• RSC 5284 - Independent Study in Rehabilitation Science (1.0 - 3.0 cr)
• RSC 5306 - Scientific and Professional Presentation (1.0 cr)
• RSC 5310 - Physiology for Physical Rehabilitation (1.0 - 5.0 cr)
• RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
• RSC 5841 - Applied Data Acquisition and Processing (4.0 cr)
• RSC 5901 - Scholarly Inquiry in Health Sciences (4.0 cr)
• RSC 8106 - Critical Analysis of Scientific Literature (1.0 - 2.0 cr)
• RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
• RSC 8135 - Advanced Kinesiology (3.0 cr)
• RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
• RSC 8185 - Problems in Rehabilitation Science (1.0 - 3.0 cr)
• RSC 8188 - Teaching Practicum (1.0 - 5.0 cr)
• RSC 8192 - Research Design in Rehabilitation Science (4.0 cr)
• RSC 8206 - Grant Writing (2.0 cr)
• RSC 8235 - Human Kinetics (3.0 cr)
• RSC 8282 - Problems in Human Movement (4.0 cr)
• RSC 8306 - Peer Review and Publication (2.0 cr)

Statistics Requirement
Take at least 3 credits of statistics from the following list, or chosen in consultation with the advisor.
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• EPSY 8251 - Statistical Methods in Education I (3.0 cr)
• EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Electives
Take 13 elective RSC and/or non-RSC credits, selected in consultation with the advisor.
• RSC 5xxx
• RSC 8xxx

Joint- or Dual-degree Coursework:
Integrated Biomedical Engineering BS / Rehabilitation Science MS joint degree Student may take a total of 0 credits in common among the academic programs.
Twin Cities Campus
Rehabilitation Science Minor
Rehabilitation Medicine Administration
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street SE, Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in rehabilitation science is a post-professional program designed to train rehabilitation scientists and academicians. The program includes occupational and physical therapists and students with other backgrounds interested in rehabilitation research. The program's philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience specifically tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Minimum US equivalent bachelor's degree.

Other requirements to be completed before admission:
Applicants must hold a bachelor's degree or graduate degree in a discipline related to rehabilitation such as biomedical engineering, medicine, occupational therapy, physical therapy, or speech/audiology. International students must hold a comparable foreign degree from an accredited program. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework.

Special Application Requirements:
The student must inform the director of graduate studies (DGS) in writing of his or her intent to pursue the minor. A rehabilitation science faculty admissions committee determines student admission for the minor. To be admitted, a student must be an active graduate student pursuing an equivalent graduate degree in another field. The student must be in good academic standing within his or her major program. The student must have a mutually agreed-upon graduate faculty member in rehabilitation science serve as a reviewer on the student's dissertation committee and serve as the minor field examiner on the final exam committee.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Doctoral**

**Ph.D. Minor**

Take at least 12 credits, selected in consultation with the Rehabilitation Sciences director of graduate studies. RSC courses must be taken on the A-F grading basis.

Take 12 or more credit(s) from the following:
- RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
- RSC 5206 - Academic Ethos (1.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 5294 - Independent Study in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 5306 - Scientific and Professional Presentation (1.0 cr)
- RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- RSC 5841 - Applied Data Acquisition and Processing (4.0 cr)
- RSC 8106 - Critical Analysis of Scientific Literature (1.0 - 2.0 cr)
- RSC 8206 - Grant Writing (2.0 cr)
- RSC 8306 - Peer Review and Publication (2.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- RSC 8135 - Advanced Kinesiology (3.0 cr)
- RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8185 - Problems in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8192 - Research Design in Rehabilitation Science (4.0 cr)
- RSC 8282 - Problems in Human Movement (4.0 cr)

**Masters**

**Master's Minor**

Take at least 6 credits, selected in consultation with the Rehabilitation Sciences director of graduate studies. RSC courses must be taken on the A-F grading basis.

Take 6 or more credit(s) from the following:
- RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
- RSC 5206 - Academic Ethos (1.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- RSC 5294 - Independent Study in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 5306 - Scientific and Professional Presentation (1.0 cr)
- RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
- RSC 5841 - Applied Data Acquisition and Processing (4.0 cr)
- RSC 8106 - Critical Analysis of Scientific Literature (1.0 - 2.0 cr)
- RSC 8206 - Grant Writing (2.0 cr)
- RSC 8306 - Peer Review and Publication (2.0 cr)
- RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
- RSC 8135 - Advanced Kinesiology (3.0 cr)
- RSC 8170 - Special Topics in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8185 - Problems in Rehabilitation Science (1.0 - 3.0 cr)
- RSC 8192 - Research Design in Rehabilitation Science (4.0 cr)
- RSC 8282 - Problems in Human Movement (4.0 cr)
Twin Cities Campus
Rehabilitation Science Ph.D.
Rehabilitation Medicine Administration
Medical School

Link to a list of faculty for this program.

Contact Information:
Rehabilitation Science Program, 420 Delaware Street SE - MMC 388, Minneapolis, MN, 55455 (phone: 612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.physicalrehab.umn.edu/rehabilitation-science

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in rehabilitation science is a post-professional program designed to train rehabilitation scientists and academicians to meet the growing demand for experts in physical and occupational therapy and related fields. The program includes occupational and physical therapists and students with other backgrounds interested in rehabilitation research. The program’s philosophy provides students with 1) a strong foundation in research methodology, 2) a concentrated educational experience tailored toward a student's specific research question in rehabilitation science, and 3) a working knowledge of the importance of a collaborative, interdisciplinary approach to the scientific process.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Bachelor's degree or US equivalent in a related discipline is minimal requirement.

Professional, graduate, or master's degree preferred but not required.

Other requirements to be completed before admission:
Applicants must hold a bachelor's or graduate degree, or accredited US equivalent, in a discipline related to rehabilitation; for example, biomedical engineering, kinesiology, medicine, occupational therapy, physical therapy, public health, or speech/audiology. Depending on the educational background of the applicant, admission may be contingent upon completion of selected prerequisite coursework.

Special Application Requirements:
In addition to completing and submitting the University's online application (which includes submission of a personal statement, diversity statement, and upload of CV/resume), applicants must submit the following materials: report of GRE General Test scores (scores in the 50th percentile or higher are preferred); transcripts from all institutions attended; three letters of recommendation; and TOEFL and/or iELTS scores for international students. Student must also have an agreed-upon faculty adviser at the time of application. Compatibility of research interest is a major determinant in the student/adviser relationship. For further information regarding these requirements, contact Program Administrator, Rich Adamczak, via email at adamc002@umn.edu.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 155
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
• TOEFL
- Internet Based - Total Score: 88
- Internet Based - Listening Score: 21
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 21
- Internet Based - Speaking Score: 23

IELTS
- Total Score: 6.5

The preferred English language test is Test of English as Foreign Language

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

16 credits are required in the major.
20 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

**Core Courses**

All students must complete the core courses.

Take 6 or more credit(s) from the following:
- RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
- RSC 5206 - Academic Ethos (1.0 cr)
- RSC 5306 - Scientific and Professional Presentation (1.0 cr)
- RSC 8106 - Critical Analysis of Scientific Literature (1.0 - 2.0 cr)
- RSC 8206 - Grant Writing (2.0 cr)
- RSC 8306 - Peer Review and Publication (2.0 cr)

**Additional RSC Courses**

Take at least 10 credits from the following courses, upon consultation with advisor:
- RSC 5xxx
- RSC 8xxx

**Statistics Requirement**

Take at least 8 credits of statistics from the following options, or choose 8 statistics credits in consultation with advisor:

**Public Health Statistics Series**
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)

**Educational Psychology Statistics Series**
- EPSY 8261 (inactive) (3.0 cr)
- EPSY 8262 (inactive) (3.0 cr)

**Elective Courses**

Take at least 12 credits in consultation with advisor. Electives can include a combination of RSC coursework and courses from other disciplines.

**Joint- or Dual-degree Coursework:** DPT/PhD
Student may take a total of 18 credits in common among the academic programs.
Twin Cities Campus

Stem Cell Biology M.S.

Stem Cell Institute

Medical School

Link to a list of faculty for this program.

Contact Information:
Stem Cell Institute, 2001 6th Street S.E., Mail Code 2873, Minneapolis, MN 55455-3007
Email: scbgrad@umn.edu
Website: http://www.stemcell.umn.edu/graduate_programs/master_of_science/home.htm

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The stem cell biology master's program is a multidisciplinary program that prepares graduates for a career in research, teaching, or industry within the field of stem cell biology. It offers training in stem cell biology, a rapidly growing interdisciplinary field that rests on foundations provided by molecular, cellular, and developmental biology. Students will take lecture, lab, and seminar courses in these various disciplines, in addition to stem cell biology. They will interact with members of the Stem Cell Institute through participation in research seminars and journal clubs.

Students who elect Plan A will spend a full calendar year, including summer, conducting research in the laboratory of a stem cell graduate program faculty member. This research will form the basis of the master's thesis.

Students who elect Plan B will conduct research of primary literature resulting in a written paper and seminar on a topic in Stem Cell Biology agreed upon in advance by the student and faculty adviser. Part-time students choosing Plan B are expected to complete the degree within 3 years by taking one to two courses per semester, excluding summers.

Program Delivery

This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.20.

A bachelor's degree or foreign equivalent in biological science or a related field.

Special Application Requirements:

Applicants must upload to the Apply Yourself on-line application website: 1) a personal statement (500 words or less) outlining research interests and long- and short-term goals (NOTE: students applying to Plan A should include information about previous research experience); 2) a curriculum vitae or resume; 3) the names of three individuals whom the student has asked to write letters of recommendation; and 4) unofficial transcripts.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 94
  - Internet Based - Listening Score: 22
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
  - Internet Based - Speaking Score: 26
  - Paper Based - Total Score: 580
• IELTS

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Information current as of August 31, 2018
- Total Score: 7
- Listening Score: 6.2
- Reading Score: 6.2
- Writing Score: 6.2
- Speaking Score: 6.2

**MELAB**

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A**: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students must demonstrate familiarity with the tools of research and scholarship in their major field, the ability to work independently, and the ability to present the results of their investigation effectively.

**Plan Options**

**Plan A**

Take 10 master's thesis credits. Students are recommended to take 5 in spring of year 1 and the remaining 5 in fall of year 2. Plan A students must also take SCB 5051.

**SCB 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)
**SCB 5051** - Stem Cell Biology Practical Training Module (1.0 cr)

**Plan A Electives**

Take elective credits from the following list, or other courses in consultation with the program advisor, to complete the minimum credit requirement.

**BIOC 8401** - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
**BIOL 4004** - Cell Biology (3.0 cr)
**BMEN 5041** - Tissue Engineering (3.0 cr)
**BMEN 5351** - Cell Engineering (3.0 cr)
**BTHX 5210** - Ethics of Human Subjects Research (3.0 cr)
**BTHX 5325** - Biomedical Ethics (3.0 cr)
**BTHX 5400** - Intro Ethics in Hlth Policy (3.0 cr)
**GCD 5036** - Molecular Cell Biology (3.0 cr)
**GCD 8008** - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
**GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
**GCD 8151** - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
**GCD 8161** - Advanced Cell Biology and Development (3.0 cr)
**MICA 8003** - Immunity and Immunopathology (4.0 cr)
**MICA 8004** - Cellular and Cancer Biology (4.0 cr)
**MILI 6235** - Pharmaceutical Industry: Business and Policy (2.0 cr)
**MILI 6726** - Medical Device Industry: Business and Public Policy (2.0 cr)
**MILI 6990** - The Health Care Marketplace (2.0 cr)
**MILI 6995** - Medical Industry Valuation Laboratory (2.0 cr)
**NSC 8211** - Developmental Neurobiology (3.0 cr)
**PHCL 5110** - Introduction to Pharmacology (3.0 cr)
**PHCL 5112** - A Graduate Toolkit I: An Introduction to the Scientific Research Lab (1.0 cr)
PHSL 5510 - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
PHSL 8242 - Professional Skills Development for Biomedical Scientists (2.0 cr)
PSY 5063 - Introduction to Functional MRI (3.0 cr)

-OR-

Plan B
Take SC B 5900.
SCB 5900 - Master's Plan B Research Paper and Presentation (2.0 cr)

Plan B Electives
Take elective credits from the following list, or other courses in consultation with the advisor, to complete the minimum credit requirement.
BIOC 5213 - Selected Topics in Molecular Biology (3.0 cr)
BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
BIOC 4004 - Cell Biology (3.0 cr)
BMEN 5041 - Tissue Engineering (3.0 cr)
BMEN 5351 - Cell Engineering (3.0 cr)
BTHX 5210 - Ethics of Human Subjects Research (3.0 cr)
BTHX 5325 - Biomedical Ethics (3.0 cr)
BTHX 5400 - Intro Ethics in Health Policy (3.0 cr)
GCD 5036 - Molecular Cell Biology (3.0 cr)
GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
MICA 8003 - Immunity and Immunopathology (4.0 cr)
MICA 8004 - Cellular and Cancer Biology (4.0 cr)
MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
MILI 6726 - Medical Device Industry: Business and Public Policy (2.0 cr)
MILI 6990 - The Health Care Marketplace (2.0 cr)
MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
NSC 8211 - Developmental Neurobiology (3.0 cr)
PHCL 5110 - Introduction to Pharmacology (3.0 cr)
PHCL 5112 - A Graduate Toolkit I: An Introduction to the Scientific Research Lab (1.0 cr)
PHSL 5510 - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
PHSL 8242 - Professional Skills Development for Biomedical Scientists (2.0 cr)
PSY 5063 - Introduction to Functional MRI (3.0 cr)

Required Coursework
Required Courses
All students take the following courses:
SCB 5054 - Stem Cell Institute Research Seminar and Journal Club (2.0 cr)
SCB 8181 - Stem Cell Biology (3.0 cr)

Required molecular biology course
Take at least one of the following required courses:
GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or BIOC 8007 - Molecular Biology of DNA (2.0 cr)

Take at least one of the following required courses:
GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
or GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
or 5xxx-or 8xxx-level Bioethics course, approved prior to registration by the SCB program.
Twin Cities Campus
Stem Cell Biology PhD Minor
Stem Cell Institute
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Stem Cell Biology Institute, 2001 6th Street SE, Mail Code 2873, Minneapolis, MN 55455-3007 (612-625-0602; fax: 612-624-2436)
Email: ander607@umn.edu
Website: http://www.stemcell.umn.edu/graduate-programs/phd-level-minor

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This degree program offers training in stem cell biology, a rapidly growing interdisciplinary field that rests on foundations provided by molecular, cellular, and developmental biology. Students will take lecture, lab, and seminar courses in these various disciplines, in addition to Stem Cell Biology. They will interact with members of the Stem Cell Institute through participation in research seminars and journal clubs, and will spend a full calendar year conducting stem cell research in the laboratory of a stem cell biology graduate program faculty member.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
Applicants must be admitted to a Ph.D. program and obtain approval from the director of graduate studies in stem cell biology to enroll in the minor program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

In addition to the major requirement appropriate to the student's specific program, the stem cell biology PhD minor will require 12 credits from designated courses with a minimum GPA 3.00.

The main research project must be done in the lab of a member of the stem cell biology graduate faculty.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
The PhD minor is available to students with an interest in stem cell biology who are in relevant PhD programs such as MCDB&G, MCB, pharmacology, microbiology, bio-engineering, or in a medical or veterinary medicine school program. It offers training in stem cell biology, which is a rapidly growing interdisciplinary field that rests on foundations provided by molecular, cellular, and developmental biology. Students will take lecture and seminar courses. They will interact with members of the Stem Cell Institute through participation in research seminar and journal clubs and conduct stem cell research in the laboratory of a stem cell biology
graduate program faculty member.

Requirements include 12 credits from designated courses—9 core credits and 3 credits from elective courses—and a research project in the lab of a Stem Cell Institute faculty member. Students may not use credits offered in their major field to satisfy minor requirements.

**Required Courses**

All students are required to take these courses.

- **BIOC 8002** - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- **GCD 8161** - Advanced Cell Biology and Development (3.0 cr)
- **SCB 8181** - Stem Cell Biology (3.0 cr)

**PhD Minor Electives**

Students may choose from following list of courses. If any are required as part of major requirements, they may not be used to fulfill minor requirements.

Take 3 or more credit(s) from the following:

- **BIOC 8401** - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
- **BMEN 5041** - Tissue Engineering (3.0 cr)
- **BMEN 5351** - Cell Engineering (3.0 cr)
- **BTHX 5400** - Intro Ethics in Hlth Policy (3.0 cr)
- **BTHX 8000** - Advanced Topics in Bioethics (1.0 - 4.0 cr)
- **GCD 8008** - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- **GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
- **GCD 8151** - Cellular Biochemistry and Cell Biology (3.0 cr)
- **MICA 8003** - Immunity and Immunopathology (4.0 cr)
- **MICA 8004** - Cellular and Cancer Biology (4.0 cr)
- **NSC 8211** - Developmental Neurobiology (3.0 cr)
- **PHCL 5110** - Introduction to Pharmacology (3.0 cr)
- **PHSL 5510** - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
- **PHSL 8242** - Professional Skills Development for Biomedical Scientists (2.0 cr)
- **PSY 5063** - Introduction to Functional MRI (3.0 cr)
Twin Cities Campus
Surgery M.S. Surg.
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, University of Minnesota, 420 Delaware Street S.E., MMC 195, Minneapolis, MN 55455 (612-626-6122)
Email: roger031@umn.edu
Website: http://www.surg.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science in Surgery

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The general surgery residency program trains medical doctors for the practice of surgery and for academic positions. During Residency, research trainees spend two to three years in either a basic science laboratory or in clinical translational surgery. The Department of Surgery offers supervised work in its experimental research laboratories, hospital, and outpatient departments.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
MD or graduate student in an applicable field

Other requirements to be completed before admission:
Prospective students must be in the general surgery training program, with two to three clinical years of training completed; physicians interested in an advanced research degree; or individuals with relevant research education and experience. Non-physician applicants should confer with the Director of Graduate Studies prior to applying to determine their potential for the M.S.Surg degree.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Required Coursework
All students complete the following courses:
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 6301 - Fundamentals of Clinical Research (3.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
SURG 8202 - Surgical Research (3.0 cr)
SURG 8990 - Topics in Pancreatoloogy (1.0 - 4.0 cr)
SURG 8994 - Directed Readings (1.0 - 4.0 cr)

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Information current as of August 31, 2018
Twin Cities Campus
Adult Health/Gerontological Clinical Nurse Specialist Postgraduate Certificate
School of Nursing

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 18 to 31
- This program requires summer semesters for timely completion.
- Degree: Adlt Hlth/Geron Clincial Nurse Spec Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a doctor of nursing practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space-available basis until March 1.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

3.0 cumulative GPA is required. Please contact the School of Nursing for detailed information about the requirements for this certificate.

Specialty Courses (18 Credits)
Complete the following required specialty courses for the certificate. NURS 6408 must be taken for 1 credit. NURS 6502 must be taken for 3 credits. NURS 7505 must be taken for 2 credits.

- **NURS 6405 - Advanced Practice CNS Roles Across the Lifespan (3.0 cr)**
- **NURS 6406 - Advanced Practice CNS Roles Across the Lifespan: Practicum (1.0 cr)**
- **NURS 6407 - Advanced Nursing Care of Older Adults (3.0 cr)**
- **NURS 6408 - Advanced Nursing Care of Older Adults Practicum (1.0 - 2.0 cr)**
- **NURS 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (2.0 - 3.0 cr)**
- **NURS 7505 - Assessment and Management of Health for Advanced Practice Nurses Practicum II (1.0 - 2.0 cr)**
- **NURS 7706 - Implementing the Role of the Clinical Nurse Specialist in Acute Care (1.0 cr)**
- **NURS 7406 - Advanced Nursing Practicum in Adult-Gerontology Health (2.0 cr)**
- **NURS 7705 - The Adult and Gerontological Clinical Nurse Specialist in Acute Care (2.0 cr)**

Advanced Practice Registered Nurse Core Courses (0 to 13 credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 4 credits.

- **NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)**
- **NURS 5222 - Advanced Human Physiology (2.0 cr)**
- **NURS 5226 - Advanced Human Pathophysiology (2.0 cr)**
- **NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)**
- **NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)**
Twin Cities Campus
Adult/Gerontological Primary Care Nurse Practitioner Postgraduate Certificate
School of Nursing
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 18 to 31
- This program requires summer semesters for timely completion.
- Degree: Adult/Gerontological Primary Care NP Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a doctor of nursing practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space available basis until March 1.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

A 3.0 cumulative GPA is required. Please contact the School of Nursing for detailed information about the requirements for this certificate.

Specialty Courses (18 Credits)
Complete the following required specialty courses for the certificate. Take NURS 6305 for 2 credits; NURS 6408 for 2 credits; NURS 6502 for 3 credits; NURS 7504 for 1 credit; and NURS 7505 must be taken for 1 credit.

NURS 6305 - Women’s Reproductive Health Care (2.0 - 3.0 cr)
NURS 6307 - Assessment and Management of Health for APNs Practicum III (1.0 cr)
NURS 6407 - Advanced Nursing Care of Older Adults (3.0 cr)
NURS 6408 - Advanced Nursing Care of Older Adults Practicum (1.0 - 2.0 cr)
NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
NURS 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (2.0 - 3.0 cr)
NURS 7406 - Advanced Nursing Practicum in Adult-Gerontology Health (2.0 cr)
NURS 7504 - Assessment and Management of Health for Advanced Practice Nurses, Practicum I (1.0 - 2.0 cr)
NURS 7505 - Assessment and Management of Health for Advanced Practice Nurses Practicum II (1.0 - 2.0 cr)

Advanced Practice Registered Nurse Core Courses (13 Credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 4 credits.

NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
NURS 5222 - Advanced Human Physiology (2.0 cr)
NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
Twin Cities Campus
Doctor of Nursing Practice D.N.P.
School of Nursing

Contact Information:
Office of Student Career & Advancement Services, 5-160 Weaver Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: sonstudentinfo@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 41 to 100
- This program requires summer semesters for timely completion.
- Degree: Doctor of Nursing Practice

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Doctor of Nursing Practice (DNP) Program is offered as the post-baccalaureate with specialty (12 specialties). The School of Nursing also offers a reduced-credit, post-master's DNP program for students who have completed a master's degree in a nursing practice specialty.

The DNP program is an innovative, practice-focused program that prepares students to be leaders in health care, develop quality improvement, and systems problem solving. It prepares nurses to create and lead new models of care delivery for communities locally, across the nation, and around the world. Students work with faculty who are leaders in their fields and on the cutting edge of nursing research and practice. These experts become mentors and guide students through the program. The unique, interdisciplinary core curriculum is divided into the following four areas.

1. DNP core - Includes science of nursing intervention, moral and ethical positions, research, statistics, program evaluation, evidence-based practice, epidemiology, informatics, leadership, health economics, health policy, and teaching and learning.
2. DNP specialty core - Prepares students for advanced clinical practice; includes physiology, pharmacology, pharmacotherapeutics, and advanced health assessment.
3. DNP specialization - Prepares graduates for certification in their chosen specialty by a national certifying body and includes:
   a. Advanced clinical practice with specialty-specific courses for each of the areas of clinical specialization
   b. Other specialization in public health, innovation and leadership, informatics, and integrative health and healing
4. DNP project - Completed by all students in a three-semester sequence during which the project is planned, implemented, evaluated, and disseminated

The School of Nursing and the School of Public Health offer a DNP/MPH-Public Health Practice dual degree program. This dual degree option provides students with a unique opportunity to provide advanced nursing care as leaders of inter-professional health care teams, emphasizing population-focused practice, and quality improvement to impact patient outcomes.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
• primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

The post-baccalaureate DNP specialty areas and post-master's DNP require an entry-level nursing degree (e.g. BSN, BAN, post-bacc certificate in nursing, or entry-level master of nursing).

A graduate degree is not required for admission to the post-baccalaureate DNP program.
Applicants for the post-master's DNP must hold a master's degree in a nursing practice specialty.

Other requirements to be completed before admission:
The required application process is available on the School of Nursing website at www.nursing.umn.edu. Interviews are by invitation only and are not granted to all applicants. Application deadlines for the DNP program are available on the School of Nursing website.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
41 to 100 credits are required in the major.
This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students MUST complete coursework according to the program plan appropriate for their term of admission and year plan. Any modifications to the program plan must be approved by the Specialty Coordinator/Faculty Advisor and Doctoral Programs Coordinator.

Core Coursework
Students with a Master of Nursing (MN) degree earned prior to 2010 must take NURS 7600 for 4 credits, and complete the remaining core coursework for a total of 41 credits. Students with an MN degree earned between 2010 and 2014 must take NURS 7600 for 2 credits and complete the remaining core courses for a total of 39 credits.

NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 6200 - Science of Nursing Intervention (3.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7100 - Quality Improvement and Implementation Science in Health Care (3.0 cr)
NURS 7102 - Scholarly Dissemination and Advanced Professional Engagement (2.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 7300 - Program Planning and Evaluation (3.0 cr)
NURS 7400 - Health Policy Leadership (3.0 cr)
NURS 7600 - Nursing Research and Evidence Based Practice (2.0 - 4.0 cr)
NURS 7610 - System Leadership and Innovation (3.0 cr)
NURS 7900 - Scholarly Teaching and Learning in Nursing (3.0 cr)
NURS 6110 - Epidemiology in Nursing (2.0 cr)
or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
Take 3 or more credit(s) from the following:
• NURS 7110 - NURS 7110 DNP Project Practicum (1.0 - 3.0 cr)

Statistics
Complete at least 3 credits of graduate-level inferential statistics
EPSY 5261 - Introductory Statistical Methods (3.0 cr)
or PUBH 6414 - Biostatistical Literacy (3.0 cr)

Joint- or Dual-degree Coursework:Doctor of Nursing Practice/Master of Public Health - Public Health Practice (D.N.P./M.P.H.-Public Health Practice) Student may take a total of 14 credits in common among the academic programs.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may complete the program with more than one sub-plan.

**Adult Health/Gerontological Clinical Nurse Specialist**
The DNP program with a specialty in adult health and gerontological nursing as a clinical nurse specialist prepares nurses for leadership as advanced practice nurses and clinical experts to provide advanced nursing care to adults and elders in a variety of settings. The DNP program is for students who already hold a baccalaureate degree in nursing, and involves both coursework and practicum experiences as well as a final internship where the student has the opportunity to focus on a sub-specialty area (e.g., oncology, cardiology, palliative care), if desired. Graduates work as expert clinicians and consultants in acute care settings, nursing homes, transitional care, and specialty practices. The adult health and gerontological specialty offers leadership preparation for nurses desiring expertise in the management of complex health conditions, working with nurses and interdisciplinary teams and organizations to provide care and services for adults and older adults. Students ground their studies in the science of nursing interventions, moral/ethical issues, and nursing research. Practicum experiences are arranged to meet the individual needs of students while also meeting accreditation and certification requirements. In addition to completing core studies in the specialty, students also gain skills in evidence-based practice, program evaluation, informatics, teaching/learning, health economics, health care policy, and epidemiology.

**Required Specialty Coursework**
Complete the following courses for at least 34 credits. 4 credits of NURS 5229 is required; 3 credits of NURS 6502 is required; 2 credits of NURS 7505 is required; 1 credit of NURS 6408 is required for this specialty.

- **CSPH 5101** - Introduction to Integrative Healing Practices (3.0 cr)
- **NURS 5200** - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- **NURS 5222** - Advanced Human Physiology (2.0 cr)
- **NURS 5226** - Advanced Human Pathophysiology (2.0 cr)
- **NURS 5228** - Pharmacology for Advanced Practice Nursing (2.0 cr)
- **NURS 5229** - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- **NURS 6405** - Advanced Practice CNS Roles Across the Lifespan (3.0 cr)
- **NURS 6406** - Advanced Practice CNS Roles Across the Lifespan: Practicum (1.0 cr)
- **NURS 6407** - Advanced Nursing Care of Older Adults (3.0 cr)
- **NURS 6408** - Advanced Nursing Care of Older Adults Practicum (1.0 - 2.0 cr)
- **NURS 6502** - Assessment and Management of Health for Advanced Practice Nurses, II (2.0 - 3.0 cr)
- **NURS 7406** - Advanced Nursing Practicum in Adult-Gerontology Health (2.0 cr)
- **NURS 7505** - Assessment and Management of Health for Advanced Practice Nurses Practicum II (1.0 - 2.0 cr)
- **NURS 7705** - The Adult and Gerontological Clinical Nurse Specialist in Acute Care (2.0 cr)
- **NURS 7706** - Implementing the Role of the Clinical Nurse Specialist in Acute Care (1.0 cr)

**Adult Health/Gerontological Primary Care Nurse Practitioner**
The DNP program with a specialty in adult health and gerontological nursing as a clinical nurse practitioner prepares nurses for leadership as advanced practice nurses and clinical experts to provide advanced nursing care to adults and elders in a variety of settings. This DNP program is for students who already hold a baccalaureate degree in nursing, and involves both coursework and practicum experiences, as well as a final internship where the student has the opportunity focus on a sub-specialty area (e.g., oncology, cardiology, palliative care), if desired. Graduates work in primary care/ambulatory care settings, hospitals, group practices of advanced practice gerontological nurses that manage care of adults and older adults in nursing homes, transitional care settings, assisted living, and specialty practices. The adult health and gerontological specialty offers leadership preparation for nurses desiring expertise in advanced nursing assessment and management for health promotion and disease prevention, management of complex health conditions, and working with interdisciplinary teams to provide care and services for persons ranging from adolescents, adults, and older adults. Practicum experiences are arranged to meet the individual needs of students while also meeting accreditation and certification requirements.

**Required Specialty Coursework**
Complete the following courses for 34 credits. Specialty requirements for Variable credit course: NURS 5229 = 4 credits; NURS 6305 = 2 credits; NURS 7504 = 1 credit; NURS 7505 = 1 credit; NURS 6502 = 3 credits; NURS 6408 = 2 credits

- **CSPH 5101** - Introduction to Integrative Healing Practices (3.0 cr)
- **NURS 5200** - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- **NURS 5222** - Advanced Human Physiology (2.0 cr)
- **NURS 5226** - Advanced Human Pathophysiology (2.0 cr)
- **NURS 5228** - Pharmacology for Advanced Practice Nursing (2.0 cr)
- **NURS 5229** - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- **NURS 6305** - Women's Reproductive Health Care (2.0 - 3.0 cr)
- **NURS 6307** - Assessment and Management of Health for APNs Practicum III (1.0 cr)
- **NURS 6407** - Advanced Nursing Care of Older Adults (3.0 cr)
- **NURS 6408** - Advanced Nursing Care of Older Adults Practicum (1.0 - 2.0 cr)
- **NURS 6501** - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
- **NURS 7406** - Advanced Nursing Practicum in Adult-Gerontology Health (2.0 cr)
- **NURS 7504** - Assessment and Management of Health for Advanced Practice Nurses, Practicum I (1.0 - 2.0 cr)
Women’s Healthcare Nurse Practitioner or (NP)
The DNP program with a specialty in women’s health prepares nurses for leadership as advanced practice nurses. This DNP program is for students who hold a baccalaureate degree in nursing, and involves both coursework and clinical practicum experience with an internship in the final semester.

Clinical experience is offered in primary care, women’s health, and specialty practice areas, such as oncology and reproductive endocrinology. Students ground their studies in the science of nursing intervention, moral/ethical issues, and nursing research. They then focus on courses that examine the basis of assessment and intervention for adolescent and adult populations with an emphasis on adolescent and adult women. Practicum experiences are arranged to meet the individual needs of students while also meeting accreditation and certification requirements. In addition to completing core studies in the specialty, students also gain skills in evidence-based practice, program evaluation, informatics, teaching/learning, health economics, health care policy, and epidemiology. A final project that is a systematic investigation of a practice problem is planned, implemented, and completed during the curriculum.

Required Specialty Coursework
Complete the following courses for at least 36 credits. Courses with Variable credit requirements for this specialty: NURS 5229 = 3 credits; NURS 6305 = 3 credits; NURS 6925 = 3 credits.

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- NURS 6213 - Reproductive Healthcare for Women at Risk (2.0 cr)
- NURS 6214 - Reproductive Healthcare for Women at Risk Practicum (2.0 cr)
- NURS 6305 - Women’s Reproductive Health Care (2.0 - 3.0 cr)
- NURS 6306 - Women’s Reproductive Health Practicum (1.0 cr)
- NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
- NURS 6925 - Advanced Concepts in Women’s Health Care I (1.0 - 3.0 cr)
- NURS 6926 - Advanced Concepts in Women's Health for WHNP Practicum I (1.0 cr)
- NURS 6927 - Advanced Concepts in Women's Health II (3.0 cr)
- NURS 6928 - Adv Concepts in Women's Health II WHNP Prac (1.0 cr)
- NURS 7310 - WHNP Clinical and Professional Integration (2.0 cr)

Nurse Anesthesia
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

The nurse anesthesia area of study prepares registered nurses to become Certified Registered Nurse Anesthetists (CRNAs) who are prepared for nurse anesthesia practice at the highest level. Graduates will possess expertise in general and regional anesthesia techniques and will be prepared to provide leadership in the practice setting. The nurse anesthesia area of study is fully accredited by the Council on Accreditation of Nurse Anesthesia Education Programs. In January of 2009, the University of Minnesota Nurse Anesthesia Area of Study received the maximum 10-year accreditation approval from the Council on Accreditation of Nurse Anesthesia Educational Programs. The program was the first nurse anesthesia program in the US to be accredited to offer the entry-level DNP.

With the Minneapolis VA Medical Center serving as the primary clinical site for the program, the University of Minnesota nurse anesthesia students rotate to several urban and rural clinical sites, which offer a broad spectrum of practice experiences. Some of the clinical sites are required, and some are optional. All required clinical sites are within daily driving distance of the campus.

Nurse anesthesia students complete the requirements for the DNP degree, as well as the requirements to take the National Certification Exam for nurse anesthetists.

Required Specialty Coursework
Complete the following courses for at least 59 credits.

- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5230 - Pharmacotherapeutics for Nurse Anesthesia (4.0 cr)
- NURS 6895 - Adult Acute Care Holistic Health Assessment (2.0 cr)
- NURS 6900 - Introduction to Principles of Anesthesia (6.0 cr)
- NURS 6901 - Basic Nurse Anesthesia Principles (3.0 cr)
- NURS 6902 - Nurse Anesthesia Care: Cardiothoracic Disease (2.0 cr)
- NURS 6903 - Nurse Anesthesia Care: Special Populations (2.0 cr)
- NURS 6910 - Introduction to Nurse Anesthesia Practicum I (1.0 cr)
Family Nurse Practitioner

The DNP program with a specialty in the family nurse practitioner (FNP) area of study prepares nurses for leadership as advanced practice nurses. The three-year DNP program is for students who already hold a baccalaureate degree in nursing, and involves both coursework and clinical practicums.

The FNP area of study offers leadership preparation for nurses desiring expertise in the scope of practice and in the role of the family nurse practitioner. Students ground their studies in the science of nursing intervention, moral/ethical issues, and nursing research. They then focus on courses that examine the basis of assessment and intervention for families and individuals of all ages. Practicum experiences are arranged to meet the individual needs of students while also meeting accreditation and certification requirements. In addition to completing core studies in the specialty, students also gain skills in evidence-based practice, program evaluation, informatics, teaching/learning, health economics, health care policy, and epidemiology. A final project that is a systematic investigation of a practice problem is planned, implemented, and completed during the curriculum.

Where applicable, completion of required FNP coursework and practice hours provides eligibility to sit for the FNP Certification through the American Nurses Credentialing Center.

Required Specialty Coursework

Completion of the courses for 39 credits is required for this specialty. Specialty Credit requirements for courses with variable credits:

- NURS 5229 = 4 credits; NURS 6305 = 3 credits; NURS 6502 = 3 credits; NURS 7504 = 1 credit; NURS 7505 = 1 credit
- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- NURS 6102 - Family Health Theory (2.0 cr)
- NURS 6305 - Women’s Reproductive Health Care (2.0 - 3.0 cr)
- NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
- NURS 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (2.0 - 3.0 cr)
- NURS 7501 - Health Care of Children for the Family Nurse Practitioner Practicum (1.0 cr)
- NURS 7503 - Reproductive Health Care of Women Practicum for Family Nurse Practitioners (1.0 cr)
- NURS 7504 - Assessment and Management of Health for Advanced Practice Nurses, Practicum I (1.0 - 2.0 cr)
- NURS 7505 - Assessment and Management of Health for Advanced Practice Nurses Practicum II (1.0 - 2.0 cr)
- NURS 7506 - Family Practice Practicum III: Assessment and Management of Health for the Family Nurse Practitioner (1.0 cr)
- NURS 7507 - Assessment Management of Health Practicum IV: Community Health Leadership for Family Nurse Prac (1.0 cr)
- NURS 7508 - Health Care of the Elderly for the Family Nurse Practitioner Practicum (1.0 cr)
- NURS 7509 - Assessment and Management of Health Practicum VI: Primary Care for the Family Nurse Practitioner (1.0 cr)
- NURS 7515 - Health Care of Children for the Family Nurse Practitioner: Well Child Care (1.0 cr)
- NURS 7516 - Health Care of Children for the Family Nurse Practitioner: Acute and Chronic Management (2.0 cr)
- NURS 7518 - Health Care of the Elder Patient for the Family Nurse Practitioner (1.0 cr)

Health Innovation and Leadership

Health care is delivered today in diverse settings, by an expanding workforce and with extraordinary opportunities for nurses to lead, whether through formal leadership positions or through personal advocacy, in traditional settings, or in emerging sites. This requires an individual who can think broadly and embrace a global perspective; who embraces diversity in all its forms, including diversity of thought; who is curious and never satisfied with the status quo; who stimulates new ways of thinking and solutions which open up possibilities for action; who bases action on informed practice gained from multiple ways of knowing; who engages in critical thinking, and learns from other thought leaders; who inspires and creates needed change within a particular environment; who can work effectively with a variety of individuals and within disparate groups; and who can create healing environments within which others can do their best work.

The DNP, with a focus on health innovation and leadership, prepares nurses to function effectively as leaders in traditional and contemporary settings. The goal is to prepare a leader who can work well in the current environment while promoting change and improvement. Students in the program utilize a combination of learning strategies, readings, reflections, and independent learning experiences. Seminars will enable students and faculty to discuss relevant issues and share expertise.
Students must complete the required specialty courses for 32 credits and at least 5 credits of electives to achieve 37 graduate level credits to complete the specialty. Credit requirements for this specialty for courses with variable credits: NURS 6704 = 1 credit; NURS 6706 = 2 credits; NURS 7605 = 2 credits. Students choose 5 credits of elective graduate level coursework in consultation with their faculty advisor.

**Required Coursework**
Completion of the following courses for at least 37 credits.

- **CSPH 5711** - Optimal Healing Environments (3.0 cr)
- **NURS 6600** - Health Systems and Care Models (3.0 cr)
- **NURS 6702** - Nursing Leadership Seminar: Introduction to Innovation and Leadership (3.0 cr)
- **NURS 6703** - Nursing Leadership Seminar: Organizational Culture and Leadership (2.0 cr)
- **NURS 6704** - Nursing Leadership Practicum: Organizational Culture and Leadership (1.0 - 2.0 cr)
- **NURS 6705** - Nursing Leadership Seminar: Quality and Change Management (2.0 cr)
- **NURS 6706** - Nursing Leadership Practicum: Quality and Change Management (1.0 - 2.0 cr)
- **NURS 6707** - Health Care Design and Innovation Practicum (2.0 cr)
- **NURS 7605** - Executive Leadership Practicum: Boundary Spanning Leadership (1.0 - 2.0 cr)
- **NURS 7606** - Executive Leadership Seminar: Boundary Spanning Leadership (2.0 cr)
- **NURS 7607** - Health Care Design and Innovation Practicum (2.0 cr)
- **NURS 7608** - Executive Leadership Seminar: Boundary Spanning Leadership (1.0 - 2.0 cr)
- **NURS 7609** - Relationship-Based Leadership and Management (3.0 cr)
- **NURS 7610** - Health Care Finance and Resource Management (3.0 cr)
- **HUMF 5874** - Service Design: Designing complex systems to improve service delivery (4.0 cr)

**Specialty Electives**
Choose 5 credits of elective coursework in collaboration with faculty advisor. Additional selections permitted with approval from the faculty advisor.

Take 5 or more credit(s) from the following:
- **CSPH 5118** - Whole Person, Whole Community: The Reciprocity of Wellbeing (3.0 cr)
- **NURS 5812** - Global Health Through Study Abroad (1.0 - 2.0 cr)
- **GCC 5010** - Grand Challenge: The Global Climate Challenge: Creating an Empowered Movement for Change [CIV] (3.0 cr)
- **CSPH 5805** - Wellbeing in the Workplace (3.0 cr)
- **CSPH 5806** - Wellbeing and Resiliency for Health Professionals (1.0 cr)
- **CSPH 5807** - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
- **CSPH 5115** - Cultural Awareness, Knowledge and Health (3.0 cr)
- **PUBH 6170** - Introduction to Occupational Health and Safety (3.0 cr)
- **PUBH 6100** - Topics: Environmental Health (1.0 - 4.0 cr)

**Nursing Informatics**
The nursing informatics (NI) specialty area prepares graduates with knowledge and skills necessary for leadership roles in health and nursing informatics to address the issues for consumers, clinical providers, and public health for processing and managing information through the use of various technologies. A wide array of courses throughout the University of Minnesota accompany nursing offerings, which offers students the opportunity to strengthen their disciplinary and interdisciplinary expertise.

With increasing demand for computerizing health information, graduates of the nursing informatics specialty are well positioned to assume leadership roles in nursing and health informatics field. The NI area of study provides knowledge and scholarship complemented by clinical experiences in the following areas:

- Systems analysis and design
- Knowledge representation and interoperability
- Clinical decision support and evidence-based practice
- Human factors and usability
- Leadership and health informatics
- Consumer, clinical provider, and population health informatics
- Health policy leadership
- Development and project management of health informatics projects
- Program evaluation
- Organization and administration of health services
- Ethical foundations of nursing
- Applied research

**Required Specialty Coursework**
Complete the following courses and at least 26 credits:

- **CSPH 5711** - Optimal Healing Environments (3.0 cr)
- **HINF 5510** - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
- **NURS 5116** - Consumer Health Informatics (1.0 cr)
- **NURS 5117** - Consumer Health Informatics Practicum (1.0 cr)
- **NURS 6105** - Systems Analysis and Design (3.0 cr)
Integrative Health and Healing

The integrative health and healing specialty area prepares graduates with skills necessary for working with individuals, families, communities and health systems in developing holistic approaches to health promotion, disease prevention, and chronic disease management, with a special emphasis on managing lifestyle changes and incorporating the use of complementary therapies. Graduates are prepared to work in diverse settings including hospitals, outpatient settings, health plans, corporate and community organizations, and in private practice. A wide array of courses are available which offer students the opportunity to strengthen their disciplinary and interdisciplinary expertise. Through a collaboration with the Center for Spirituality and Healing, students can opt to concurrently earn a graduate certificate in integrative therapies and healing practices, including a focus in health coaching.

The integrative health and healing area of study provides a foundation of knowledge and practical experiences in the following areas:

- Optimal healing environments
- Botanical medicine
- Clinical aromatherapy
- Mind/body healing
- Functional nutrition
- Energy healing
- Health coaching
- Self-care
- Advanced integrative health and healing skills and program planning
- Applied research

Students choosing to complete coursework part-time are well accommodated by the curriculum.

Completion of 40 graduate level credits is required for the specialty - 38 credits of required coursework and 2 credits of elective coursework.

Required Specialty Coursework

Complete the following courses for at least 38 credits.

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- CSPH 5226 - Advanced Meditation: Body, Brain, Mind, and Universe (1.0 cr)
- CSPH 5313 - Acupressure (1.0 cr)
- CSPH 5423 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
- CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
- CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
- CSPH 5535 - Reiki Healing (1.0 cr)
- CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
- CSPH 5561 - Healing Imagery I (2.0 cr)
- CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
- CSPH 5711 - Optimal Healing Environments (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 7209 - Integrative Health and Healing (1.0 cr)
- NURS 7210 - Integrative Health and Healing Practicum I (1.0 cr)
- NURS 7211 - Integrative Health and Healing II (1.0 cr)
- NURS 7212 - Integrative Health and Healing Practicum II (2.0 cr)
- NURS 7214 - Integrative Health and Healing III (1.0 cr)
- NURS 7215 - Integrative Health and Healing Practicum III (2.0 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)

or CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)

Specialty Electives

Additional course options may be available with faculty advisor approval.

Take 2 or more credit(s) from the following:

- CSPH 5000 - Explorations in Integrative Therapies and Healing Practices (1.0 - 4.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
Nurse Midwifery

This program combines academic preparation with clinical skills for the independent management of health care of women and newborns. Further, students receive additional academic preparation in health care policy, economics, evidence-based practice, evaluation and informatics, and complete a systems change project while in the program. DNP midwifery graduates will be prepared to more quickly fulfill leadership roles in the health care setting.

Courses are offered in a web-based format, with multi-day, on-campus seminars approximately two to three times per semester, in Minneapolis. By taking the courses in a web-based or online format, students may complete the midwifery program without having to relocate. Trips to campus to interact with faculty and other students allow for development of a professional learning community and enhance professional socialization. Midwifery clinical sites are used in or near a student's home community if available. Travel may be necessary depending on available midwifery practice locations. The online program is primarily geared to students in the five-state Upper Midwest region of Minnesota, Iowa, South Dakota, North Dakota, and Wisconsin. For more information about online learning, please visit Online Learning Opportunities.

Nurse-midwives assist women and families to promote and maintain health, and to facilitate optimal individual and family integrity in the context of culture and community.

Completion of the following courses and at least 38 credits is required. NURS 5505 is required for students without labor and delivery experience as a Registered Nurse. Specialty credit requirements for courses with variable credits: NURS 5229 = 3 credits; NURS 6305 = 3 credits; NURS 6925 = 2 credits; NURS 6308 = 2 credits

Required Specialty Coursework

Complete the following courses for at least 38 credits.

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
NURS 6210 - Midwifery Care of the Childbearing Family (3.0 cr)
NURS 6211 - Midwifery Care of the Childbearing Family Practicum (2.0 cr)
NURS 6213 - Reproductive Healthcare for Women at Risk (2.0 cr)
NURS 6214 - Reproductive Healthcare for Women at Risk Practicum (2.0 cr)
NURS 6305 - Women's Reproductive Health Care (2.0 - 3.0 cr)
NURS 6306 - Women's Reproductive Health Practicum (1.0 cr)
NURS 6308 - Women's Primary Care Practicum (1.0 - 2.0 cr)
NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
NURS 6925 - Advanced Concepts in Women's Health Care I (1.0 - 3.0 cr)
NURS 7213 - Midwifery Clinical and Professional Integration (3.0 cr)

Labor and Delivery Experience
Students are required to complete NURS 5505 if they do not have labor and delivery experience as Registered Nurse
NURS 5505 - Assessment and Support of Women in Labor (2.0 cr)

Pediatric Clinical Nurse Specialist
Students who pursue the pediatric clinical nurse specialist (PCNS) specialty area take core courses in nursing theory, moral/ethical issues, and research. They acquire skills in health assessment, intervention, and evaluation. They examine the care of children and families with special health care needs. They focus on planning and implementing programs to improve quality of care for children with chronic and complex illnesses. As the population of children with special health care needs continues to increase, there is likely to be a greater demand for clinical experts and leaders in pediatric nursing. The PCNS area of study is supported by the Center for Children with Special Health Care Needs.

PCNS coursework includes supervised clinical experiences. Efforts are made to provide students with clinical settings within their geographical area. Clinical courses are directed by certified faculty and supervised by clinical nurse specialist preceptors. The PCNS area of study can be completed in a two-year (full-time) or three-year (part-time) sequence.

PCNs work in collaboration with health care teams in a variety of settings to facilitate quality care for children across the continuum of care settings. They function as clinical experts in the planning, implementation, and evaluation of patient care standards. They provide direct care, oversee staff, patient and family education, participate in clinical research, and develop programs specific to the needs of children.

Required Specialty Coursework
Completion of the courses for 37 credits. Specialty credit requirements for courses with variable credits: NURS 5229 = 3 credits; NURS 6921 = 1 credit
CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
NURS 5222 - Advanced Human Physiology (2.0 cr)
NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
NURS 6102 - Family Health Theory (2.0 cr)
NURS 6405 - Advanced Practice CNS Roles Across the Lifespan (3.0 cr)
NURS 6406 - Advanced Practice CNS Roles Across the Lifespan: Practicum (1.0 cr)
NURS 6920 - Primary Care: Assessment of Health and Care of Well Children (3.0 cr)
NURS 6921 - Assessment of Health and Care of Well Children: Primary Care Practicum (1.0 - 2.0 cr)
NURS 6924 - Assessment and Interventions for Children and Youth With Special Health Care Needs (2.0 cr)
NURS 6929 - Advanced Nursing Care of Children with Acute Illness: Practicum for PCNS (2.0 cr)
NURS 7925 - Systems of Care for Children and Youth With Special Health Care Needs Practicum (2.0 cr)
NURS 7926 - Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs (2.0 cr)
NURS 7927 - Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Prac (1.0 cr)
OLPD 5356 - Disability Policy and Services (3.0 cr)

Primary Care Pediatric Nurse Practitioner
The pediatric nurse practitioner (PNP) area of study incorporates theory and clinical courses to prepare students to provide comprehensive care to children and their families. Most students elect to complete the children with special health care needs (CSPHN) leadership track by taking additional courses which are supported by the Center for Children with Special Health Care Needs.

Coursework includes nursing theory, moral/ethical issues, research, child assessment, management of childhood illnesses, and health policy. Courses are taught by faculty from the School of Nursing, School of Public Health, the Institute of Child Development, Family Social Science, the Medical School, and the Institute of Community Integration in the College of Education.

Supervised clinical experience is incorporated in the program. Efforts are made to meet students’ individual goals and to provide experiences in their geographic area. Clinical experiences are available in interdisciplinary settings such as primary care, home care, schools, specialty clinics, community agencies, the legislature, and the Minnesota Department of Health.

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Information current as of August 31, 2018
At the completion of the program, students are eligible to take the Pediatric Nurse Practitioner certification examinations offered by the American Nurses Credentialing Center or the National Certification Board of Pediatric Nurse Practitioners and Nurses. Students in the CSHCN track are eligible for certification from the Institute on Community Integration.

Required Specialty Coursework

Completion of the following courses for at least 37 credits is required. Specialty credit requirements for variable credit courses: NURS 5229 = 3 credits; NURS 6921 = 2 credits

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5225 - Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing (3.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- NURS 6102 - Family Health Theory (2.0 cr)
- NURS 6920 - Primary Care: Assessment of Health and Care of Well Children (3.0 cr)
- NURS 6921 - Assessment of Health and Care of Well Children: Primary Care Practicum (1.0 - 2.0 cr)
- NURS 6922 - Primary Care: Assessment and Management of Common Conditions Affecting Children (3.0 cr)
- NURS 6923 - Primary Care Practicum: Assessment and Management of Common Conditions Affecting Children (2.0 cr)
- NURS 6924 - Assessment and Interventions for Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 7925 - Systems of Care for Children and Youth With Special Health Care Needs Practicum (2.0 cr)
- NURS 7926 - Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 7927 - Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Prac (1.0 cr)
- OLDP 5356 - Disability Policy and Services (3.0 cr)

Psychiatric-Mental Health Nurse Practitioner

Graduate studies in psychiatric-mental health nursing prepare nurses to assume clinical nurse specialist roles with an emphasis on providing direct patient care to persons with major mental disorders and their families. Coursework focuses on the development of advanced practice nursing knowledge and skills required to provide both psychotherapeutic and biological interventions for the management of acute and chronic psychiatric symptoms with a variety of patients in diverse settings. Coursework integrates extant theories and research in the study of advanced health assessment, psychopathology assessment, psychopharmacology, and individual family and group therapy within various community and institutional systems.

Clinical emphasis is on secondary and tertiary psychiatric interventions and outcomes within a managed care context. Students are clinically precepted by certified psychiatric-mental health clinical nurse specialists. Clinical experiences are available in outpatient clinics, community mental health centers, hospitals, schools, and home care agencies. Full-time or part-time students may enroll in the area of study. Current psychiatric nursing experience is strongly encouraged.

Graduates will be academically prepared to take the American Nurses Credentialing Center (ANCC) certification examination for certified specialists in psychiatric-mental health nursing, after obtaining additional required post-master's clinical hours and supervision.

Completion of 39 credits is required for the specialty - 36 credits of required specialty coursework and 3 credits of complimentary alternative medicine elective coursework.

Required Specialty Coursework

Completion of the following courses for at least 36 credits. Specialty requirements for courses with variable credits: NURS 5229 = 2 credits

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5225 - Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing (3.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
- NURS 6102 - Family Health Theory (2.0 cr)
- NURS 6920 - Primary Care: Assessment of Health and Care of Well Children (3.0 cr)
- NURS 6921 - Assessment of Health and Care of Well Children: Primary Care Practicum (1.0 - 2.0 cr)
- NURS 6922 - Primary Care: Assessment and Management of Common Conditions Affecting Children (3.0 cr)
- NURS 6923 - Primary Care Practicum: Assessment and Management of Common Conditions Affecting Children (2.0 cr)
- NURS 6924 - Assessment and Interventions for Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 7925 - Systems of Care for Children and Youth With Special Health Care Needs Practicum (2.0 cr)
- NURS 7926 - Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 7927 - Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Prac (1.0 cr)
- OLDP 5356 - Disability Policy and Services (3.0 cr)

Complimentary Alternative Medicine Electives
Eelective coursework is required and chosen in consultation with faculty advisors. Additional options may be permitted with faculty advisor approval. Take 3 or more credit(s) from the following:

- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)
- CSPH 5111 - Ways of Thinking about Health (2.0 cr)
- CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
- CSPH 5311 - Introduction to Traditional Chinese Medicine (2.0 cr)
- CSPH 5315 - Traditional Tibetan Medicine: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5317 - Yoga: Ethics, Spirituality, and Healing (2.0 cr)
- CSPH 5313 - Acupressure (1.0 cr)
- CSPH 5331 - Foundations of Shamanism and Shamanic Healing (2.0 cr)
- CSPH 5401 - People, Plants, and Drugs: Introduction to Ethnopharmacology (3.0 cr)
- CSPH 5421 - Botanical Medicines in Integrative Healthcare (3.0 cr)
- CSPH 5431 - Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health (2.0 cr)
- CSPH 5503 - Aromatherapy Fundamentals (1.0 cr)
- CSPH 5523 - Applications in Therapeutic Horticulture (2.0 cr)
- CSPH 5535 - Reiki Healing (1.0 cr)
- CSPH 5536 - Advanced Reiki Healing: Level II (1.0 cr)
- CSPH 5555 - Introduction to Body and Movement-based Therapies (2.0 cr)
- CSPH 5631 - Healing Imagery I (2.0 cr)
- CSPH 5641 - Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3.0 cr)
- CSPH 5121 - Whole Systems Healing: Health and the Environment (2.0 cr)
- CSPH 5201 - Spirituality and Resilience (2.0 cr)
- CSPH 5318 - Tibetan Medicine, Ayurveda, and Yoga in India (4.0 cr)
- CSPH 5343 - Ayurveda Medicine: The Science of Self-healing (2.0 cr)
- CSPH 5341 - Overview of Indigenous Hawaiian Healing (2.0 cr)
- CSPH 5323 - Botanical Medicines: Foundations and Practical Applications (1.0 cr)
- CSPH 5642 - Nature Heals: An Introduction to Nature-Based Therapeutics (3.0 cr)
- CSPH 5708 - Mind-Body Science and the Art of Transformation (1.0 cr)
- CSPH 5805 - Wellbeing in the Workplace (3.0 cr)
- CSPH 5806 - Wellbeing and Resiliency for Health Professionals (1.0 cr)
- CSPH 5807 - Mindfulness in the Workplace: Pause, Practice, Perform (2.0 cr)
- CSPH 5905 - Food Matters: Cook Like Your Life Depends On It (1.0 cr)

Post-Master's D.N.P.

The post-master's option is for individuals who already hold a master's degree in a nursing practice specialty and who have nursing specialty preparation. The DNP program prepares nurses for leadership as advanced practice nurses, clinical experts, health care executives, policy experts, and informaticians.

Post-master's DNP students complete the core DNP requirements and any additional coursework needed to achieve the 1000 hour practicum requirement. Consult with the DNP program for more information.

Preceptor Supervisor Practicum Hours

Students completing the Post-Master's DNP must complete 1000 supervised hours of practicum. Upon admission, the total hours completed through the master's degree is documented and a gap analysis identifies whether additional practicum hours are needed. The number of credits of appropriate systems-level practicum coursework necessary to meet the 1000-hour requirement, if any, will be determined in consultation with the faculty advisor.

Practicum Course Options

Courses are chosen in consultation with the faculty advisor. Additional options are permitted with advisor approval. Take 0 or more credit(s) from the following:

- NURS 5117 - Consumer Health Informatics Practicum (1.0 cr)
- NURS 6704 - Nursing Leadership Practicum: Organizational Culture and Leadership (1.0 - 2.0 cr)
- NURS 6706 - Nursing Leadership Practicum: Quality and Change Management (1.0 - 2.0 cr)
- NURS 7106 - Knowledge Representation and Interoperability Practicum (2.0 cr)
- NURS 7109 - Population Health Informatics Practicum (2.0 cr)
- NURS 7401 - Health Policy Leadership Practicum (0.5 - 1.0 cr)
- NURS 7605 - Executive Leadership Practicum: Boundary Spanning Leadership (1.0 - 2.0 cr)
- NURS 7904 - Nursing Education Practicum (2.0 cr)
- NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
- NURS 5812 - Global Health Through Study Abroad (1.0 - 2.0 cr)
Twin Cities Campus
Leadership in Health Information Technology for Health Professionals
Postbaccalaureate Certificate
School of Nursing
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2018
• Length of program in credits: 16
• This program requires summer semesters for timely completion.
• Degree: Ldrshp in Hlth Info Tec for Hlth Pro PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

By combining formal clinical or public health advanced preparation with course work in health information technology (HIT), individuals who earn the postbaccalaureate certificate in leadership in health information technology for health professionals will be able to lead the successful deployment and use of HIT to achieve transformational improvement in the quality, safety, outcomes, and thus in the value of health services.

Program Delivery
This program is available:
• primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Admittance to the program requires a baccalaureate degree from an accredited institution in a clinical or public health discipline. Example degrees would be a BS/BA in nursing or public health.

Preferred: Advanced degree in clinical or public health discipline from an accredited institution (nursing MS/DNP/PhD; public health MPH/MS/PhD; MS/PhD in other health-related field)

Other requirements to be completed before admission: Applicants must have clinical or public health experience. A minimum of two years of management experience is required if the applicant does not hold an advanced degree.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 587
• MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

3.0 GPA required.

Required Coursework
Take the following courses to meet the 16-credit minimum:
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5116 - Consumer Health Informatics (1.0 cr)
NURS 6105 - Systems Analysis and Design (3.0 cr)
NURS 7105 - Knowledge Representation and Interoperability (2.0 cr)
NURS 7108 - Population Health Informatics (2.0 cr)
NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
Twin Cities Campus
Master of Nursing M.N.
School of Nursing

Link to a list of faculty for this program.

Contact Information:
Office of Student Career and Advancement Services, 5-160 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455
(612-625-7980; fax: 612-625-7727)
Email: sonstudentinfo@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 52
- This program requires summer semesters for timely completion.
- Degree: Master of Nursing

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of nursing degree (MN) is a full-time, 16-month, graduate-level program for students with a baccalaureate (or higher) degree in a non-nursing field. The program includes all the essentials of a bachelor of science in nursing (BSN) program, plus additional graduate work. Upon completion of the coursework, students are eligible to take the National Council Licensure Examination for Registered Nurses (NCLEX-RN) and are also eligible for Public Health Nursing (PHN) certification in Minnesota. Traditional classroom formats are complemented by interactive components and web-based resources.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Completion of a baccalaureate degree from an accredited institution in a non-nursing area of study completed no later than June 1 prior to start of fall semester for year admitted.

Other requirements to be completed before admission:
There are nine prerequisite courses to complete before the start of the master of nursing (MN) program: General Chemistry, Human Anatomy, Human Physiology, Microbiology, Pathology, Human Nutrition, Lifespan Growth and Development, Abnormal Psychology, Inferential Statistics.

Five courses must be complete, with final grades sent to the School of Nursing, by the application deadline. Students are recommended to make three of the five courses their science courses.

Special Application Requirements:
Prior to matriculation to the program, students must complete a Minnesota background check, immunizations, submit provider-level CPR verification, and meet the School of Nursing published technical standards. Application to the Master of Nursing program is available on the School of Nursing website. After a preliminary review of submitted materials, selected applicants are invited to participate in an interview with representatives of the admissions committee.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 52 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The capstone project is an examination of a clinical problem in the setting where students complete their final clinical rotation. It may also be a type of research experience or practicum with a School of Nursing faculty member.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students must maintain the compliance requirements (Minnesota background check, immunizations, provider-level CPR verification, and School of Nursing published technical standards) throughout the program.

Required Coursework

NURS 5029 - Introduction to Nursing Interventions (4.0 cr)
NURS 5030 - Foundational Concepts of Professional Nursing (3.0 cr)
NURS 5031 - Human Response to Health and Illness: Adults and Elders (4.0 cr)
NURS 5032 - Human Response to Health and Illness: Children and Childbearing Families (5.0 cr)
NURS 5033 - Population-Focused Health in Public Health and Mental Health Nursing (5.0 cr)
NURS 5034 - Transition to Professional Nursing Practice (3.0 cr)
NURS 5035 - Practicum Nursing Care for Complex Health Conditions (4.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5190 - Essentials of Holistic Health Assessment (3.0 cr)
NURS 5222 - Advanced Human Physiology (2.0 cr)
NURS 5241 - Nursing Leadership for Effective Practice (2.0 cr)
PHAR 5800 - Pharmacotherapy for the Health Professions (3.0 cr)
NURS 6200 - Science of Nursing Intervention (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 7600 - Nursing Research and Evidence Based Practice (2.0 - 4.0 cr)
NURS 5226 - Advanced Human Pathophysiology (2.0 cr)

Program Sub-plans

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

MN Bridge Program

This sub-plan is not currently accepting applicants.
Twin Cities Campus

Nurse Midwifery Postgraduate Certificate

School of Nursing

School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455
(612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 23 to 37
- This program requires summer semesters for timely completion.
- Degree: Nurse Midwifery Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nurse midwifery offers students with a doctor of nursing practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by American Midwifery Certification Board & Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where postsecondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space available basis until March 1.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
• MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Please contact the School of Nursing for detailed information about the requirements for this certificate. Each applicant's curriculum is unique and based on the applicant's previous DNP degree and coursework. Final coursework decisions are made by the faculty advisor. A 3.0 cumulative GPA is required.

Specialty Courses (23 Credits)
Complete the following required specialty courses for the certificate. Credit requirements for courses with variable credits: Take NURS 6305 for 3 credits; NURS 6308 for 2 credits; and NURS 6925 for 2 credits.

- NURS 6305 - Women's Reproductive Health Care (2.0 - 3.0 cr)
- NURS 6306 - Women's Reproductive Health Practicum (1.0 cr)
- NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
- NURS 6308 - Women's Primary Care Practicum (1.0 - 2.0 cr)
- NURS 6210 - Midwifery Care of the Childbearing Family (3.0 cr)
- NURS 6211 - Midwifery Care of the Childbearing Family Practicum (2.0 cr)
- NURS 6213 - Reproductive Healthcare for Women at Risk (2.0 cr)
- NURS 6214 - Reproductive Healthcare for Women at Risk Practicum (2.0 cr)
- NURS 7213 - Midwifery Clinical and Professional Integration (3.0 cr)
- NURS 6925 - Advanced Concepts in Women's Health Care I (1.0 - 3.0 cr)

Advanced Practice Registered Nurse Core Courses (0 to 12 Credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 3 credits.

- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)

Labor and Delivery Competencies (2 Credits)
Students are required to complete NURS 5505 if they do not have labor and delivery experience as a registered nurse.

- NURS 5505 - Assessment and Support of Women in Labor (2.0 cr)
Twin Cities Campus
Nursing Ph.D.
School of Nursing
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 58 to 70
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The PhD program in nursing prepares scholars as scientists, leaders, innovators, and educators in nursing and health care who:
- Discover new knowledge for nursing science and health care practice through ethical, innovative, theory-based research;
- Integrate knowledge to influence health care delivery and policy through collaborative, interprofessional initiatives at organizational, local, state, regional, national, and global levels;
- Create and evaluate strategies to improve the health and well-being of individuals, families, communities, and populations; and
- Disseminate knowledge to those in nursing, other health sciences, policy makers, and the public through scholarly publication, formal teaching, and other creative venues.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 156
  - General Test - Quantitative Reasoning: 146
  - General Test - Analytical Writing: 5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
- MELAB
  - Final score: 85

Key to test abbreviations (GRE, TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

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Information current as of August 31, 2018
34 to 46 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Core Coursework (26 credits)
All students take the following courses. Take NURS 8171 for 3 credits.
NURS 8180 - Doctoral Proseminar I: Scholarly Development (1.0 cr)
NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
NURS 8172 - Theory and Theory Development for Research (3.0 cr)
NURS 8152 - Scholarship in Health Care Ethics (3.0 cr)
NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)
NURS 8177 - Advanced Nursing Research Practicum (2.0 cr)
NURS 8190 - Critical Review in Health Research (2.0 cr)
NURS 8121 - Health Behaviors and Illness Responses (3.0 cr)
NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
NURS 8134 - Interventions and Outcomes Research (3.0 cr)

Statistics (6 credits)
Select at least 6 statistics credits from the courses listed below, in consultation with the faculty advisor.
Biostatistics
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
or EPSY 8251 - Statistical Methods in Education I (3.0 cr)
EPSY 8252 - Statistical Methods in Education II (3.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
NURS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Post-Master's- and Post-Baccalaureate-Entry Electives
The number of required elective credits is determined by the highest degree awarded prior to Nursing PhD enrollment. Note that the Master of Nursing degree does not qualify for Post-Master's-Entry status.

Post-Master's-Entry Electives (2 credits)
Take two or more credits from the following list, or select alternative courses, in consultation with the faculty advisor:
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5925 - Grant Writing and Critique (1.0 cr)
NURS 7600 - Nursing Research and Evidence Based Practice (2.0 - 4.0 cr)
NURS 6102 - Family Health Theory (2.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7300 - Program Planning and Evaluation (3.0 cr)
NURS 7900 - Scholarly Teaching and Learning in Nursing (3.0 cr)
NURS 7904 - Nursing Education Practicum (2.0 cr)
NURS 8195 - Mixed Methods in the Social, Behavioral, and Applied Health Sciences (3.0 cr)
NURS 8185 - Qualitative Data Analysis for Health Care Research (3.0 - 4.0 cr)
NURS 8179 - Biophysiological Measurement and Instrumentation in Clinical Research (3.0 cr)
NURS 8193 - Special Topics in Nursing Research (1.0 - 6.0 cr)
HINF 5430 - Foundations of Health Informatics I (3.0 cr)
HINF 5431 - Foundations of Health Informatics II (3.0 cr)
FSOS 8105 - Family Gerontology (3.0 cr)
GERO 5100 - Topics in Gerontology (0.5 - 4.0 cr)
GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
GERO 5125 - Gerontology Service Learning (3.0 cr)
GERO 8021 - Application of Proteomics to Aging (1.0 cr)
GERO 8022 - Fostering a Career in Aging Research (1.0 cr)
GERO 8023 - Aging Policy Seminar (2.0 cr)
PUBH 6904 - Nutrition and Aging (2.0 cr)
PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
SW 5810 - Seminar: Special Topics (1.0 - 4.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
PUBH 6810 - Survey Research Methods (3.0 cr)
PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
PUBH 7251 - Data Analysis From Focus Groups (1.0 cr)
EPSY 5245 - Advanced Survey Data Analysis for Categorical and Rating Scale Data (1.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8265 - Factor Analysis (3.0 cr)
EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)

-OR-
Post-Baccalaureate-Entry Electives (14 credits)
Take 14 or more credits from the following list, or select alternative courses, in consultation with the faculty advisor:
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5925 - Grant Writing and Critique (1.0 cr)
NURS 7600 - Nursing Research and Evidence Based Practice (2.0 - 4.0 cr)
NURS 6102 - Family Health Theory (2.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7300 - Program Planning and Evaluation (3.0 cr)
NURS 7900 - Scholarly Teaching and Learning in Nursing (3.0 cr)
NURS 7904 - Nursing Education Practicum (2.0 cr)
NURS 8195 - Mixed Methods in the Social, Behavioral, and Applied Health Sciences (3.0 cr)
NURS 8185 - Qualitative Data Analysis for Health Care Research (3.0 - 4.0 cr)
NURS 8179 - Biophysiological Measurement and Instrumentation in Clinical Research (3.0 cr)
NURS 8193 - Special Topics in Nursing Research (1.0 - 6.0 cr)
HINF 5430 - Foundations of Health Informatics I (3.0 cr)
HINF 5431 - Foundations of Health Informatics II (3.0 cr)
FSOS 8105 - Family Gerontology (3.0 cr)
GERO 5100 - Topics in Gerontology (0.5 - 4.0 cr)
GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
GERO 5125 - Gerontology Service Learning (3.0 cr)
GERO 8021 - Application of Proteomics to Aging (1.0 cr)
GERO 8022 - Fostering a Career in Aging Research (1.0 cr)
GERO 8023 - Aging Policy Seminar (2.0 cr)
PUBH 6904 - Nutrition and Aging (2.0 cr)
PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
SW 5810 - Seminar: Special Topics (1.0 - 4.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
PUBH 6810 - Survey Research Methods (3.0 cr)
PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
PUBH 7251 - Data Analysis From Focus Groups (1.0 cr)
EPSY 5245 - Advanced Survey Data Analysis for Categorical and Rating Scale Data (1.0 cr)
EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
EPSY 8265 - Factor Analysis (3.0 cr)
EPSY 8266 - Statistical Analysis Using Structural Equation Methods (3.0 cr)
EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
Twin Cities Campus

Pediatric Clinical Nurse Specialist Postgraduate Certificate

School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 19 to 31
- This program requires summer semesters for timely completion.
- Degree: Pediatric Clinical Nurse Specialist Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a doctor of nursing practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space available basis until March 1.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Please contact the School of Nursing for detailed information about the requirements for this certificate. Each applicant's curriculum is unique and based on the applicant's previous DNP degree and coursework; final coursework decisions are made by the faculty advisor.

A 3.0 cumulative GPA is required.

Specialty Courses (19 Credits)
Complete the following courses for a total of 19 credits. Take NURS 6921 for 1 credit.

- NURS 6102 - Family Health Theory (2.0 cr)
- NURS 6405 - Advanced Practice CNS Roles Across the Lifespan (3.0 cr)
- NURS 6406 - Advanced Practice CNS Roles Across the Lifespan: Practicum (1.0 cr)
- NURS 6920 - Primary Care: Assessment of Health and Care of Well Children (3.0 cr)
- NURS 6921 - Assessment of Health and Care of Well Children: Primary Care Practicum (1.0 - 2.0 cr)
- NURS 6924 - Assessment and Interventions for Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 6929 - Advanced Nursing Care of Children with Acute Illness; Practicum for PCNS (2.0 cr)
- NURS 7925 - Systems of Care for Children and Youth With Special Health Care Needs Practicum (2.0 cr)
- NURS 7926 - Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs (2.0 cr)
- NURS 7927 - Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Prac (1.0 cr)

Advanced Practice Registered Nurse Core Courses (0 to 12 Credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 3 credits.

- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
Twin Cities Campus
Pediatric Primary Care Nurse Practitioner Postgraduate Certificate
School of Nursing
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455
(612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 17 to 29
- This program requires summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a Doctor of Nursing Practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable).

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Coursework (17 credits)
Take the following courses. Nurs 6921 must be completed for 2 credits.
   NURS 6920 - Primary Care: Assessment of Health and Care of Well Children (3.0 cr)
   NURS 6921 - Assessment of Health and Care of Well Children: Primary Care Practicum (1.0 - 2.0 cr)
   NURS 6922 - Primary Care: Assessment and Management of Common Conditions Affecting Children (3.0 cr)
   NURS 6923 - Primary Care Practicum: Assessment and Management of Common Conditions Affecting Children (2.0 cr)
   NURS 6924 - Assessment and Interventions for Children and Youth With Special Health Care Needs (2.0 cr)
   NURS 7925 - Systems of Care for Children and Youth With Special Health Care Needs Practicum (2.0 cr)
   NURS 7926 - Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs (2.0 cr)
   NURS 7927 - Adv Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Prac (1.0 cr)

Advanced Practice Registered Nurse Core Courses (0 to 12 credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 3 credits.
   NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
   NURS 5222 - Advanced Human Physiology (2.0 cr)
   NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
   NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
   NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
Twin Cities Campus
Psychiatric Mental Health Nurse Practitioner Postgraduate Certificate
School of Nursing
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455
(612-625-7980; fax: 612-625-7727)
Email: nursecert@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 20 to 31
- This program requires summer semesters for timely completion.
- Degree: Psych Mental Hlth Nurse Practitioner Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a doctor of nursing practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space available basis until March 1.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
• MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Contact the School of Nursing for detailed information about the requirements for this certificate. Each student's course of study will be unique, based on their previous DNP degree and coursework, and will require approval of the faculty advisor. A 3.0 cumulative GPA is required.

Coursework (20 credits)
Select courses from the following list, or select alternative courses, in consultation with the advisor.
- **NURS 6604** - Foundations for Integrative Mental Health and Psychiatric Advanced Practice Nursing (2.0 cr)
- **NURS 6605** - Psychiatric/Mental Health Advanced Nursing Practice Practicum I (1.0 cr)
- **NURS 6504** - Assessing, Managing Psychiatric Disorders in Adv Practice Psychiatric-Mental Health Nursing (2.0 cr)
- **NURS 5225** - Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing (3.0 cr)
- **NURS 6505** - PMH/APN Prac II: Assessing, Managing Psychiatric Disorders in Adv Prac Psychiatric-Mental Health Nurs (2.0 cr)
- **NURS 6602** - PMH Advanced Practice Nursing: Group as a Health Care Intervention (2.0 cr)
- **NURS 6603** - PMH APN Practicum IV: Group as a Health Care Intervention (2.0 cr)
- **NURS 7612** - Psychiatric/Mental Health Advanced Practice Nursing: Professional Seminar (1.0 cr)
- **NURS 7613** - Psychiatric/Mental Health Advanced Practice Nursing: Practicum V (2.0 cr)
- **NURS 6802** - Psychiatric/Mental Health Advance Practice Nursing: Psychotherapy with Individuals and Families (2.0 cr)
- **NURS 6803** - Psychiatric/Mental Health Adv Prac Nurs Practicum III: Psychotherapy With Individuals,Families (1.0 cr)

Advanced Practice Registered Nurse Core Courses (0 to 11 credits)
Completion of the following coursework is required for the post-graduate certificate program. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be taken for 2 credits.
- **NURS 5200** - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- **NURS 5222** - Advanced Human Physiology (2.0 cr)
- **NURS 5226** - Advanced Human Pathophysiology (2.0 cr)
- **NURS 5228** - Pharmacology for Advanced Practice Nursing (2.0 cr)
- **NURS 5229** - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
Women's Health Care Nurse Practitioner Postgraduate Certificate
School of Nursing

Link to a list of faculty for this program.

Contact Information:
School of Nursing, 5-160 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455 (612-625-7980; fax: 612-625-7727)
Email: nursecerts@umn.edu
Website: http://www.nursing.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 21 to 33
- This program requires summer semesters for timely completion.
- Degree: Ad Hlth/Wmn Hlth Care Nrs Pract Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postgraduate certificate program in nursing offers students with a Doctor of Nursing Practice (DNP) or other graduate degree in a clinical nursing specialty area the opportunity to complete an additional area of study. Completion of required coursework and practice hours provides eligibility to take certification examinations.

Accreditation
This program is accredited by Commission on Collegiate Nursing Education (CCNE).

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A DNP or other accredited graduate degree in a clinical nursing specialty area is required for admission to this program.

Other requirements to be completed before admission:
All applicants must have a current registered nurse license.

Special Application Requirements:
Applicants are required to submit transcripts from all institutions where post-secondary credit was earned, reference materials containing an Admission Reference Form and personal letter of reference from two separate individuals, two essays, a current curriculum vitae/resume, a current registered nurse license, and English language proficiency scores (if applicable). Application deadlines for this certificate are a priority deadline of November 1, with rolling admissions on a space available basis until March 1.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Paper Based - Total Score: 586
- MELAB
  - Final score: 85

The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (TOEFL, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

3.0 cumulative GPA is required.

Specialty Courses (21 Credits)

Complete the following required specialty courses for the certificate. NURS 6305 and NURS 6925 each must be taken for 3 credits.

- NURS 6305 - Women's Reproductive Health Care (2.0 - 3.0 cr)
- NURS 6306 - Women's Reproductive Health Practicum (1.0 cr)
- NURS 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
- NURS 6925 - Advanced Concepts in Women's Health Care I (1.0 - 3.0 cr)
- NURS 6926 - Advanced Concepts in Women's Health for WHNP Practicum I (1.0 cr)
- NURS 6927 - Advanced Concepts in Women's Health II (3.0 cr)
- NURS 6928 - Adv Concepts in Women's Health II WHNP Prac (1.0 cr)
- NURS 6929 - WHNP Clinical and Professional Integration (2.0 cr)

Advanced Practice Registered Nurse Core Courses (0 to 12 Credits)

Completion of the following coursework is required for the certificate. Students who have not completed these courses or their equivalents prior to admission must do so to meet requirements. Consult with the Doctor of Nursing Practice Program Director to evaluate prior APRN coursework for equivalency. NURS 5229 must be take for 3 credits.

- NURS 5200 - Advanced Holistic Health Assessment for the Advanced Practice Nurse (3.0 cr)
- NURS 5222 - Advanced Human Physiology (2.0 cr)
- NURS 5226 - Advanced Human Pathophysiology (2.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 4.0 cr)
Experimental and Clinical Pharmacology M.S.
Twin Cities Campus
College of Pharmacy

Contact Information:
Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, 7-153 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-626-8419)
Email: dicki002@umn.edu
Website: http://www.pharmacy.umn.edu/ecp/grad/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Experimental and Clinical Pharmacology (ECP) graduate program was designed specifically for students interested in clinical research. Its goal is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients.

Students study such topics as experimental pharmacotherapy, drug metabolism, infectious disease, pharmacometrics, and pharmacogenomics. Graduates are prepared for distinguished careers in clinical research.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A U.S. bachelor's degree or a comparable foreign degree from a recognized college or university is required.

Preference is given to candidates who have had professionally-related pharmacy education, but those from other fields such as biology, chemistry, statistics, and public health will be considered.

Other requirements to be completed before admission:
GRE scores are required from non-U.S. Pharm.D. applicants. Foreign students may be required to have a phone interview. All international students who are non-English speakers are required to submit TOEFL scores. However, applicants who have completed 24 quarter credits or 16 semester credits within the past 24 months in residence as full-time students at recognized institutions of higher learning in the United States or other English-speaking countries before entering the University of Minnesota are generally exempted from this requirement.

Special Application Requirements:
Students are generally admitted to the ECP program for fall semester only. The application deadline is February 1. Applications received after February 1 will be considered on a space-available basis only.

Application to the ECP program at the University of Minnesota is done entirely online through ApplyYourself. A supplemental departmental application form is also required. Applicants should upload it directly to the ApplyYourself system.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of August 31, 2018
The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 6 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.
Experimental and Clinical Pharmacology Minor
Experimental and Clinical Pharmacology
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, 7-153 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-626-8419)
Email: dicki002@umn.edu
Website: http://www.pharmacy.umn.edu/ecp/grad/home.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Experimental and Clinical Pharmacology (ECP) graduate program was designed specifically for students interested in clinical research. Its goal is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients.

Students study such topics as experimental pharmacotherapy, drug metabolism, infectious disease, pharmacometrics, and pharmacogenomics. Graduates are prepared for distinguished careers in clinical research.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Paper Based - Total Score: 550

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
Twin Cities Campus
Experimental and Clinical Pharmacology Ph.D.
Experimental and Clinical Pharmacology
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, 7-153 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-626-8419)
Email: dicki002@umn.edu
Website: http://www.pharmacy.umn.edu/ecp/grad/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 72
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Experimental and Clinical Pharmacology (ECP) graduate program was designed specifically for students interested in clinical research. Its goal is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients.

Students study such topics as experimental pharmacotherapy, drug metabolism, infectious disease, pharmacometrics, and pharmacogenomics. Graduates are prepared for distinguished careers in clinical research.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A U.S. bachelor's degree or a comparable foreign degree from a recognized college or university is required.

Preference is given to candidates who have had a professionally-related pharmacy education, but those from other fields such as biology, chemistry, statistics, and public health will be considered.

Other requirements to be completed before admission:
All international students who are non-English speakers are required to submit TOEFL scores. However, applicants who have completed 24 quarter credits or 16 semester credits within the past 24 months in residence as full-time students at recognized institutions of higher learning in the United States or other English-speaking countries before entering the University of Minnesota are generally exempted from this requirement. ETS will download your TOEFL score directly into ApplyYourself. Non U.S.-Pharm.D. applicants are required to submit GRE scores. Foreign students may be required to have a phone interview.

Special Application Requirements:
Application to the ECP program at the University of Minnesota is done entirely online through ApplyYourself. A supplemental departmental application form is also required. Applicants should upload it to the ApplyYourself system.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

The preferred English language test is Test of English as Foreign Language.
Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

36 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must pass one written preliminary examination and one preliminary oral examination before writing the dissertation.

The final oral examination for the Ph.D. is a defense of the thesis.
Twin Cities Campus
Medicinal Chemistry M.S.
Graduate Studies in Medicinal Chemistry
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Medicinal Chemistry, 8-101 Weaver-Densford Hall, 308 Harvard Street SE, Minneapolis, MN 55455 (612-624-9919; fax: 612-626-3114)
Email: medchem@umn.edu
Website: http://z.umn.edu/medchemgrad

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are not admitted directly to the MS program. See the Medicinal Chemistry PhD or contact the director of graduate studies for more information.

The medicinal chemistry program emphasizes the application of chemical principles to research on the action of drugs on biological systems. Courses offered by the program focus on general principles of medicinal chemistry, drug design and synthesis, chemical aspects of drug metabolism, chemical mechanisms of drug toxicity and carcinogenicity, computer-assisted drug design and receptor modeling, and combinatorial chemistry.

Students must complete a core curriculum of advanced courses in organic and medicinal chemistry, as well as credits in a minor or related field.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Note: Students are not admitted directly to the M.S. program. See the Medicinal Chemistry Ph.D.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students complete a 14-credit core curriculum of advanced courses in organic chemistry and medicinal chemistry. In addition, students take 6 credits of coursework, chosen in consultation with the advisor, which supports the course of study.
Required Courses
MEDC 8001 - General Principles of Medicinal Chemistry (3.0 cr)
MEDC 8002 - General Principles of Medicinal Chemistry (3.0 cr)
MEDC 8050 - Physical and Mechanistic Organic Chemistry (2.0 cr)
MEDC 8100 - Medicinal Chemistry Seminar (1.0 cr)
MEDC 8435 - BioAssay & Data Analysis (1.0 cr)
CHEM 8321 - Organic Synthesis (4.0 cr)

Additional Courses
Take at least 1 course from the following list. Choose remaining coursework to meet the 6-credit minimum in consultation with the advisor.
MEDC 5185 - Principles of Biomolecular Simulation (3.0 cr)
MEDC 5494 - Advanced Methods in Quantitative Drug Analysis (2.0 cr)
MEDC 8500 - Design of Chemotherapeutic Agents (2.0 cr)
MEDC 8753 - MOLECULAR TARGETS OF DRUG DISCOVERY (3.0 cr)
MEDC 8420 - Natural Products Chemistry (3.0 cr)
MEDC 8471 - High Throughput Drug Discovery (3.0 cr)
MEDC 8413 - Chemistry of Nucleic Acids (4.0 cr)
MEDC 8700 - Advanced Concepts in Drug Design (2.0 cr)

Thesis Credits
Take at least 10 masters thesis credits.
MEDC 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus
Medicinal Chemistry Ph.D.
Graduate Studies in Medicinal Chemistry
College of Pharmacy

Contact Information:
Department of Medicinal Chemistry, 8-101 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-9919; fax: 612-626-3114)
Email: medchem@umn.edu
Website: http://z.umn.edu/medchemgrad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program in medicinal chemistry emphasizes the application of chemical principles to research on the action of drugs on biological systems. Courses offered by the program focus on general principles of medicinal chemistry, drug design and synthesis, chemical aspects of drug metabolism, chemical mechanisms of drug toxicity and carcinogenicity, computer-assisted drug design and receptor modeling, and combinatorial chemistry.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants should have a BS or MS degree in an appropriate related science field such as pharmacy, chemistry, or biology. Students majoring in other degree programs that encompass chemical, biochemical, or biological fields of study are also encouraged to apply. All applicants should have completed undergraduate chemistry through elementary organic chemistry. Undergraduate coursework in biochemistry and physical chemistry is also a prerequisite, but under certain circumstances such coursework may be taken during the first year. Students may apply for admission to the PhD program only and are only admitted fall semester.

Special Application Requirements:
Scores from the General (Aptitude) Test of the GRE, three letters of recommendation from college-level faculty, a complete set of official transcripts, and a statement of immediate and long range career objectives are required. All application materials should be submitted by the admissions deadline listed on the departmental website in order to be considered for fellowship, teaching, and research assistantships awarded in the next academic year.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Required Courses (15 credits)
- MEDC 8001 - General Principles of Medicinal Chemistry (3.0 cr)
- MEDC 8002 - General Principles of Medicinal Chemistry (3.0 cr)
- MEDC 8050 - Physical and Mechanistic Organic Chemistry (2.0 cr)
- MEDC 8435 - BioAssay & Data Analysis (1.0 cr)
- MEDC 8100 - Medicinal Chemistry Seminar (1.0 cr)
- CHEM 8066 - Professional Conduct of Chemical Research (1.0 cr)
- CHEM 8321 - Organic Synthesis (4.0 cr)

Biochemistry Requirement (2 to 4 credits)
Take at least one of the following courses or select a different course in consultation with the advisor and director of graduate studies.
- BIOC 8005 - Biochemistry: Structure and Catalysis (2.0 cr)
- BIOC 8006 - Biochemistry: Metabolism and Control (2.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- CHEM 8411 - Introduction to Chemical Biology (4.0 cr)

Additional Course Requirements
Take three additional courses, two of which must be from the following list, to complete the 24 course-credit requirement.
- MEDC 5185 - Principles of Biomolecular Simulation (3.0 cr)
- MEDC 5494 - Advanced Methods in Quantitative Drug Analysis (2.0 cr)
- MEDC 8070 - The Chemistry and Biology of Infectious Diseases (3.0 cr)
- MEDC 8420 - Natural Products Chemistry (3.0 cr)
- MEDC 8471 - High Throughput Drug Discovery (3.0 cr)
- MEDC 8413 - Chemistry of Nucleic Acids (4.0 cr)
- MEDC 8461 - Design of Cancer Therapeutics (3.0 cr)
- MEDC 8753 - MOLECULAR TARGETS OF DRUG DISCOVERY (3.0 cr)
- CHEM 8322 - Advanced Organic Chemistry (4.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
- MEDC 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Pharmaceutics M.S.
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Pharmaceutics
Room 9-177 Weaver-Densford Hall
308 Harvard Street SE
Minneapolis, MN 55455
USA
Phone: 612-624-5151
Fax: 612-626-2125
Email: pceuts@umn.edu
Website: http://www.pharmacy.umn.edu/pharmaceutics

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Entry to the MS program is available on a restricted basis. Please contact the director of graduate studies to obtain details about admission.

The Pharmaceutics program offers emphases in physical pharmacy, biopharmaceutics, and pharmacokinetics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

Other requirements to be completed before admission:
Undergraduate (and graduate, if applicable) scholastic records, recent GRE scores (with a preferred minimum 80% quantitative reasoning score and 3.5 analytical writing score), a statement of career goals and research interests, and three letters of recommendation.

International applicants must submit results from the TOEFL (with a preferred minimum 100 total score and 23 speaking score, and a required minimum 21 writing score and 19 reading score) or IELTS (with a required minimum 6.5 total score, 6.5 reading score, and 6.5 writing score). Prefer "First Class" or the equivalent on transcripts from foreign institutions.

All of the above are collectively used to determine each candidate's admissibility. Fall admission is preferred and the deadline to apply is November 30.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Required Courses**

**Pharmaceutics Modules**
- Register for 2 credits of PHM 8295 in the fall and spring for a total of 4 credits.
- PHM 8295 - Research Problems in Pharmaceutics (1.0 - 12.0 cr)

**Pharmaceutics Graduate Courses: 84xx**
- Choose 1 of the following courses:
  - PHM 8421 - Advanced Pharmacokinetics (4.0 cr)
  - PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
  - PHM 8441 - Solubility and Solid-State Properties of Drugs (3.0 cr)
  - PHM 8481 - Advanced Neuropharmaceutics (4.0 cr)

**Required Background**
- Complete this requirement by taking one of the following courses. If PHAR 6726 or 6762 is chosen, or if the faculty accepts previous experience in lieu of background courses, additional elective coursework may be required to meet minimum credit requirements.
  - PHCL 5110 - Introduction to Pharmacology (3.0 cr)
  - PHAR 6726 - Principles of Pharmacology (2.3 cr)
  - PHAR 6762 - Medicinal Chemistry and Neuropharmacology (2.8 cr)

**Electives**
- Take at least 3 elective credits, in consultation with the advisor, to meet minimum credit requirements. Electives can be from inside or outside the major.

**Outside Courses**
- Take at least 6 credits outside the major, in consultation with the advisor.

**Thesis Credits**
- A total of 10 thesis credits is required.
- PHM 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Twin Cities Campus
Pharmaceutics Minor
Graduate Studies in Pharmaceutics
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Pharmaceutics
Room 9-177 Weaver-Densford Hall
308 Harvard Street SE
Minneapolis, MN 55455
USA
Phone: 612-624-5151
Fax: 612-626-2125
Email: pceuts@umn.edu
Website: http://www.pharmacy.umn.edu/pharmaceutics

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The pharmaceutics program offers emphases in physical pharmacy, biopharmaceutics, and pharmacokinetics.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Doctoral
The doctoral minor requires a minimum of 12 credits in PHM 8xxx or PHAR 6xxx courses, approved by the pharmaceutics director of graduate studies.

Masters
The master's minor requires a minimum of 6 credits in PHM 8xxx or PHAR 6xxx courses, approved by the pharmaceutics director of graduate studies.
Twin Cities Campus
Pharmaceutics Ph.D.
Graduate Studies in Pharmaceutics
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
Department of Pharmaceutics
Room 9-177 Weaver-Densford Hall
308 Harvard Street SE
Minneapolis, MN 55455
USA
Phone: 612-624-5151
Fax: 612-626-2125
Email: pceuts@umn.edu
Website: http://www.pharmacy.umn.edu/pharmaceutics

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The pharmaceutics program offers emphases in physical pharmacy, biopharmaceutics, and pharmacokinetics. Minor fields of particular value include biochemistry, biomedical engineering, biometry, chemistry, chemical engineering, mechanical engineering, molecular biology, pharmacology, and statistics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

Other requirements to be completed before admission:
Undergraduate (and graduate, if applicable) scholastic records, recent GRE scores (with a preferred minimum 80% quantitative reasoning score and 3.5 analytical writing score), a statement of career goals and research interests, and three letters of recommendation.

International applicants must submit results from the TOEFL (with a preferred minimum 100 total score and 23 speaking score, and a required minimum 21 writing score and 19 reading score) or IELTS (with a required minimum 6.5 total score, 6.5 reading score, and 6.5 writing score). Prefer “First Class” or the equivalent on transcripts from foreign institutions.

All of the above are collectively used to determine each candidate's admissibility. Fall admission is preferred and the deadline to apply is November 30.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
16 credits are required in the major.
8 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Successful completion of program examinations and timely progress towards the degree are also required for students to remain in good standing.

Required Courses

Pharmaceutics Modules
Register for 2 credits in fall and 2 credits in spring for a total of 4 credits.
PHM 8295 - Research Problems in Pharmaceutics (1.0 - 12.0 cr)

Pharmaceutics Seminar
Register for 1 credit each semester in which presenting a seminar, for a total of 3 credits.
PHM 8100 - Seminar: Pharmaceutics (1.0 cr)

Pharmaceutics Graduate Courses: 81xx
Take two courses for a total of 2 credits from the following list:
PHM 8110 - Readings in Pharmaceutics (1.0 cr)
or
PHM 8120 - Readings in Central Nervous System (CNS) Drug Delivery (1.0 cr)
or
PHM 8150 - Pharmacokinetics Research Seminar (1.0 cr)

Pharmaceutics Graduate Courses: 84xx
Choose two courses from the following list for at least 7 credits:
PHM 8421 - Advanced Pharmacokinetics (4.0 cr)
or
PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
or
PHM 8441 - Solubility and Solid-State Properties of Drugs (3.0 cr)
or
PHM 8481 - Advanced Neuropharmaceutics (4.0 cr)

Required Background
Equivalent coursework or previous experience, with approval of the program faculty, may be substituted for some or all of the following courses:

Pharmacy Background
PHCL 5110 - Introduction to Pharmacology (3.0 cr)
or
PHAR 6726 - Principles of Pharmacology (2.3 cr)
or
PHAR 6762 - Medicinal Chemistry and Neuropharmacology (2.8 cr)

Math Background
MATH 4512 - Differential Equations with Applications (3.0 cr)

Statistics Background
PUBH 6450 - Biostatistics I (4.0 cr)
or
STAT 5021 - Statistical Analysis (4.0 cr)
or
Take exactly 2 course(s) from the following:
• STAT 5101 - Theory of Statistics I (4.0 cr)
or
• STAT 5102 - Theory of Statistics II (4.0 cr)
or
Take exactly 3 course(s) from the following:
• STAT 5302 - Applied Regression Analysis (4.0 cr)
or
• STAT 5303 - Designing Experiments (4.0 cr)
or
• STAT 5401 - Applied Multivariate Methods (3.0 cr)

Outside Coursework Requirement
Take at least 8 credits of coursework outside the major, which can include non-PHAR- and non-PHM-designated courses taken to satisfy the background requirement. All courses must be selected in consultation with the advisor.

Thesis Credits
Take at least 24 doctoral thesis credits.

PHM 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Social and Administrative Pharmacy M.S.
Pharmaceutical Care and Health
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
7-155 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-2973; fax: 612-625-9931)
Email: cremi001@umn.edu
Website: https://www.pharmacy.umn.edu/departments/pharmaceutical-care-health-systems/social-and-administrativ

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30 to 32
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Study within the Social and Administrative Pharmacy Program is tailored carefully to the specific needs and objectives of the student. It is a flexible, interdisciplinary program which utilizes all resources of the University's many outstanding departments in an effort to provide the student with knowledge and experience in areas she/he feels are applicable to the resolution of pharmacy-oriented problems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Although the majority of students in the program are pharmacists, a pharmacy education is not required. A bachelor's degree or its foreign equivalent from a recognized college of pharmacy and a strong scholastic record are desirable. Individuals from other fields such as economics, engineering, computer science, medicine, psychology, sociology, or public health may be admitted if their undergraduate coursework satisfies the prerequisites for graduate coursework.

Special Application Requirements:
Applicants must complete a supplementary application form in addition to the University application. The supplementary form along with three letters of recommendation should be uploaded to the University Apply Yourself application. GRE scores are required and a performance level of 580 (158 for November 1, 2011-June 30, 2012) is preferred on the TOEFL for all international applicants whose native language is not English.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

**Plan A:** Plan A requires 16 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 16 major credits and 6 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** The balance of coursework taken to meet the 30-credit minimum (8 credits in addition to the 16 major field credits and 6 minor or related field credits) is determined by agreement between the student and adviser.

Plan B also requires two papers of publishable quality; one paper must include a research component with an analysis of data.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.
Twin Cities Campus
Social and Administrative Pharmacy Minor
Pharmaceutical Care and Health
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
7-155 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-2973; fax: 612-625-9931)
Email: cremi001@umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students in the Social and Administrative Pharmacy Program are prepared for research and related activities investigating relationships between biological and physical factors in social settings that involve the drug use process. The flexible interdisciplinary program uses the resources of the many health and social science departments at the University, and may include courses and offerings from public health, geriatrics, management, sociology, psychology, and public affairs.

The program focuses on the discovery and dissemination of new knowledge to foster appropriate use of drugs to improve patient outcomes at the individual and societal level. Students are educated and mentored to become professional scientists. Those who complete the program will understand the process of conducting high quality research and problem solving through the application of disciplinary and interdisciplinary knowledge, theory, and research methodology.

Social and administrative pharmacy (SAPH) is the application of behavior-oriented interdisciplinary theories to pharmacy problem solving and pharmacy system development. This includes the study of the social, psychosocial, political, legal, public policy, historic, and economic factors that impinge upon the use, non-use, and abuse of drugs.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.
Twin Cities Campus
Social and Administrative Pharmacy Ph.D.
Pharmaceutical Care and Health
College of Pharmacy

Link to a list of faculty for this program.

Contact Information:
7-155 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-624-2973; fax:612-625-9931)
Email: cremi001@umn.edu
Website: http://www.pharmacy.umn.edu/pchs/saph/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 71
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Social and administrative pharmacy (SAPH) is the application of behavior-oriented interdisciplinary theories to pharmacy problem solving and pharmacy system development. This includes the study of the social, psycho-social, political, legal, public policy, historic, and economic factors that impinge upon the use, non-use, and abuse of drugs.

Students in the Social and Administrative Pharmacy Program are prepared for research and related activities of investigating relationships between biological and physical factors in social settings that involve the drug use process. This flexible interdisciplinary program uses the resources of the many health and social science departments at the University, and may include courses and offerings from public health, geriatrics, management, sociology, psychology, and public affairs.

The program focuses on the discovery and dissemination of new knowledge to foster appropriate use of drugs to improve patient outcomes at the individual and societal level. Students are educated and mentored to become professional scientists. Those who complete the program will understand the process of conducting high-quality research and problem solving through the application of disciplinary and interdisciplinary knowledge, theory, and research methodology.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants must complete a supplementary application form in addition to the University application. The supplementary form along with three letters of recommendation should be uploaded to the University Apply Yourself application. GRE scores are required and a performance level of 580 (158 for November 1, 2011-June 30, 2012) is preferred on the TOEFL for all international applicants whose native language is not English.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
35 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Two preliminary written exams are required: one concentrates on research design, methodological issues, and statistical analysis; the other on material specific to social and administrative pharmacy. Students must also pass a preliminary oral exam.
Twin Cities Campus

Advanced Management Training for Clinician Leaders Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health
MMC 819, A395 Mayo Memorial Building
420 Delaware Street SE
Minneapolis, MN 55455
Phone: (612)626-3500
Fax: (612)624-4498
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 13
- This program requires summer semesters for timely completion.
- Degree: Adv Mgmt Training for Clin Leaders PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

NOTE: Applications to the Advanced Management Training for Clinician Leaders Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.

The Regents Certificate in Advanced Management Training for Clinician Leaders is intended for clinicians employed by integrated health systems who will take on critical and expanded roles as executives and managers. This one-year course of study will prepare clinician leaders for successful innovation in emerging forms of healthcare organizations, bring new healthcare leaders with clinical backgrounds into network relationships with other administrators, and consider new approaches to strategy and success in healthcare that are specific to integrated systems.

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have at least two years experience in a US-based healthcare organization that either has developed or is considering integrated system relationships. International applications will be considered on a case-by-case basis with special attention paid to the nature and structure of their employing organizations.

Special Application Requirements:
NOTE: Applications to the Advanced Management Training for Clinician Leaders Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.
Applicants must submit a letter of intent describing career interests and the relevance of the certificate to the applicant's personal development. One letter of recommendation from a person qualified to assess the applicant's academic work; clinical, public health or professional experience; or leadership potential in integrated health systems is required.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The certificate is build on a cohort model and comprises 13 credits: five 2-credit courses, one 1-credit face-to-face course and a 2-credit face-to-face practicum. Students will be required to attend on-campus sessions twice during the program. The first on-campus session will be four days in length, during which students will complete a 1-credit course, PUBH 7571. The second session will be held at the end of the program over three days, during which students will present their capstone projects.

Requirements
The certificate requires 13 total credits. PUBH 7571, PUBH 7572, along with four brand-new courses and a practicum/capstone project (each offered as topics courses via PUBH 6570) make up the requirements for the program. Students complete PUBH 7571 while on campus during for four days at the start of the program, and will complete five courses online during the remaining 12 months. Students will present their capstone projects completed for the practicum during their final three days on campus.

PUBH 7572 - Health Care Strategies in Competitive Markets (2.0 cr)
PUBH 6570 - Healthcare Administration (1.0 - 4.0 cr)
Twin Cities Campus
Aging Studies Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Aging Studies PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

NOTE: Applications to the Aging Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu. The Certificate on Aging is a 12-credit graduate level program with some course offerings available online, as well as in a face-to-face format. The certificate is designed to increase knowledge and understanding in the multifaceted field of human aging. This interdisciplinary program provides students with the background and confidence necessary to meet the challenges of serving the aging population. The courses are offered through the Center on Aging within the Division of Health Policy and Management.

Aging studies at the University of Minnesota involves an interdisciplinary approach to gerontology for those individuals who hold at least a bachelor's degree. The interdisciplinary nature of the program embraces different backgrounds and interests, and is suitable for graduates from any major.

The primary purpose of aging studies is to prepare professionals for work in programs, businesses, organizations, and agencies that address the needs of an aging population. Examples include the following: hospitals, long-term care facilities, education, clinics, home health care agencies, hospice and end-of-life care organizations, insurance groups, counseling and social services, physician groups, financial planning, architecture and design, public policy makers, and nursing.

Accreditation
This program is accredited by CEPH

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
NOTE: Applications to the Aging Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu. Students who have completed 16-semester credits/24-quarter credits (within the past 24 months) in an academic program in a recognized institution of higher learning in the U.S. do not need to submit the TOEFL as part of the application process.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Suggested Coursework
Select coursework from the following list, or other courses in consultation with the director of graduate studies, to meet the 12-credit minimum.

Take 12 or more credit(s) from the following:
• FSOS 8105 - Family Gerontology (3.0 cr)
• GERO 5100 - Topics in Gerontology (0.5 - 4.0 cr)
• GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
• GERO 5125 - Gerontology Service Learning (3.0 cr)
• GERO 8020 - Seminar in Gerontology (2.0 cr)
• SW 5810 - Seminar: Special Topics (1.0 - 4.0 cr)
• SOC 8590 - Topics in Life Course Sociology (3.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
• PA 5412 - Aging and Disability Policy (3.0 cr)
Twin Cities Campus
Applied Biostatistics Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware St, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program requires summer semesters for timely completion.
- Degree: Applied Biostatistics PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This online certificate program is designed for working biostatisticians, such as data managers and analysts, who are not formally trained and want to improve their technical, mathematical, and computational skills.

The program will enhance your understanding of database management and investigation, alert you to key variables and trends, help you judge the statistical significance, and improve your overall data evaluation and programming skills. You'll learn key aspects of study design, implementation, and analysis for both observational and clinical studies.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission preferences and prerequisites:
- Applicants must hold a baccalaureate degree.
- Applicant should demonstrate strong written skills.
- The admissions committee looks closely at the applicant's work experience and grades in math and science.

Special Application Requirements:
Applicants must submit to SOPHAS Express, a centralized online application service:
- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application requirements and instructions visit www.sph.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

**Required Coursework (15 credits)**

Take the following courses, offered online throughout the calendar year, for 14 credits.

- **PUBH 6450** - Biostatistics I (4.0 cr)
- **PUBH 6451** - Biostatistics II (4.0 cr)
- **PUBH 6320** - Fundamentals of Epidemiology (3.0 cr)
- **PUBH 7415** - Introduction to Clinical Trials (3.0 cr)

Take one of the following 1-credit, in-class courses through the summer School of Public Health Institute to complete the 15-credit requirement.

- **PUBH 6431** - Topics in Hierarchical Bayesian Analysis (1.0 cr)
- or **PUBH 6432** - Biostatistical Methods in Translational and Clinical Research (1.0 cr)
Twin Cities Campus
Biostatistics M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42
- This program requires summer semesters for timely completion.
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A biostatistician is an important member of many research teams. Working in close partnership with researchers across a wide array of scientific disciplines, a biostatistician designs studies and develops statistical tools to extract meaning from complex data.

The Biostatistics M.P.H. program requires that students meet core competencies in seven core public health areas, including administration, behavioral science, biostatistics, environmental health, foundations, epidemiology, and ethics.

The M.P.H. program also requires students to complete an Applied Practice Experience, in addition to an Integrative Learning Experience.

Accreditation
This program is accredited by CEPH (Council on Education for Public Health).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The admissions committee reviews applicants according to their record of academic achievement, demonstrated academic potential, letters of recommendation, background and experience, and other factors. GPAs and standardized test scores provide competitive points of reference for admission but are not alone decisive in the admissions review.

Prospective applicants should have taken at least:
- Three semesters of calculus (including multivariable calculus)
- One semester of linear algebra

Experience with a programming language (eg. Java, C, Python) is helpful, but not required.

Preferred GRE performance expectations (test taken post-August 2011): 150 Verbal; 146 Quantitative

Special Application Requirements:
International applicants who have attended post-secondary institutions outside of the U.S. are also required to submit the following supporting documentation to SOPHAS.

World Education Services (WES) evaluation of foreign academic credentials. The University of Minnesota School of Public Health requires all applicants with foreign academic credentials to provide a WES course-by-course evaluation of those credentials.

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Information current as of August 31, 2018
Note: Applicants with transcripts from Canadian schools are exempt from this requirement. Instead, applicants should have copies of their Canadian transcripts sent directly to SOPHAS.

Through special arrangements with SOPHAS, WES will deliver its credential evaluation report directly to SOPHAS by secure electronic transmission. This expedites the delivery of the evaluation report as well as images of the applicant's verified transcripts to SOPHAS and allows SOPHAS to process the report most efficiently. Go to http://www.wes.org/sophas for more information.

Note: Once WES receives the required documentation, it can complete an evaluation in seven business days or less, depending on the type of service requested. However, if additional research, correspondence, or verification is required, the evaluation will take longer. Students are recommended to start the process at least six weeks prior to the program deadline to ensure that their WES evaluation reports are complete by the deadline.

Proof of English Proficiency
Applicants whose native language is not English, or whose academic study was done exclusively at non-English speaking institutions, must prove English proficiency by providing either official Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores.

Official report of the scores should be sent directly to SOPHAS using designation code 5688 for the TOEFL or designation code SOPHAS for the IELTS.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 146
  - General Test - Analytical Writing: 4
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 42 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Integrative Learning Experience (ILE)
This program may be completed with a minor.
Use of 4xxx courses towards program requirements is not permitted.
A minimum GPA of 3.00 is required for students to remain in good standing.
At least 2 semesters must be completed before filing a Degree Program Form.

The Integrative Learning Experience (ILE) demonstrates the student’s familiarity with the tools of research or scholarship in the program, the capacity to work independently, and the ability to present the results of the investigation effectively. The ILE should involve a combined total of 120 hours of work.

MPH Core Curriculum (12 Credits)
Take the following courses for a total of 12 credits:
- Administration
  - PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- Foundations of Social and Behavioral Science
  - PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)
- Environmental Health
Biostatistics Required Courses (22 Credits)
Take the following courses for a total of 22 credits:

- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 7450 - Survival Analysis (3.0 cr)
- STAT 5101 - Theory of Statistics I (4.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)

Applied Practice Experience (1 Credit)
Take at least 1 credit of PubH 7494.

- PUBH 7494 - Integrative Learning Experience: Biostatistics (1.0 - 3.0 cr)

Integrative Learning Experience (1 Credit)
Take the following ILE course:

- PUBH 7496 - Applied Practice Experience: Biostatistics (1.0 cr)

Electives (6 Credits)
Take at least 6 elective credits, selected in consultation with the advisor, to meet the 42-credit minimum. Electives can be from the areas of public health, statistics, or biostatistics.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Public Health Policy Interdisciplinary Concentration Area
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an M.P.H., includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care.

PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- Understanding community dynamics
- Developing advocacy skills for public health
- Analyzing legal and policy structures
- Evaluating and implementing policies and programs
- Influencing community health
- Motivating and educating stakeholders and decision-makers
- Using policy as prevention strategy
- Eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
Twin Cities Campus  
Biostatistics M.S.  
School of Public Health - Adm  
School of Public Health

Link to a list of faculty for this program.

Contact Information:  
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)  
Email: sph-ask@umn.edu  
Website: http://www.sph.umn.edu

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 30 to 31  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A biostatistician is an important member of many research teams. Working in close partnership with researchers across a wide array of scientific disciplines, a biostatistician designs studies and develops statistical tools to extract meaning from complex data.

With an MS in biostatistics, you'll collaborate in the design of biomedical studies, analyze data, and put the results in context for researchers. You'll need mathematical, computational, and communication skills, as well as a curiosity about science.

Program Delivery  
This program is available:  
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission  
The preferred undergraduate GPA for admittance to the program is 3.10.

Other requirements to be completed before admission:  
For the MS, prospective applicants should have taken at least three semesters of calculus (including multivariable calculus) and one semester of linear algebra. A year (two semesters) of coursework in undergraduate-level probability and mathematical statistics is recommended. Experience with a programming language (e.g., R, Java, C, Python) and exposure to applied statistics is helpful, but not required.

Special Application Requirements:  
Students should apply for admission during fall semester only. New students are not admitted in spring semester.

Applicants must submit their test score(s) from the following:  
• GRE  
  - General Test - Verbal Reasoning: 150  
  - General Test - Quantitative Reasoning: 146  
  - General Test - Analytical Writing: 4.5

International applicants must submit score(s) from one of the following tests:  
• TOEFL  
  - Internet Based - Total Score: 100  
  - Paper Based - Total Score: 600  
• IELTS  
  - Total Score: 7  
• MELAB  
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 31 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

A comprehensive written exam is taken after year 1 spring semester final examinations.

An advanced background in mathematics or theoretical statistics is necessary for the Plan A (thesis) option. Students considering the Plan A must first consult with the advisor and director of graduate studies.

Coursework (31 Credits)
Plan B students take the following courses for at least 31 credits. Plan A students select at least 20 credits from the following in consultation with the advisor and director of graduate studies.

**Biostatistics Electives**
Take at least 8 Biostatistics elective credits from the following:
- GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
- GIS 5571 - ArcGIS I (3.0 cr)
- MATH 5615H - Honors: Introduction to Analysis I (4.0 cr)
- MATH 5616H - Honors: Introduction to Analysis II (4.0 cr)
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
- PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- PUBH 7460 - Advanced Statistical Computing (3.0 cr)
- PUBH 7461 - Exploring and Visualizing Data in R (2.0 cr)
- PUBH 7462 - Advanced Programming and Data Analysis in R (2.0 cr)
- PUBH 7465 - Biostatistics Consulting (3.0 cr)
- PUBH 7470 - Statistics for Translational and Clinical Research (3.0 cr)
- PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
- PUBH 7485 - Methods for Causal Inference (3.0 cr)
- PUBH 8422 - Modern Nonparametrics (3.0 cr)
- PUBH 8435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 8472 - Spatial Biostatistics (3.0 cr)
- PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5601 - Nonparametric Methods (3.0 cr)
- WRIT 5051 - Graduate Research Writing for International Students (3.0 cr)
- WRIT 5052 - Graduate Research Presentations and Conference Writing for Non-Native Speakers of English (3.0 cr)
Twin Cities Campus
Biostatistics Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12 to 14
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in Biostatistics is designed to familiarize students with the statistical tools necessary to analyze health science data. By taking public health courses focused on the fundamentals of statistical methodologies and programming techniques, students will gain skills that enable them to be involved in the design and analysis of quantitative studies as part of their future professional career or graduate study in an applied field.

Minors are available for both University of Minnesota masters and doctoral level students.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to the biostatistics graduate minor is contingent upon prior admission to a master's or doctoral degree-granting program.

Students should first consult with their adviser about declaring the minor in biostatistics. Students will then need to contact the director of graduate studies (DGS) at bstgdg@umn.edu or graduate program coordinator (GPC) for minor information. A biostatistics faculty member must be on the student's doctoral preliminary oral examination committee as well as master's and doctoral final oral examination committees.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Master's-level minor in Biostatistics
NOTE: One course may be taken S/N and all other courses must be taken A/F
Take 2 or more course(s) from the following:
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
Doctoral Minor

14 credits are required for doctoral minor for non-statistics students. 12 credits required for doctoral minor for statistics students.

Doctoral-level minor in Biostatistics for Non-Statistics Students

Students should take the required set of two core courses (either 7405 and 7406, or 7401 and 7402) first, before choosing two additional courses from the list of elective courses below.

NOTE: One course may be taken S/N and all other courses must be taken A/F

Biostatistics Core

Biostat Core Option 1
- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)

Biostat Core Option 2
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)

Electives
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
- PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- PUBH 7450 - Survival Analysis (3.0 cr)
- PUBH 7470 - Statistics for Translational and Clinical Research (3.0 cr)
- PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
- PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
  or PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

-OR-

Doctoral-level minor Biostatistics for Statistics Students

NOTE: One course may be taken S/N and all other courses must be taken A/F

- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 7450 - Survival Analysis (3.0 cr)

Take 2 or more course(s) totaling 6 or more credit(s) from the following:
- PUBH 8422 - Modern Nonparametrics (3.0 cr)
- PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
- PUBH 8452 - Advanced Longitudinal Data Analysis (3.0 cr)
- PUBH 8462 - Advanced Survival Analysis (3.0 cr)
- PUBH 8472 - Spatial Biostatistics (3.0 cr)
- PUBH 8482 - Sequential and Adaptive Methods for Clinical Trials (3.0 cr)
Twin Cities Campus
Biostatistics Ph.D.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 59 to 67
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

A biostatistician is an important part of many research teams. Working in close partnership with researchers across a wide array of scientific disciplines, a biostatistician designs studies and develops statistical tools to extract meaning from complex data.

With a biostatistics PhD, you'll conduct original research, collaborate and consult with biomedical researchers, implement and disseminate results of this research, and teach and mentor others in this field.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.70.

Other requirements to be completed before admission:
At least three semesters of calculus (including multivariable) and one semester of linear algebra, and two semesters of undergraduate courses in probability and mathematical statistics are strongly recommended. Real analysis or an equivalent is recommended. Experience with programming language (e.g., R, Java, C) and exposure to applied statistics is helpful, but not required.

In addition to completing the SOPHAS application, applicants must submit the following directly to SOPHAS:
- Statement of purpose and objectives (an essay describing past education, experience, and current professional career objectives)
- Résumé or curriculum vitae
- Official postsecondary transcripts from all institutions attended, including previous study at the University of Minnesota (have transcripts sent directly from the institutions to SOPHAS)
- Three letters of recommendation from persons qualified to assess academic work; clinical, public health, or professional experience; and leadership potential

Special Application Requirements:
All admitted international Ph.D. applicants are required to provide a World Education Services (WES) document verification report prior to beginning the program.

Proof of English Proficiency
Applicants whose native language is not English, or whose academic study was done exclusively at non-English speaking institutions, must prove English proficiency by providing either official Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores. Official report of the scores should be sent directly to SOPHAS using designation code 5688 for the TOEFL or designation code SOPHAS for the IELTS. Scores must be less than two years old. The preferred minimum English language test scores for admission to the School of Public Health are listed below.

The English Language test requirement may be waived if an applicant can provide proof of one of the following:
- Completion of 16 semester credits/24 quarter credits (within the past 24 months) in an academic program at a recognized institution of
higher learning in the U.S. or Canada.
- An Educational Commission for Foreign Medical Graduates (ECFMG) certificate. Students should have an official or attested copy sent directly to the University of Minnesota School of Public Health at the address listed above.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 146

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
35 to 43 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.3 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

This program takes approximately 45 years. Coursework during the first 23 years provides a foundation in statistical theory, methods, and applied data analysis. Written exams are completed after the first and after the second year (after the first year for students entering with a masters degree). The dissertation is completed during years 45. Most students also work on several collaborative research projects during their training.

The PhD program usually requires three years of full-time study after the MS degree. Students entering the PhD program without an MS degree in mathematics or statistics will be required to take additional core coursework.

Required Coursework
Core Coursework
All students take the following 20 credits of core coursework:
- PUBH 8401 - Linear Models (4.0 cr)
- PUBH 8403 - Research Skills in Biostatistics (1.0 cr)
- PUBH 8412 - Advanced Statistical Inference (3.0 cr)
- PUBH 8432 - Probability Models for Biostatistics (3.0 cr)
- PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
- STAT 8101 - Theory of Statistics 1 (3.0 cr)
- STAT 8102 - Theory of Statistics 2 (3.0 cr)

Elective Coursework
All students take at least 3 elective courses for a total of 9 or more credits from the following biostatistics and statistics course lists. Courses are selected in consultation with the advisor.

Biostatistics Elective Courses
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 7465 - Biostatistics Consulting (3.0 cr)
- PUBH 8422 - Modern Nonparametrics (3.0 cr)
- PUBH 8435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 8445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
or PUBH 8446 - Advanced Statistical Genetics and Genomics (3.0 cr)
or PUBH 8452 - Advanced Longitudinal Data Analysis (3.0 cr)
or PUBH 8462 - Advanced Survival Analysis (3.0 cr)
or PUBH 8472 - Spatial Biostatistics (3.0 cr)
or PUBH 8482 - Sequential and Adaptive Methods for Clinical Trials (3.0 cr)
or PUBH 8492 - Theories of Hierarchical and Other Richly Parametrized Linear Models (3.0 cr)
or PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
or PUBH 8485 - Methods for Causal Inference (3.0 cr)

or Statistics Elective Course
Students may select, in consultation with the advisor, an 8xxx-level course offered by the School of Statistics that is not among the core courses listed above.

or Biostatistics Topics Course
Students may select, in consultation with the advisor, any PUBH 84xx biostatistics topic course that is not among the core courses listed above.

Survival Analysis Course
Take PUBH 7450 as early as possible during the PhD program. Students who have taken a course equivalent to PUBH 7450 should confer with their advisor regarding a substitute course.

PUBH 7450 - Survival Analysis (3.0 cr)

Health Science Elective
Three public health course credits are required. PUBH 6250 is required and counts towards a portion of the three credit requirement. Students need at least one more credit from PUBH 6xx, 7xx, or 8xx level courses offered by other divisions in the SPH or other Academic Health Center Programs.
PUBH 6250 - Foundations of Public Health (2.0 cr)
PUBH 6xx
PUBH 7xx
PUBH 8xx

Thesis Credits
Take at least 24 doctoral thesis credits.
PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Curriculum for students without an MS in mathematics or statistics
Students without the MS in mathematics or statistics must take two additional core courses. Students also are strongly recommended to gain more background in real analysis by taking MATH 4603, Advanced Calculus I, in the fall of their first year. Students with a prior analysis course may choose instead, but are not required, to take MATH 5615 and MATH 5616 as an elective.

Additional Core Coursework
In addition to the standard curriculum outlined above, take the following two courses:

PUBH 7405 - Biostatistics: Regression (4.0 cr)
PUBH 7406 - Advanced Regression and Design (4.0 cr)
Twin Cities Campus
Clinical Research M.S.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 38
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The field of clinical research is becoming increasingly complex and regulated. This has created a demand for formally trained clinical researchers. This program will prepare you to conduct patient-oriented research, including clinical trials and observational studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

An advanced health professional degree, e.g. M.D., D.D.S., D.O., D.N.P., D.C., D.V.M., Pharm.D., Ph.D.; an advanced doctoral degree in a clinical biomedical field; or an advanced nursing degree.

Other requirements to be completed before admission:
Students must have completed or must be at an advanced stage of their clinical practice training and be affiliated with someone at the University of Minnesota who can provide advising and access to a clinical project. The admissions committee considers exceptions on an individual basis.

Special Application Requirements:
The M.S. has specific application requirements including an advanced health professional degree, and training sufficient to be eligible for a license to practice as supported in the form of an official transcript. One of the three required recommendation letters and a completed School of Public Health Recommendation form should be from the clinical director of training supporting the applicant's potential as a clinical researcher.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 25 major credits, 3 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 21 major credits and 7 to 11 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: There are two options for capstone project: 1) A manuscript, for which the student is the first author who contributes to the design and analysis presented, and which is to be submitted to a peer-reviewed journal in the student's field. The manuscript cannot be a review article; however meta-analysis and formal systematic reviews are allowed. 2) A grant proposal, for which the student is Principal Investigator (PI) at the standard national institute grant mechanism level of R21, R03 or higher (example, R01), to be submitted to the National Institute of Health (NIH). Students' choices regarding the topic and scope of their capstone project must be approved by the advisor and director of graduate studies.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

Students must complete both sessions of the University's Responsible Conduct of Research course, validated by ORTTA. Students also must complete the NIH's online training, Protection of Human Research Subjects, validated by electronic certificate upon successful completion.

Required Coursework

All students take the following courses:
- PUBH 6301 - Fundamentals of Clinical Research (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Plan Options

Plan A Requirements

The Plan A curriculum prepares the next generation of clinical researchers and principal investigators. It covers clinical trials, epidemiology, biostatistics, ethics, grant writing, and research methods. Students are trained to conduct patient-oriented, epidemiological, and behavioral research.

Plan A Coursework

Take the following courses for a total of 4 credits:
- PUBH 6303 - Clinical Research Project Seminar (2.0 cr)
- PUBH 6348 - Writing Research Grants (2.0 cr)

Outside Coursework

Take at least 3 credits in a related field to meet minimum course credit requirements.

Thesis Credits

Take at least 10 master's thesis credits.
- PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B Requirements

The Plan B curriculum prepares the next generation of translational, clinical, and outcomes researchers. The flexible curriculum, determined through consultation with mentors and the director of graduate studies, includes a core of required courses covering clinical trials, epidemiology, and biostatistics, supplemented by elective courses in translational sciences, outcomes sciences, health services research, and other areas.

Plan B Coursework

- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
  or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
  or PUBH 7415 - Introduction to Clinical Trials (3.0 cr)

Outside Coursework
Take at least 7 credits in a related field to meet minimum course credit requirements.

**Capstone Project**
Take 6 to 10 credits of PUBH 8394, in consultation with the advisor and director of graduate studies.

**PUBH 8394 - Plan B Project: Clinical Research (1.0 - 10.0 cr)**
Twin Cities Campus
Clinical Research Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 16
- This program does not require summer semesters for timely completion.
- Degree: Clinical Research PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This certificate is designed for clinicians and other health professionals who have at least five years of relevant experience and who want to learn how to design, implement, and interpret clinical research studies.

The program includes 16 credits and can be completed in six terms, attending part-time.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants are required to have a baccalaureate degree and either a minimum of five years of relevant clinical research experience or GRE scores.

Special Application Requirements:
Applicants must submit to SOPHAS Express, a centralized online application service:
- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application requirements and instructions visit www.sph.umn.edu.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600
  • IELTS
    - Total Score: 7
  • MELAB
    - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework
- PUBH 6301 - Fundamentals of Clinical Research (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6303 - Clinical Research Project Seminar (2.0 cr)
- PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
Twin Cities Campus  
Community Health Promotion M.P.H.  
School of Public Health - Adm  
School of Public Health

Link to a list of faculty for this program.

Contact Information:  
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)  
Email: sph-ask@umn.edu  
Website: http://www.sph.umn.edu

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 48  
- This program requires summer semesters for timely completion.  
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Through coursework and fieldwork taken at the School of Public Health, students in community health promotion develop basic competencies in theory, health behavior and policy interventions, assessment methods, cultural competency, and management.

Each graduate should have the ability to:
- Use theories of behavior and social change to inform the planning and evaluation of health interventions  
- Identify individual, community, and policy-level interventions that are effective in promoting healthy behaviors and social conditions  
- Design and implement effective individual, community, and policy-level interventions targeting a variety of health behaviors  
- Assess the health status of populations and communities  
- Utilize appropriate data collection strategies and qualitative and quantitative methods to evaluate health interventions  
- Identify the role of cultural, social, and behavioral factors in influencing health behaviors and status  
- Develop and adapt approaches to solving health problems, taking into account cultural differences  
- Communicate health information effectively both in writing and orally  
- Advocate for public health programs and resources  
- Collaborate with public health agencies and other constituency groups  
- Coordinate and manage health programs/services  
- Relate ethical considerations and values to one’s professional practice

The M.P.H. in community health promotion is a good path for students planning for careers as public health practitioners or planning to pursue a PhD in social and behavioral epidemiology, which is available in the School of Public Health.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH).

Program Delivery
This program is available: 
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must have one year of community, social service or public health experience. An introductory course in statistics and three to four social and behavioral science courses are also required. The average undergraduate GPA for admitted applicants is a 3.5.

Special Application Requirements:
Applicants are admitted from a wide variety of academic backgrounds, including social and behavioral sciences (e.g., psychology, sociology, anthropology), the humanities, basic sciences (e.g., biology, nursing), and mathematics. There is no single appropriate undergraduate major; however, applicants should meet prerequisites by the time of admission.
Who should apply? Individuals who want skills to:
- influence policy and public opinion on health issues;
- develop and evaluate innovative community-based programs to prevent disease and injury;
- work with communities, health departments, and non-profit organizations and policymakers to create healthy living and working environments;
- work on issues related to specific population, including youth and disadvantaged populations.
And individuals who:
- have a variety of backgrounds, including those trained in basic sciences, social and behavioral sciences, and the humanities;
- want an M.P.H. degree;
- plan to pursue a Ph.D. degree in social and behavioral epidemiology at the University of Minnesota;
- have met the prerequisites listed below before admission.

Prerequisites for Admission
- Baccalaureate degree or higher from an accredited college or university
- College-level courses in the following areas:
  - Social and behavioral sciences (at least 3 courses)
  - Introductory statistics (1 course)
  - One year of paid or volunteer experience in a public health, social service, or community setting

Preferences for Admission
- Strong personal statement indicating why applicant is interested in pursuing a community health promotion degree
- Compatibility of interests with program faculty
- GPA of 3.0
- Combined GRE score of 300 and analytical writing score of 3.5
- TOEFL score of 600/250/100 for international applicants
- Strong reference letters

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 34 to 48 major credits and 0 to 14 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Integrative Learning Experience (ILE)

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Theory
- PUBH 6050 - Community Health Theory and Practice I (3.0 cr)
- PUBH 6051 - Community Health Theory and Practice II (3.0 cr)

Health Behavior and Policy Interventions
Take 8 or more credit(s) from the following:
PUBH 6000 TOPICS: Urban Health and Social Policy
Take 1 or more course(s) from the following:
• PUBH 6081 - Sex, Sexuality, and Sexual Health (2.0 cr)
• PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6094 - Obesity and Eating Disorder Interventions (2.0 cr)
• PUBH 6000 - Topics: Community Health Promotion (0.5 - 4.0 cr)

Intervention Approaches
Take 2 or more course(s) from the following:
• PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)
• PUBH 6045 - Skills for Policy Development (1.0 cr)
• PUBH 6049 - Legislative Advocacy Skills for Public Health (3.0 cr)
• PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
• PUBH 6074 - Mass Communication and Public Health (3.0 cr)
• PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
• SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)

Assessment Methods
Students are required to take 5-6 credits
PUBH 6035 - Applied Research Methods (3.0 cr)
choice of the following 2 courses
PUBH 6034 - Evaluation (3.0 cr)
or PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

Additional Assessment Methods
Students must select one course from the following list:
PUBH 6636 - Qualitative Research Methods in Public Health Practice (2.0 cr)
or PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)

SPH Core Courses
PUBH 6250 - Foundations of Public Health (2.0 cr)
Biostatistics
PUBH 6450 - Biostatistics I (4.0 cr)
Environmental Health
PUBH 6101 - Environmental Health (2.0 cr)
or PUBH 6102 - Issues in Environmental Health (2.0 cr)
Epidemiology
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
Ethics
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
Management
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Applied Practice Experience (APEX) and Integrative Learning Experience (ILE)
PUBH 7096 - Applied Practice Experience: Community Health Promotion (1.0 - 5.0 cr)
PUBH 7094 - Integrative Learning Experience: Community Health Promotion (1.0 - 6.0 cr)

Electives
Electives to total 48 credits.

Joint- or Dual-degree Coursework: Master of Social Work (MSW), Juris Doctorate (JD)

Program Sub-plans
A sub-plan is not required for this program.
Students may complete the program with more than one sub-plan.

Public Health Policy Interdisciplinary Concentration Area
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an M.P.H., includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care.
PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- Understanding community dynamics
- Developing advocacy skills for public health
- Analyzing legal and policy structures
- Evaluating and implementing policies and programs
- Influencing community health
- Motivating and educating stakeholders and decision-makers
- Using policy as prevention strategy
- Eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
Twin Cities Campus
Environmental Health M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42 to 52
- This program does not require summer semesters for timely completion.
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Environmental health is the study of how exposures to external hazards, including chemical, physical, and biological agents, affect human health. Environmental health researchers and professionals seek to understand how to evaluate exposures that create risk to human health, how those exposures elicit biological responses that lead to disease and injury, and how policy is developed and used to prevent adverse health effects. This program offers academic programs at the master's and doctoral levels, conducts research in diverse areas of environmental health, offers continuing education, and conducts outreach. The academic programs prepare students to be leaders in environmental health in academia, industry, consulting groups, and government agencies. The program's training and research emphasizes the importance of translating basic scientific knowledge into solutions for current societal problems and concerns.

The School of Public Health (SPH) and College of Biological Sciences (CBS) offer an early-admission opportunity for eligible University CBS students interested in completing the MPH Environmental Health degree. Interested CBS students should contact their college office or the SPH for more information.

Accreditation
This program is accredited by Council on Education for Public Health

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Minimum qualifications include a baccalaureate degree with coursework in the basic sciences. Occupational health nursing/medicine applicants must have a relevant degree from an accredited school.

Required prerequisites
Program Course Prerequisites
All specialties require basic sciences. Industrial hygiene also requires demonstrable strengths in physics, chemistry (including organic chemistry), biology and math (including calculus). A microbiology background is preferred for the environmental infectious diseases specialty.

Other requirements to be completed before admission:
For more information visit www.sph.umn.edu

Special Application Requirements:
To be considered for admission to Environmental Health's Accelerated MPH program, prospective students must be in their junior year, and in good academic standing (3.25 minimum GPA) in one of the BS degree programs offered by the University's College of Biological
Sciences. In lieu of the GRE, applicants to the accelerated MPH program must complete an interview with environmental health admissions committee.

Applicants must submit their test score(s) from the following:

- **GRE**
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5
- **GMAT**
- **MCAT**
  - Verbal Reasoning score: 10
  - Physical Science score: 10
  - Biological Reasoning score: 10
  - Writing Sample score: 10
- **LSAT**
  - Law School Admission Test (LSAT) score: 140
- **DAT**
  - Score: 15

International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- **IELTS**
  - Total Score: 7
- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, GMAT, MCAT, LSAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 42 to 52 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** This requirement is met by registering for PUBH 7194 Culminating Experience: Environmental Health for a minimum of 3 credits. Results in a written paper and presentation and oral exam. Students choose from a broad set of project options including a Plan B style project. The project must be required to be relevant to the field of environmental health and should represent a minimum of 120 hours of work. Minimum program length is 42 credits.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

**Concentration Areas**

**General Program**

Students looking for a program of study that does not fit precisely with the defined concentrations in the major may be admitted to this program. Emphasis is on the development of a broad, solid foundation, with a larger than usual number of elective credits to allow the student an opportunity to pursue their particular interests. It is occasionally possible for students to transfer into a different concentration after admission to the general program.

**Public Health Core Courses**

- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

**Division Core Courses**

- PUBH 6103 (Inactive) (2.0 cr)
**PUBH 6104 - Environmental Health Effects (2.0 cr)**

**PUBH 6105 (Inactive) (2.0 cr)**

**PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)**

**PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)**

**Concentration Courses**

- **PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)**
- **PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)**

**Electives**

Selected in consultation with adviser to meet the 42 credit minimum requirement.

- **OR-**

**Environmental and Occupational Epidemiology (EOE)**

Env Occ Epi strives to understand the causal impact of environment and occupation on human health. Public health interventions are most likely to be effective when disease and injury etiology is understood. Epidemiologists develop studies to identify factors that cause diseases and injuries - requiring knowledge of both subject matter and methods. Students may focus in one of three these areas: exposures related to cancer, exposures related to injury, or epidemiologic methods.

**Public Health Core Courses**

- **PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)**
- **PUBH 6341 - Epidemiologic Methods I (3.0 cr)**
- **PUBH 6450 - Biostatistics I (4.0 cr)**
- **PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)**
- **PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)**
- **PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)**

**Division Core Courses**

- **PUBH 6103 (Inactive) (2.0 cr)**
- **PUBH 6104 - Environmental Health Effects (2.0 cr)**
- **PUBH 6105 (Inactive) (2.0 cr)**
- **PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)**
- **PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)**

**Concentration Program Courses**

- **PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)**
- **PUBH 6342 - Epidemiologic Methods II (3.0 cr)**
- **PUBH 6451 - Biostatistics II (4.0 cr)**

**Elective Courses**

Select electives in consultation with adviser to meet the 42 credits requirement.

Take exactly 0 course(s) totaling exactly 0 credit(s) from the following:

- **PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)**
- **PUBH 6160 - Systems Toxicology (3.0 cr)**
- **PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)**
- **PUBH 6171 (Inactive) (3.0 cr)**
- **PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)**
- **PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)**
- **PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)**
- **PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)**
- **PUBH 6343 - Epidemiologic Methods III (4.0 cr)**
- **PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)**
- **PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)**
- **PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)**
- **PUBH 6386 - Public Health Aspects of Cardiovascular Disease (2.0 cr)**
- **PUBH 6387 - Cancer Epidemiology (2.0 cr)**
- **PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)**
- **PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)**
- **PUBH 7407 - Analysis of Categorical Data (3.0 cr)**
- **PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)**
- **PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)**
- **VMED 8090 - Epidemiology of Zoonoses and Diseases Common to Animals and Humans (3.0 cr)**
- **PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)**
- **PUBH 7210 - Topics: Global Food Systems (0.5 cr)**

- **OR-**

**Environmental Health Policy**

This concentration provides broad, multidisciplinary training in environmental health issues, including occupational health, risk assessment, risk management, decision making, and policy analysis. Internship experiences are arranged with leading occupational and environmental health policy experts who assist students with synthesizing and applying their academic experiences to potential professional settings. Students participate in ongoing research.
Environmental Health Policy

Public Health Core Course Requirements

- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
  or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses

- PUBH 6103 (Inactive) (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 (Inactive) (2.0 cr)
- PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Program Course Requirements

- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6115 - Worker Protection Law (1.0 cr)
- PUBH 6116 - Environmental Law (1.0 cr)

Electives

Select electives in consultation with adviser.

Take exactly 0 course(s) totaling exactly 0 credit(s) from the following:

- PUBH 6049 - Legislative Advocacy Skills for Public Health (3.0 cr)
- PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
- PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
- PUBH 6711 - Public Health Law (2.0 cr)
- PUBH 6724 - The Health Care System and Public Health (3.0 cr)
- PUBH 6726 - Medical Device Industry: Business and Public Policy (3.0 cr)
- PUBH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)
- PUBH 6835 - Principles of Health Policy (2.0 cr)
- PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
- PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)
- PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
- ANTH 7801 - Ecological Anthropology (3.0 cr)
- ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
- PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5021 - Economics For Policy Analysis and Planning I (3.0 cr)
- PA 5022 - Economics For Policy Analysis and Planning II (1.5 - 3.0 cr)
- PA 5031 - Empirical Analysis I (4.0 cr)
- PA 5032 - Regression Analysis (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
- PA 5035 - Survey Research and Data Collection (1.5 cr)
- PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
- PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
- PUBH 6863 - Understanding Health Care Quality (2.0 cr)
- PA 8790 - Advanced Topics in Science, Technology, and Environmental Policy (1.0 - 3.0 cr)
- PA 5311 - Program Evaluation (3.0 cr)

-OR-

Environmental Infectious Diseases

This program explores the environmental factors associated with infectious diseases and the emergence of food-borne diseases in the United States and around the world. The environment and changing conditions have a great impact on the distribution and occurrence of infectious diseases. In evaluating the chain of infection, the environment may play a key role in reservoir maintenance. Coursework includes basic principles of infection control and predicting the impact of emerging infections.

Public Health Core Courses

- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
  or VMED 5180 - Ecology of Infectious Disease (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Courses
PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
VMED 5180 - Ecology of Infectious Disease (3.0 cr)

Recommended Electives
Select electives in consultation with adviser.
Take exactly 0 course(s) totaling exactly 0 credit(s) from the following:
- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6711 - Public Health Law (2.0 cr)
- PUBH 7210 - Topics: Global Food Systems (0.5 cr)
- PUBH 7214 - Principles of Risk Communication (1.0 cr)
- VMED 8090 - Epidemiology of Zoonoses and Diseases Common to Animals and Humans (3.0 cr)
- VMED 5420 (Inactive) (3.0 cr)
- FSCN 4121 - Food Microbiology (3.0 cr)
- PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
- MICB 4131 - Immunology (3.0 cr)
- MICB 4151 - Molecular and Genetic Bases for Microbial Diseases (3.0 cr)
- MICB 4171 - Biology, Genetics, and Pathogenesis of Viruses (3.0 cr)

Global Environmental Health
Issues of water and air quality, food safety, and the effects of industrialization are examined, as well as major ecological problems such as deforestation and sustainable agriculture. Interactions between the physical environment and biological health risks are considered also, as the effects of globalization of trade and the rapid movement of populations from one part of the world to the other are important vectors for the spread of disease globally.

Public Health Core Courses
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)

Division Core Courses
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Courses
PUBH 6131 - Working in Global Health (2.0 cr)
PUBH 6133 - Global Health Seminar (1.0 cr)
PUBH 72xx Topics: Globalization and Health (1 cr)
PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)

Recommended Electives
Selected in consultation with adviser to meet the 42 credit minimum requirement.

Occupational and Environmental Health Nursing (OEHN)
Occupational and Environmental Health Nursing provides intensive training for nurses interested in the development, management and evaluation of health services, programs, and policies designed to promote health and prevent work-related injuries and disease.

Public Health Core Courses
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Occupational and Environmental Health Nursing Courses
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)

School of Nursing Courses
NURS 8170 (Inactive) (3.0 cr)
NURS 8600 (Inactive) (2.0 cr)

Recommended Electives
Select electives in consultation with adviser to meet the 42 credit minimum requirement.
Take exactly 0 course(s) totaling exactly 0 credit(s) from the following:
• PUBH 6034 - Evaluation (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6122 - Seminar: Safety in the Workplace (1.0 cr)
• PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
• PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
• NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)

-OR-

Occupational and Environmental Medicine
The Occupational and Environmental Medicine (OEM) residency program trains physicians who will improve the health and safety of workers. The program emphasizes a solid clinical basis for the practice of occupational medicine and the management of patients with work-related health problems, as well as the identification and remediation of occupational risks and hazards in the workplace.

Public Health Core Courses
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Courses
PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
PUBH 6173 - Exposure to Physical Agents (2.0 cr)
PUBH 6387 - Cancer Epidemiology (2.0 cr)
PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)
PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)
Select electives in consultation with adviser to meet the 42 credit minimum requirement.

-OR-

Regulatory Toxicology and Risk Assessment
Regulatory toxicology and risk assessment teaches students to think analytically about the biochemical mechanisms of toxicity, and how toxicology is used to protect human health through laboratory research, and the development of sound environmental policy and regulations. Strong background in the biological sciences, interest in laboratory research or environmental regulation and policy. Emphasizes: biological sciences, physiology, biochemistry, cellular and molecular biology, toxicology.

Public Health Core Courses
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)

**Ethics Courses**
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

**Division Core Courses**
PUBH 6103 *(inactive)* (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 *(inactive)* (2.0 cr)
PUBH 7194 - Cumulating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

**Concentration Courses**
PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
PUBH 6160 - Systems Toxicology (3.0 cr)
PUBH 6161 - Regulatory Toxicology (2.0 cr)
PUBH 8160 - Advanced Toxicology (2.0 cr)
PUBH 8161 - Current Literature in Toxicology (1.0 cr)

**Electives**
Selected in consultation with adviser to meet the 42 credit minimum requirement.

**Joint- or Dual-degree Coursework:** Master of Public Health and Juris Doctor (MPH/JDP). Student may take a total of 12 credits in common among the academic programs.

**Program Sub-plans**
A sub-plan is not required for this program. Students may complete the program with more than one sub-plan.

**Industrial Hygiene**
The Industrial Hygiene (IH) program is concerned with the health and safety of people at work, and the community at large. Specific concerns are with the recognition, evaluation and control of potential workplace hazards, including chemical, physical, and biological agents; and the potential health threats to the community and the environment.


**Industrial Hygiene**
The Industrial Hygiene program is concerned with the health and safety of people at work, and the community at large. Specific concerns are with the recognition, evaluation and control of potential workplace hazards, including chemical, physical and biological agents; and the potential health threats to the community and the environment. Prepares well-qualified practitioners and researchers for an exciting career in industry, government organizations, and academic and research institutions.

**School of Public Health Core Requirements**
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
Choose one of the following courses.
PUBH 6450 - Biostatistics I (4.0 cr)

**Division Core Course Requirements**
PUBH 6103 *(inactive)* (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 *(inactive)* (2.0 cr)
PUBH 7194 - Cumulating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

**Occupational Health and Safety Core Requirements**
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)

**Industrial Hygiene Program Requirements**
PUBH 6172 - Industrial Hygiene Applications (2.0 cr)
PUBH 6173 - Exposure to Physical Agents (2.0 cr)
PUBH 6174 - Control of Workplace Exposure (3.0 cr)
PUBH 6175 - Environmental Measurements Laboratory (2.0 cr)
PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)
PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)

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Information current as of August 31, 2018
Select electives in consultation with adviser to meet the 52 credit minimum requirement.

Take 0 or more credit(s) from the following:

- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6115 - Worker Protection Law (1.0 cr)
- PUBH 6116 - Environmental Law (1.0 cr)
- PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
- PUBH 6131 - Working in Global Health (2.0 cr)
- PUBH 6132 - Air, Water, and Health (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
- PUBH 6161 - Regulatory Toxicology (2.0 cr)
- PUBH 6167 - Hazardous Materials and Waste Management (2.0 cr)
- PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
- PUBH 6190 - Environmental Chemistry (3.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 7220 - Personal Protective Equipment and Respiratory Protection (1.0 cr)
- PUBH 7280 - Ergonomics and the Prevention of Workplace Injuries (1.0 cr)
- CEGE 4561 - Solids and Hazardous Wastes (3.0 cr)
- CEGE 5551 - Environmental Microbiology (3.0 cr)
- IE 5511 - Human Factors and Work Analysis (4.0 cr)
- IE 5513 - Engineering Safety (4.0 cr)
- KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
- ME 5113 - Aerosol/Particle Engineering (4.0 cr)
- ME 5133 - Aerosol Measurement Laboratory (4.0 cr)
- PA 5721 - Energy and Environmental Policy (3.0 cr)

Accelerated M.P.H. Program

This sub-plan is limited to students completing the program under Plan C.

The School of Public Health and the College of Biological Sciences offer an early-admission opportunity for eligible University of Minnesota Bachelor of Science students also interested in completing the Master's of Public Health (MPH) Environmental Health degree. The Accelerated MPH Environmental Health sub-plan enables majors from CBS undergraduate programs to take 12 MPH credits during their senior (fourth) year, and to complete the MPH after a fifth year of full-time graduate student plus one summer. Interested CBS undergraduates should contact their CBS college adviser for more information. The MPH accelerated program sub-plan application deadline is during the spring of the student's junior year, and admission to the MPH accelerated program sub-plan is contingent on a formal admissions process. Check sph.umn.edu for specific application deadline and instructions. Students admitted to the accelerated program sub-plan must maintain timely degree progress to ensure the bachelor of science is awarded by the end of their fourth year. The MPH accelerated program sub-plan is open to students in the CBS Bachelor of Science programs.

Accelerated M.P.H. Program

Public Health Core Courses

- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Division Core Courses

- PUBH 6103 [Inactive] (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 [Inactive] (2.0 cr)
- PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Accelerated MPH Concentration Courses

- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
- PUBH 6700 [Inactive] (3.0 cr)
- PUBH 6100 Careers in Environmental Health

Electives

Selected in consultation with adviser to meet the 42 credit minimum requirement

Global Health Interdisciplinary Concentration Area

The Global Health Interdisciplinary Concentration (GHIC) provides graduate students who are pursuing an M.P.H. with information necessary to define the constitution, cause, and consequences of health problems worldwide. The program offers a unique opportunity to explore the relationships between health, environment, politics, culture, and economic pressures in developed and developing nations.
Developing countries are currently undergoing profound demographic changes—changes that are accompanied by shifts in patterns of illness. In many of these nations, the major causes of morbidity and mortality are mutating from traditional infectious diseases to chronic, non-communicable maladies like cardiovascular diseases, cancer, and diabetes. As a result, there is increasing demand for qualified public health practitioners who can identify and help reduce the vast and varied global vectors for chronic disease.

Practical application of theory in the field is a major component of the GHIC. Students are encouraged to hone their expertise by pursuing an international field experience. The School of Public Health has established relationships with collaborative institutions abroad.

SPH graduate students must complete a formal program plan if they want the GHIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the U.S., as well as unequal quality of and access to health care. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020 and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:
- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer, and HIV/AIDS are higher for many minority communities compared to the state as a whole.

SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Public Health Policy Interdisciplinary Concentration Area
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an M.P.H., and includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care.

PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- Understanding community dynamics
- Developing advocacy skills for public health
- Analyzing legal and policy structures
- Evaluating and implementing policies and programs
- Influencing community health
- Motivating and educating stakeholders and decision-makers
- Using policy as prevention strategy
- Eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
**Twin Cities Campus**

**Environmental Health M.S.**

*School of Public Health - Adm*

**School of Public Health**

Link to a list of faculty for this program.

**Contact Information:**

School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)

Email: sph-oasr@umn.edu

Website: [http://www.sph.umn.edu](http://www.sph.umn.edu)

- **Program Type: Master's**
- **Requirements for this program are current for Fall 2018**
- **Length of program in credits: 33 to 56**
- **This program does not require summer semesters for timely completion.**
- **Degree: Master of Science**

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Environmental health is the study of how exposures to external hazards, including chemical, physical, and biological agents, affect human health. Environmental health researchers and professionals seek to understand how to evaluate exposures that create risk to human health, how those exposures elicit biological responses that lead to disease and injury, and how policy is developed and used to prevent adverse health effects. This program offers academic programs at the master's and doctoral levels, conducts research in diverse areas of environmental health, offers continuing education, and conducts outreach. The academic programs prepare students to be leaders in environmental health in academia, industry, consulting groups, and government agencies. The program's training and research emphasizes the importance of translating basic scientific knowledge into solutions for current societal problems and concerns.

Applicants must indicate an interest in one of the following specialties within the major: the general environmental health, environmental health policy, environmental infectious diseases, environmental and occupational epidemiology, regulatory toxicology, occupational and environmental health nursing, occupational environmental medicine, occupational injury epidemiology and control, or industrial hygiene.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

Minimum requirements include a baccalaureate degree with coursework in the basic sciences. Each concentration requires different preparation: [http://www.sph.umn.edu/programs/ehs/tracks/index.asp](http://www.sph.umn.edu/programs/ehs/tracks/index.asp)

**Required prerequisites**

**Industrial Hygiene**

In addition to program requirements - industrial hygiene requires demonstrable strengths in physics, chemistry (including organic chemistry), biology, and math (including calculus). One or two missing requirements may be completed upon enrollment.

Other requirements to be completed before admission:

Please visit [www.sph.umn.edu](http://www.sph.umn.edu) for admission requirements.

Applicants must submit their test score(s) from the following:

- **GRE**
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5
- **GMAT**
- **MCAT**
  - Verbal Reasoning score: 10
  - Physical Science score: 10

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Information current as of August 31, 2018
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600

- **IELTS**
  - Total Score: 7

- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, GMAT, MCAT, LSAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 14 to 20 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 27 to 45 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The Plan B project is a master's project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

The M.S. program prepares students for specialized careers in environmental and occupational health. M.S. students receive a solid technical background in their disciplines and by graduation are proficient in applied or basic research.

The minimum credits required for graduation depend on the chosen specialty area. Most concentration areas require a two-year program. M.S. students have the option of completing a Plan A with a thesis or a Plan B project or Plan C.

**Concentration Areas**

Students may pursue a general program in environmental and occupational health, or focus in a concentration area with basic required courses, or pursue the industrial hygiene sub-plan.

**Environmental Chemistry**

Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105

Environmental chemistry examines the interactions of pollutants with air, water, soil, and their exposures to humans and wildlife. The curriculum emphasizes the processes that control chemical behavior, transport, and fate as a function of environmental factors and chemical properties.

**General Requirements**

Thesis/dissertation will be taken for 10 credits

- **PUBH 6320** - Fundamentals of Epidemiology (3.0 cr)
- **STAT 5021** - Statistical Analysis (4.0 cr)
- **PUBH 6742** - Ethics in Public Health: Research and Policy (1.0 cr)
- **PUBH 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

**Division Core Courses**

- **PUBH 6103** *(Inactive)* (2.0 cr)
- **PUBH 6104** - Environmental Health Effects (2.0 cr)
- **PUBH 6105** *(Inactive)* (2.0 cr)

**Specialty Program Course Requirements**

- **CEGE 5541** - Environmental Water Chemistry (3.0 cr)
EEB 5601 - Limnology (3.0 cr)  
PUBH 6190 - Environmental Chemistry (3.0 cr)  

**Proposed Electives**  
Select electives in consultation with adviser.  
Take 0 or more credit(s) from the following:  
  • CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)  
  • CEGE 4561 - Solids and Hazardous Wastes (3.0 cr)  
  • CEGE 8503 - Environmental Mass Transport (4.0 cr)  
  • CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)  
  • CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)  
  • EEB 4611 - Biogeochemical Processes (3.0 cr)  
  • PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)  
  • WRS 8050 - Special Topics in Water Resources Science (1.0 - 3.0 cr)  
  • EEB 5609 - Ecosystem Ecology (3.0 cr)  

-OR-  

**Environmental and Occupational Epidemiology**  
**Environmental Health Sciences Core:** PUBH 6103, PUBH 6104, PUBH 6105  
Environmental and occupational epidemiology strives to understand the causal impact of environment and occupation on human health, because public health interventions are most likely to be effective when disease and injury etiology is understood. Epidemiologists develop studies to identify factors that cause diseases and injuries.  

**General Core Requirements**  
PUBH 6341 - Epidemiologic Methods I (3.0 cr)  
PUBH 6450 - Biostatistics I (4.0 cr)  
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)  

**Division Core**  
PUBH 6103 *(Inactive)* (2.0 cr)  
PUBH 6104 - Environmental Health Effects (2.0 cr)  
PUBH 6105 *(Inactive)* (2.0 cr)  
PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)  
  or PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)  

**Specialty Program Course Requirements**  
PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)  
PUBH 6342 - Epidemiologic Methods II (3.0 cr)  
PUBH 6451 - Biostatistics II (4.0 cr)  

**Proposed Electives**  
Select electives in consultation with adviser.  
Take 0 or more credit(s) from the following:  
  • PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)  
  • PUBH 6121 - Topics: Injury Prevention in the Workplace, Community, and Home (1.0 - 2.0 cr)  
  • PUBH 6122 - Seminar: Safety in the Workplace (1.0 cr)  
  • PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)  
  • PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)  
  • PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)  
  • PUBH 6173 - Exposure to Physical Agents (2.0 cr)  
  • PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)  
  • PUBH 6343 - Epidemiologic Methods III (4.0 cr)  
  • PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)  
  • PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)  
  • PUBH 6387 - Cancer Epidemiology (2.0 cr)  
  • PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)  
  • PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)  
  • PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)  

-OR-  

**Environmental Health Policy**  
**Environmental Health Sciences Core:** PUBH 6103, PUBH 6104, PUBH 6105  
Environmental health policy provides broad, multidisciplinary training in environmental health issues, including occupational health, risk assessment, risk management, decision making, and policy analysis.  

**General Requirements**  
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)  
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)  
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)  
PUBH 6414 - Biostatistical Literacy (3.0 cr)  
  or PUBH 6450 - Biostatistics I (4.0 cr)
Division Core Courses
PUBH 6103 *(Inactive)*(2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 *(Inactive)*(2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Specialty Program Course Requirements
PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
PUBH 6115 - Worker Protection Law (1.0 cr)
PUBH 6116 - Environmental Law (1.0 cr)

Proposed Electives
Select electives in consultation with adviser.
Take 0 or more credit(s) from the following:
• PUBH 6049 - Legislative Advocacy Skills for Public Health (3.0 cr)
• PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
• PUBH 6080 *(Inactive)*(2.0 cr)
• PUBH 6420 - Introduction to SAS Programming (1.0 cr)
• PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
• PUBH 6711 - Public Health Law (2.0 cr)
• PUBH 6724 - The Health Care System and Public Health (3.0 cr)
• PUBH 6726 - Medical Device Industry: Business and Public Policy (3.0 cr)
• PUBH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)
• PUBH 6835 - Principles of Health Policy (2.0 cr)
• PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
• PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
• PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
• PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)
• PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
• ANTH 5041 - Ecological Anthropology (3.0 cr)
• ANTH 8203 - Research Methods in Social and Cultural Anthropology (3.0 cr)
• PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
• PA 5002 - Introduction to Policy Analysis (1.5 cr)
• PA 5021 - Economics For Policy Analysis and Planning I (3.0 cr)
• PA 5022 - Economics For Policy Analysis and Planning II (1.5 - 3.0 cr)
• PA 5031 - Empirical Analysis I (4.0 cr)
• PA 5032 - Regression Analysis (2.0 cr)
• PA 5033 - Multivariate Techniques (2.0 cr)
• PA 5035 - Survey Research and Data Collection (1.5 cr)
• PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
• PA 5722 - Economics of Natural Resource and Environmental Policy (3.0 cr)
• PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

-OR-

Environmental Infectious Diseases
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105
The Environmental Infectious Diseases (EID) specialty is concerned with the emergence of food-borne and infectious diseases in the United States and around the world. The environment, and changing conditions in the environment can have a great impact on the distribution and occurrence of infectious diseases. In evaluating the chain of infection, environment may play a key role in reservoir maintenance, as well as a route of transmission through food, water, and air.

General Requirements
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

Division Core Courses
PUBH 6103 *(Inactive)*(2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 *(Inactive)*(2.0 cr)
PUBH 6777 - Thesis Credits: Master's (1.0 - 18.0 cr)
or PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)

Specialty Program Course Requirements
PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)
PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
Recommended Electives
Select electives in consultation with adviser.
Take 0 or more credit(s) from the following:
- PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
- PUBH 7210 - Topics: Global Food Systems (0.5 cr)
- PUBH 8100 - Validity Concepts in Epidemiologic Research (2.0 cr)
- VMED 6090 - Epidemiology of Zoonoses and Diseases Common to Animals and Humans (3.0 cr)
- VMED 5420 - Inactive (3.0 cr)
- FSCN 4121 - Food Microbiology (3.0 cr)
- FSCN 4122 - Food Fermentations and Biotechnology (2.0 cr)
- PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
- MICB 4131 - Immunology (3.0 cr)
- MICB 4151 - Molecular and Genetic Bases for Microbial Diseases (3.0 cr)
- MICB 4171 - Biology, Genetics, and Pathogenesis of Viruses (3.0 cr)

-OR-

Exposure Science
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105
Students in the Exposure Science program study methods for the identification, measurement and simulation of human exposure and dose from single and multimedia environmental exposures. Students will receive training on various aspects of exposure analysis such as measurements and modeling; chemical, biological, and physical principles required to analyze exposure; mechanisms of exposure; development of molecular biomarkers; and genomic, proteomic, and metabolomic metrics for assessing exposure.

General Requirements
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)

Division Core Courses
- PUBH 6103 - Inactive (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 - Inactive (2.0 cr)
- PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Specialty Program Course Requirements
- PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)
- PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)
- PUBH 6175 - Environmental Measurements Laboratory (2.0 cr)
- PUBH 6100 - Topics: Environmental Health (1.0 - 4.0 cr)
- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6190 - Environmental Chemistry (3.0 cr)
- PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)

Electives
Select electives in consultation with adviser.

-OR-

General Program in Environmental Health
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105
Students are admitted to the General Program in Environmental Health when they are looking for a program of study that does not fit precisely with the specialty tracks defined in the environmental health sciences major. Emphasis is on the development of a broad, solid foundation in environmental health, with a larger than usual number of elective credits to allow the student an opportunity to pursue their particular interests.

General Requirements
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)

Division Core Courses
- PUBH 6103 - Inactive (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 - Inactive (2.0 cr)
- PUBH 6777 - Thesis Credits: Master's (1.0 - 18.0 cr)
or PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Program Course Requirements
Choose at least two courses from each of the following Environmental Health focus areas.

Exposure
Take 2 or more course(s) from the following:

- PUBH 6190 - Environmental Chemistry (3.0 cr)
- PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)
- PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)
- VMED 5180 - Ecology of Infectious Disease (3.0 cr)

Policy
Check with adviser for other policy class options.

Take 2 or more course(s) from the following:

- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)

Health Effects
Take 2 or more course(s) from the following:

- PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
- PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
- PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)

Electives
Select electives in consultation with adviser.

-OR-

Global Environmental Health
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105

The global environmental health track provides key information for individuals looking to work in the field of global environmental health either overseas or in the U.S. Issues of water and air quality, food safety, and the effects of industrialization are examined, as well as major ecological problems such as deforestation and sustainable agriculture.

General Requirements

- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)

Division Core Courses

- PUBH 6103 (Inactive) (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 (Inactive) (2.0 cr)
- PUBH 6777 - Thesis Credits: Master's (1.0 - 18.0 cr)
  or PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)

Specialty Program Course Requirements

- PUBH 6131 - Working in Global Health (2.0 cr)
- PUBH 6132 - Air, Water, and Health (2.0 cr)
- PUBH 6133 - Global Health Seminar (1.0 cr)
- PUBH 72xx Topics: Globalization and Health (1 cr)
- PUBH 6390 - Topics: Epidemiology (0.5 - 4.0 cr)
- PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)

Electives
7-9 credits, selected in consultation with adviser.

-OR-

Occupational and Environmental Health Nursing (OEHN)
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105

Occupational and Environmental Health Nursing (OEHN) provides intensive training for nurses interested in the development, management and evaluation of health services, programs, and policies designed to promote health and prevent work-related injuries and disease.

General Requirements

- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses

- PUBH 6103 (Inactive) (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 (Inactive) (2.0 cr)
- PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)
- PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Specialty Program Course Requirements
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
NURS 8600 (Inactive) (2.0 cr)
NURS 8170 (Inactive) (3.0 cr)

Recommended Electives
Select electives in consultation with adviser.
Take 3 or more credit(s) from the following:
• PUBH 6034 - Evaluation (3.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
• PUBH 6342 - Epidemiologic Methods II (3.0 cr)
• PUBH 6346 - Writing Research Grants (2.0 cr)
• NURS 8100 (Inactive) (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Industrial Hygiene
Industrial hygiene (IH) is concerned with the health and safety of people at work, and the community at large. Specific concerns are with the recognition, evaluation and control of potential workplace hazards, including chemical, physical, and biological agents; and the potential health threats to the community and the environment.


Required Coursework
Environmental Health Sciences Core: PUBH 6103, PUBH 6104, PUBH 6105
School of Public Health Core Requirements
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
Choose one of the following courses.
PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
Division of Environmental Health Sciences Core Requirements
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)
Occupational Health and Safety Core Requirements
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
Industrial Hygiene Program Requirements
PUBH 6172 - Industrial Hygiene Applications (2.0 cr)
PUBH 6173 - Exposure to Physical Agents (2.0 cr)
PUBH 6174 - Control of Workplace Exposure (3.0 cr)
PUBH 6175 - Environmental Measurements Laboratory (2.0 cr)
PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)
PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)
Industrial Hygiene Electives
Select electives in consultation with adviser.
Take 0 or more credit(s) from the following:
• PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
• PUBH 6115 - Worker Protection Law (1.0 cr)
• PUBH 6116 - Environmental Law (1.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6131 - Working in Global Health (2.0 cr)
• PUBH 6132 - Air, Water, and Health (2.0 cr)
• PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
• PUBH 6161 - Regulatory Toxicology (2.0 cr)
• PUBH 6176 - Hazardous Materials and Waste Management (2.0 cr)
• PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7220 - Personal Protective Equipment and Respiratory Protection (1.0 cr)
• PUBH 7260 - Ergonomics and the Prevention of Workplace Injuries (1.0 cr)
• CEGE 4561 - Solids and Hazardous Wastes (3.0 cr)
• CEGE 5551 - Environmental Microbiology (3.0 cr)
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5513 - Engineering Safety (4.0 cr)
• KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• ME 5113 - Aerosol/Particle Engineering (4.0 cr)
• ME 5133 - Aerosol Measurement Laboratory (4.0 cr)
• PA 5721 - Energy and Environmental Policy (3.0 cr)
Twin Cities Campus

Environmental Health Minor

School of Public Health - Adm

School of Public Health

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master's minor requires a minimum of 6 graduate credits; the doctoral minor requires a minimum of 12 graduate credits. Courses for the minor must be selected from those offered by the School of Public Health.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Admission to a University graduate program in a related discipline is required.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Required Courses
Take the following three courses to meet the 6-credit minimum:
PUBH 6103 (inactive)(2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (inactive)(2.0 cr)

Doctoral
Required EnvHlth Courses
Take the following three courses for 6 credits:
PUBH 6103 (inactive)(2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive)(2.0 cr)

Required Epi Courses
Take one of the two following courses for at least 3 credits:
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

Required Biostats Courses
Take one of the two following courses for at least 3 credits:
PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
Twin Cities Campus
Environmental Health Ph.D.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48 to 74
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Environmental health is the study of how exposures to external hazards, including chemical, physical, and biological agents, affect human health. Environmental health researchers and professionals seek to understand how to evaluate exposures that create risk to human health, how those exposures elicit biological responses that lead to disease and injury, and how policy is developed and used to prevent adverse health effects. This program offers academic programs at the master's and doctoral levels, conducts research in diverse areas of environmental health, offers continuing education, and conducts outreach. The academic programs prepare students to be leaders in environmental health in academia, industry, consulting groups, and government agencies. The program's training and research emphasizes the importance of translating basic scientific knowledge into solutions for current societal problems and concerns.

The Ph.D. brings students to a high level of academic competence through a combination of advanced coursework and research, and prepares students to assume leadership roles in the field.

Program Delivery
This program is available:
  • via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A baccalaureate degree with coursework in the basic sciences. Each specialty requires slightly different preparation. Industrial Hygiene requires physics, biology, chemistry, organic, and calculus.

Other requirements to be completed before admission:
For more information visit www.sph.umn.edu

Applicants must submit their test score(s) from the following:
  • GRE
    - General Test - Verbal Reasoning: 150
    - General Test - Quantitative Reasoning: 150
    - General Test - Analytical Writing: 4
  • GMAT
  • MCAT
    - Verbal Reasoning score: 10
    - Physical Science score: 10
    - Biological Reasoning score: 10
  • LSAT

International applicants must submit score(s) from one of the following tests:
  • TOEFL
    - Internet Based - Total Score: 100
Program Requirements
24 to 50 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Concentration Areas

Environmental Chemistry
Environmental Chemistry examines the interactions of pollutants with air, water, soil, and their exposures to humans and wildlife. The curriculum emphasizes the processes that control chemical behavior, transport, and fate as a function of environmental factors and chemical properties. This concentration requires a minimum of 54 total course credits.

Environmental Chemistry
Public Health Core Courses
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Division Core Courses
- PUBH 6103 (Inactive) (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 (Inactive) (2.0 cr)

Concentration Program Courses
- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
- CEGE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
- EEB 5601 - Limnology (3.0 cr)
- PUBH 6190 - Environmental Chemistry (3.0 cr)

Electives
Select electives in consultation with adviser to meet the 54 total credit minimum.
Take 1 or more course(s) from the following:
- CONS 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
- CEGE 4561 - Solids and Hazardous Wastes (3.0 cr)
- CEGE 8503 - Environmental Mass Transport (4.0 cr)
- CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
- EEB 4611 - Biogeochemical Processes (3.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)
- WRS 8050 - Special Topics in Water Resources Science (1.0 - 3.0 cr)
- EEB 5609 - Ecosystem Ecology (3.0 cr)

-OR-

Environmental and Occupational Epidemiology
Environmental and occupational epidemiology strives to understand the causal impact of environment and occupation on human health, because public health interventions are most likely to be effective when disease and injury etiology is understood. This concentration requires a minimum of 53 total course credits.

Public Health Core Courses

Key to test abbreviations (GRE, GMAT, MCAT, LSAT, TOEFL, IELTS, MELAB).
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

**Division Core Courses**
- PUBH 6103 *(Inactive)* (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 *(Inactive)* (2.0 cr)

**Concentration Program Courses**
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
- PUBH 8141 - Doctoral Seminar in Observational Inference (2.0 cr)
- PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

**Electives**
Select electives in consultation with adviser to meet the required minimum of 54 course credits.
- Take 1 or more course(s) from the following:
  - PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
  - PUBH 6121 - Topics: Injury Prevention in the Workplace, Community, and Home (1.0 - 2.0 cr)
  - PUBH 6122 - Seminar: Safety in the Workplace (1.0 cr)
  - PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
  - PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
  - PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
  - PUBH 6173 - Exposure to Physical Agents (2.0 cr)
  - PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
  - PUBH 6343 - Epidemiologic Methods III (4.0 cr)
  - PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)
  - PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
  - PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
  - PUBH 6387 - Cancer Epidemiology (2.0 cr)
  - PUBH 6806 - Principles of Public Health Research (2.0 cr)
  - PUBH 7400 - Topics: Biostatistics (0.5 - 4.0 cr)
  - PUBH 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 7460 - Advanced Statistical Computing (3.0 cr)
- PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)
- PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)

-OR-

**Environmental Health Policy**
Environmental health policy provides broad, multidisciplinary training in environmental health issues, including occupational health, risk assessment, risk management, decision making, and policy analysis. This concentration requires a minimum of 61 total course credits.

**General Requirements**
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  - or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

**Division Core Courses**
- PUBH 6103 *(Inactive)* (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 *(Inactive)* (2.0 cr)

**Program Course Requirements**
- PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
- PUBH 6115 - Worker Protection Law (1.0 cr)
- PUBH 6116 - Environmental Law (1.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

**Electives**
Select electives in consultation with adviser to meet the minimum of 61 total course credits.
- Take 1 or more course(s) from the following:
  - PUBH 6049 - Legislative Advocacy Skills for Public Health (3.0 cr)
  - PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
  - PUBH 6080 *(Inactive)* (2.0 cr)
  - PUBH 6420 - Introduction to SAS Programming (1.0 cr)
  - PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)

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Information current as of August 31, 2018
- OR -

Environmental Infectious Diseases
The study of Environmental Infectious Diseases is concerned with the emergence of foodborne and infectious diseases in the United States and around the world. The environment, and changing conditions in the environment can have a great impact on the distribution and occurrence of infectious diseases. In evaluating the chain of infection, environment may play a key role in reservoir maintenance, as well as a route of transmission through food, water, and air. Minimum 63 total course credits.

Public Health Core Courses
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses
PUBH 6103 [inactive] (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 [inactive] (2.0 cr)
PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Concentration Program Courses
PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
PUBH 6342 - Epidemiologic Methods II (3.0 cr)
PUBH 6380 - Ecology of Infectious Diseases (3.0 cr)
PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
VMED 8090 - Epidemiology of Zoonoses and Diseases Common to Animals and Humans (3.0 cr)

Recommended Electives
Select electives in consultation with adviser to meet the minimum required 63 total course credits.
Take 1 or more course(s) from the following:
• PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
• PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)
• PUBH 6711 - Public Health Law (2.0 cr)
• PUBH 7210 - Topics: Global Food Systems (0.5 cr)
• PUBH 7214 - Principles of Risk Communication (1.0 cr)
• VMED 5420 [inactive] (3.0 cr)
• FSCN 4121 - Food Microbiology (3.0 cr)
• FSCN 4122 - Food Fermentations and Biotechnology (2.0 cr)
• MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
• MICA 8003 - Immunity and Immunopathology (4.0 cr)
• MICA 8010 - Microbial Pathogenesis (3.0 cr)
Occupational and Environmental Health Nursing

Occupational and Environmental Health Nursing provides intensive training for nurses interested in the development, management and evaluation of health services, programs, and policies designed to promote health and prevent work-related injuries and disease. This concentration requires a minimum of 68 total course credits.

Public Health Core Courses
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Division Core Courses
- PUBH 6103 (Inactive) (2.0 cr)
- PUBH 6104 - Environmental Health Effects (2.0 cr)
- PUBH 6105 (Inactive) (2.0 cr)
- PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Concentration Program Courses
- PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
- PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
- PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)
- PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Recommended Electives
Select electives in consultation with adviser to meet the required minimum of 68 total course credits.
- Take 1 or more course(s) from the following:
  - PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
  - PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
  - PUBH 8325 - Data Processing with PC-SAS (1.0 cr)
  - PUBH 6342 - Epidemiologic Methods II (3.0 cr)
  - PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
  - PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)

Environmental Physiology

This is a trans-disciplinary program emphasizing new perspectives on the study of how humans, as complex heterogeneous biological systems, respond and adapt to their environment. Such study is required to understand the role of the environment in injury and disease, and to shape future technologies and policy for monitoring and protecting human health. Requires a minimum of 52 total course credits.

Public Health Core Courses
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Concentration Program Courses
- PUBH 8163 - Toxicology (5.0 cr)
- PUBH 8165 - Current Topics in Toxicology (1.0 cr)
- PUBH 8166 - Experiences in Toxicology Research (3.0 cr)
- PHSI 5101 - Human Physiology (5.0 cr)
- BIOL 4004 - Cell Biology (3.0 cr)
- BIOC 4331 - Biochemistry I: Structure, Catalysis, and Metabolism in Biological Systems (4.0 cr)
  - or BIOC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)

Recommended Electives
Select electives in consultation with adviser to fulfill the requirement of 52 total course credits.
- Take 1 or more course(s) from the following:
  - ANSC 8344 - Mechanisms of Hormone Action (2.0 cr)
  - PHCL 5111 - Pharmacogenomics (3.0 cr)
  - BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
  - PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  - PUBH 6414 - Biostatistical Literacy (3.0 cr)
  - PUBH 6160 - Systems Toxicology (3.0 cr)
• PUBH 6161 - Regulatory Toxicology (2.0 cr)

-OR-

Occupational Injury Prevention Research Training

Occupational Injury Prevention Research Training (OIPRT), in concert with programs in Occupational Medicine, Occupational Health Nursing, and Industrial Hygiene, among others, is part of the nationally funded Midwest Center for Occupational Health and Safety. This program provides a multifaceted approach to advanced academic and research training, with a primary goal to prevent and control occupational injuries. This concentration requires a minimum of 74 total course credits.

Epidemiology Course Requirements

PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6342 - Epidemiologic Methods II (3.0 cr)
PUBH 6343 - Epidemiologic Methods III (4.0 cr)

Biostatistics Course Requirements

PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)

Environmental Health Sciences Core Course Requirements

PUBH 6103 - Inactive (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 - Inactive (2.0 cr)

OIPRTP Course Requirements

See main website for more information: http://sph.umn.edu/
PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
PUBH 6121 - Topics: Injury Prevention in the Workplace, Community, and Home (1.0 - 2.0 cr)
PUBH 6122 - Seminar: Safety in the Workplace (1.0 cr)
PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 8100 - Topics: Applied Analyses of Occupational Health Data (1.0 - 4.0 cr)
PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)
PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
PUBH 8141 - Doctoral Seminar in Observational Inference (2.0 cr)
GRAD 8101 - Teaching in Higher Education (3.0 cr)
IE 5511 - Human Factors and Work Analysis (4.0 cr)
IE 5513 - Engineering Safety (4.0 cr)
PSY 5501 - Vocational and Occupational Health Psychology (3.0 cr)

Grant Writers' Seminars and Workshops, L.L.C: Write Winning Grants (2 days)
ERC Interdisciplinary Seminar Series (minimum attendance: 5 of 9 per year)

Thesis Credit Requirement

24 thesis credits required.

PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Electives

Electives chosen in consultation with advisor to meet the minimum required 74 course credits.

Take 1 or more course(s) from the following:

• PUBH 6348 - Writing Research Grants (2.0 cr)
• PUBH 7405 - Biostatistics: Regression (4.0 cr)
• PUBH 7406 - Advanced Regression and Design (4.0 cr)
• PUBH 7407 - Analysis of Categorical Data (3.0 cr)
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
• PUBH 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
• PUBH 7450 - Survival Analysis (3.0 cr)
• PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)
• PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
• GRAD 8102 - Practicum for Future Faculty (3.0 cr)
• GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)
• PUBH 6115 - Worker Protection Law (1.0 cr)
• PUBH 6116 - Environmental Law (1.0 cr)
• PUBH 6123 - Violence Prevention and Control: Theory, Research, and Application (2.0 cr)
• PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
• PUBH 6173 - Exposure to Physical Agents (2.0 cr)
• PUBH 6344 - Completing the Culminating Experience: Secondary Data Analysis (2.0 cr)
• PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)
• PUBH 6806 - Principles of Public Health Research (2.0 cr)
• PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
• PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
• PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)
• PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
• KIN 5122 - Applied Exercise Physiology (3.0 cr)
• KIN 5723 - Psychology of Sport Injury and Rehabilitation (3.0 cr)

-OR-

Occupational Health Services Research and Policy
The OHSRP training program is an innovative collaboration between the Division of Environmental Health Sciences and the Division of Health Policy and Management. The program prepares researchers that will help meet the demand for more rigorous evaluation of workplace policies and programs designed to reduce the nation's burden of occupational illness and injury and to protect and promote the well-being of the American workforce. This concentration requires a minimum of 74 total credits.

Public Health Core Curriculum
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)
PUBH 6103 (Inactive)(2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive)(2.0 cr)
PUBH 8120 - Occupational Health and Safety Research Seminar (1.0 cr)

Supporting Coursework in Health Policy and Management
PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
PUBH 6855 - Medical Sociology (3.0 cr)
PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)

Potential Electives
Select electives in consultation with advisor to meet the required minimum of 74 total credits.
Take 1 or more course(s) from the following:
• PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
• PUBH 6810 - Survey Research Methods (3.0 cr)
• PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
• PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
• PUBH 6835 - Principles of Health Policy (2.0 cr)
• PUBH 6724 - The Health Care System and Public Health (3.0 cr)
• PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
• PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
• PUBH 8142 - Epidemiologic Uncertainty Analysis (2.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Industrial Hygiene
Industrial hygiene is concerned with the health and safety of people at work, and the community at large. Specific concerns are with the recognition, evaluation and control of potential workplace hazards, including chemical, physical, and biological agents; and the potential health threats to the community and the environment.

Required Coursework
The Industrial Hygiene program is concerned with the health and safety of people at work, and the community at large. Specific concerns are with the recognition, evaluation and control of potential workplace hazards, including chemical, physical and biological agents; and the potential health threats to the community and the environment. Requires a minimum of 63 total credits.

Public Health Core Courses
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Choose one of the following courses.
• PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)

Environmental Health Core Courses
PUBH 6103 (Inactive) (2.0 cr)
PUBH 6104 - Environmental Health Effects (2.0 cr)
PUBH 6105 (Inactive) (2.0 cr)
PUBH 7194 - Culminating Experience: Environmental Health (1.0 - 5.0 cr)
PUBH 7196 - Field Experience: Environmental Health (1.0 - 5.0 cr)

Occupational Health and Safety Core Requirements
PUBH 6130 - Occupational Medicine: Principles and Practice (2.0 cr)
PUBH 6150 - Interdisciplinary Evaluation of Occupational Health and Safety Field Problems (3.0 cr)
PUBH 6170 - Introduction to Occupational Health and Safety (3.0 cr)

Industrial Hygiene Program Requirements
PUBH 6172 - Industrial Hygiene Applications (2.0 cr)
PUBH 6173 - Exposure to Physical Agents (2.0 cr)
PUBH 6174 - Control of Workplace Exposure (3.0 cr)
PUBH 6175 - Environmental Measurements Laboratory (2.0 cr)
PUBH 6192 - Measurement and Properties of Air Contaminants (2.0 cr)
PUBH 6193 - Advanced Topics in Human Exposure Science (2.0 cr)

Industrial Hygiene Electives
Select electives in consultation with adviser.
Take 1 or more course(s) from the following:
• PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
• PUBH 6115 - Worker Protection Law (1.0 cr)
• PUBH 6116 - Environmental Law (1.0 cr)
• PUBH 6120 - Injury Prevention in the Workplace, Community, and Home (2.0 cr)
• PUBH 6131 - Working in Global Health (2.0 cr)
• PUBH 6132 - Air, Water, and Health (2.0 cr)
• PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)
• PUBH 6161 - Regulatory Toxicology (2.0 cr)
• PUBH 6176 - Hazardous Materials and Waste Management (2.0 cr)
• PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)
• PUBH 6190 - Environmental Chemistry (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7220 - Personal Protective Equipment and Respiratory Protection (1.0 cr)
• PUBH 7260 - Ergonomics and the Prevention of Workplace Injuries (1.0 cr)
• CEGE 4561 - Solids and Hazardous Wastes (3.0 cr)
• CEGE 5551 - Environmental Microbiology (3.0 cr)
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5513 - Engineering Safety (4.0 cr)
• KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• ME 5113 - Aerosol/Particle Engineering (4.0 cr)
• ME 5133 - Aerosol Measurement Laboratory (4.0 cr)
• PA 5721 - Energy and Environmental Policy (3.0 cr)

Course Group 1
Twin Cities Campus
Epidemiology M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42 to 48
- This program does not require summer semesters for timely completion.
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Epidemiology is the science that describes quantitative trends in health and disease for populations, with application in the biological, environmental, behavioral, and social sciences. Epidemiologists generally collaborate with multidisciplinary teams of health professionals, such as physicians, laboratory scientists, exercise physiologists, nutritionists, statisticians, veterinarians, and behavioral scientists.

Epidemiologists analyze public health trends, design and implement studies, and interpret study results for policy and program development. Beyond investigation into the causes of disease, epidemiologists also develop intervention strategies to prevent disease and promote health. Epidemiologists work at both the individual and community levels to translate medical and laboratory data into population trends.

Students complete a 48-credit curriculum for the standard program. Many epidemiology and other health-related graduate-level courses are available as electives. These allow students to develop a specialty emphasis in either specific public health topics or methodological areas. The 48-credit curriculum includes 22 Epidemiology core course credits, 8 SPH core course credits, 8 credits of biostatistics, and elective credits. An alternative, 42-credit curriculum is offered for students who have completed M.D., D.D.S., D.V.M., or Ph.D. work in a related field. The 42-credit curriculum includes 18 Epidemiology core course credits, 8 SPH core course credits, 8 credits of biostatistics, and elective credits. The standard and alternate programs require a final examination.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Minimum qualifications include a baccalaureate degree with coursework in the basic sciences. Occupational health nursing/medicine applicants must have a relevant degree from an accredited school.

Other requirements to be completed before admission:
For more information visit www.sph.umn.edu

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5
GMAT
- Verbal Reasoning score: 10
- Physical Science score: 10
- Biological Reasoning score: 10
- Writing Sample score: 10

MCAT

LSAT

International applicants must submit score(s) from one of the following tests:

TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600

IELTS
- Total Score: 7

MELAB
- Final score: 80

Key to test abbreviations (GRE, GMAT, MCAT, LSAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 18 to 22 major credits and 24 to 26 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Culminating Experience

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Courses

Epidemiology Core Courses (18 credits)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6343 - Epidemiologic Methods III (4.0 cr)
- PUBH 6350 - Epidemiologic Methods III: Lab (1.0 cr)
- PUBH 7394 - Culminating Experience: Epidemiology (1.0 - 6.0 cr)
- PUBH 7396 - Field Experience: Epidemiology (1.0 - 5.0 cr)

"Epi of" Courses
- PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
- PUBH 6386 - Public Health Aspects of Cardiovascular Disease (2.0 cr)
- PUBH 6387 - Cancer Epidemiology (2.0 cr)
- PUBH 6389 - Nutritional Epidemiology (2.0 cr)
- PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
- PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)

Biostatistics Courses (8 credits)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)

Public Health Core (8 credits)
- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6101 - Environmental Health (2.0 cr)
- PUBH 6102 - Issues in Environmental Health (2.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Basic Science Course (4 credits)

Not required for students with a prior-earned doctorate in a health-related discipline. Nurses or other health professionals may be
PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)

Electives (8-10 credits)
10 credits required for the standard program.
8 credits required for the accelerated program.

Program Sub-plans
A sub-plan is not required for this program. Students may complete the program with more than one sub-plan.

Global Health Interdisciplinary Concentration Area
The Global Health Interdisciplinary Concentration (GHIC) provides graduate students who are pursuing an M.P.H. with information necessary to define the constitution, cause, and consequences of health problems worldwide. The program offers a unique opportunity to explore the relationships between health, environment, politics, culture, and economic pressures in developed and developing nations.

Developing countries are currently undergoing profound demographic changes--changes that are accompanied by shifts in patterns of illness. In many of these nations, the major causes of morbidity and mortality are mutating from traditional infectious diseases to chronic, non-communicable maladies like cardiovascular diseases, cancer, and diabetes. As a result, there is increasing demand for qualified public health practitioners who can identify and help reduce the vast and varied global vectors for chronic disease.

Practical application of theory in the field is a major component of the GHIC. Students are encouraged to hone their expertise by pursuing an international field experience. The School of Public Health has established relationships with collaborative institutions abroad.

SPH graduate students must complete a formal program plan if they want the GHIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the U.S., as well as unequal quality of and access to health care. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:
- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer, and HIV/AIDS are higher for many minority communities compared to the state as a whole.

SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Course Group 0

Public Health Policy Interdisciplinary Concentration Area
PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can chose courses that emphasize:
- Understanding community dynamics
- Developing advocacy skills for public health
- Analyzing legal and policy structures
- Evaluating and implementing policies and programs
- Influencing community health
- Motivating and educating stakeholders and decision-makers
- Using policy as prevention strategy
- Eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more
information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
Twin Cities Campus

Epidemiology M.S.
School of Public Health - Adm
School of Public Health

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students are not admitted directly into the master of science program; it is available only by special arrangement with the program. Students interested in a master's degree in epidemiology should apply for the master of public health (M.P.H.) degree through the School of Public Health (SPH). For more information on the M.P.H. program, visit the SPH website at www.sph.umn.edu.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Please visit www.sph.umn.edu for admission requirements.

Special Application Requirements:
Students are not admitted directly into the master of science program; it is available only by special arrangement with the program. Students interested in a master's degree in epidemiology should apply for the master of public health (M.P.H.) program through the School of Public Health (SPH). For more information on the M.P.H. degree, visit the SPH website at www.sph.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan B: Plan B requires 22 major credits and 8 credits outside the major. The final exam is oral. A capstone project is required.
Capstone Project: A master's project is required, equivalent to approximately 4 semester credits.

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Information current as of August 31, 2018
This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

These requirements apply only to students admitted by special arrangement with the program; students are not admitted directly into the master's program. Students interested in a master's degree in epidemiology should apply for the master of public health (MPH) program through the School of Public Health (SPH). For more information on the MPH degree, please visit the SPH website.
Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission to the epidemiology graduate minor is contingent upon enrollment in a University of Minnesota master's or doctoral degree-granting program. Consult first with the program advisor about the advisability of an epidemiology minor. For information regarding the minor, and to connect with the directors of graduate studies for the master's or doctoral minor regarding requirements, contact the epidemiology graduate program coordinator at epichst@umn.edu.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

All minor field coursework must be taken A/F.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Required Coursework
Take the following courses for a total of 6 credits.
If PUBH 6320 is selected, a minimum grade of A- is required.
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6342 - Epidemiologic Methods II (3.0 cr)
Electives
Take at least one of the following courses:

- PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
- or PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
- or PUBH 6386 - Public Health Aspects of Cardiovascular Disease (2.0 cr)
- or PUBH 6387 - Cancer Epidemiology (2.0 cr)
- or PUBH 6389 - Nutritional Epidemiology (2.0 cr)
- or PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)

**Doctoral Minor Options**

The doctoral minor can be completed in one of two ways: Option 1 is for students with prior epidemiology training; Option 2 is for students without prior epidemiology training.

**Option 1**

**Required Coursework**

Take the following courses for a total of 10 credits:

- PUBH 8341 - Advanced Epidemiologic Methods: Concepts (3.0 cr)
- PUBH 8342 - Advanced Epidemiologic Methods: Applications (3.0 cr)
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)

**Electives**

Take at least 2 credits in an epidemiology- or biostatistics-related area, as approved by the epidemiology director of graduate studies.

- PUBH 5xxx
- PUBH 6xxx
- PUBH 7xxx
- PUBH 8xxx

**-OR-**

**Option 2**

**Required Coursework**

Take the following 3 courses for at least 10 credits:

- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)

**Electives**

Take at least two credits in an epidemiology- or biostatistics-related area, as approved by the epidemiology director of graduate studies.

- PUBH 5xxx
- PUBH 6xxx
- PUBH 7xxx
- PUBH 8xxx
**Twin Cities Campus**

**Epidemiology Ph.D.**

*School of Public Health - Adm*

**School of Public Health**

Link to a list of faculty for this program.

**Contact Information:**
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 61
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The epidemiology PhD program is designed for students interested in research and teaching careers in the health sciences. Students select one of two formal tracks: clinical/biological epidemiology (CBE) or social/behavioral epidemiology (SBE). The two tracks, each with a minimum of 61 credits, emphasize advanced epidemiologic design, methodology, and analytic skills.

The social/behavioral epidemiology track focuses on origins and development of human behavior patterns and how they are influenced and formed by personality, family, culture, and environment. The clinical/biological epidemiology track focuses on the etiology of diseases, particularly cardiovascular, cancer, genetics, and infectious diseases. A detailed description of the details related to each track may be obtained online or by contacting the major coordinator at epichstu@umn.edu.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

For the doctoral program, applicants must have completed or be about to complete a master's degree in a related field.

**Special Application Requirements:**
Because of the program's strong emphasis on methodology, quantitative aptitude is very important. This can be demonstrated by scoring at or above the 70th percentile on the quantitative section of the GRE, along with satisfactory grades in college-level quantitative courses. At least three recommendations (form and separate letter) from faculty and/or work supervisors with knowledge of the applicant's scholastic and professional capabilities and potential, and a statement of goals and objectives (letter of intent) for seeking a career in epidemiology are also required.

In addition to the above materials, applicants for the Ph.D. program must submit a separate essay (statement of research interests) beyond what is required for the SOPHAS application process that provides evidence of their potential to conduct original research in a specific epidemiologic area and, if possible, that indicates an interest in particular methodologies or study designs. Serious doctoral applicants are encouraged to contact the major coordinator at epichstu@umn.edu before applying. Students begin their studies in the fall semester. Applications must be completed by December 1 of the year prior to beginning the doctoral program for scholarship consideration; the final deadline is February 1.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Analytical Writing: 4

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100

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Information current as of August 31, 2018
- Paper Based - Total Score: 600
  - IELTS
    - Total Score: 7
  - MELAB
    - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
37 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students may select one of two formal tracks; both have an applied perspective that emphasizes study design, measurement, quantitative analysis, and data interpretation. Social/behavioral epidemiology focuses on origins and development of human behavior patterns and how they are influenced and formed by personality, family, culture, and environment. Clinical/biological epidemiology focuses on the biological causes of diseases, especially determinants of cardiovascular disease, cancer, infectious diseases, and genetic epidemiology.

The PhD program includes a minimum curriculum of 61 credits. Students must pass written and oral preliminary examinations, serve as a teaching assistant for one semester, write and defend a dissertation, and prepare a first-authored manuscript for publication.

Required Coursework
Take the following courses for a total of 13 credits:
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 6348 - Writing Research Grants (2.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 8341 - Advanced Epidemiologic Methods: Concepts (3.0 cr)
- PUBH 8342 - Advanced Epidemiologic Methods: Applications (3.0 cr)

Take one of the following teaching courses for at least 1 credit:
- GRAD 8101 - Teaching in Higher Education (3.0 cr)
- or GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Clinical/Biological Epidemiology
Clinical/biological epidemiology focuses on the biological causes of diseases, especially determinants of cardiovascular disease, cancer, infectious diseases, and genetic epidemiology.

Clinical/Biological Track
A minimum of 23 credits is required.

Biological Methods/Statistics Requirement (6 credits minimum)
Take one of the following required courses:
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- or PUBH 6363 - Design and Analysis of Cluster-Randomized Trials in Epidemiology (3.0 cr)
Choose additional credits from the following to complete the biological methods/statistics requirement:

- PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 7407 - Analysis of Categorical Data (3.0 cr)
- PUBH 6915 - Nutrition Assessment (2.0 cr)
- PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
- PUBH 8141 - Doctoral Seminar in Observational Inference (2.0 cr)
- PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)

**Content Area Requirement (4 credits minimum)**
Take at least 4 credits from the following:

- PUBH 6386 - Public Health Aspects of Cardiovascular Disease (2.0 cr)
- PUBH 6387 - Cancer Epidemiology (2.0 cr)
- PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
- PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
- PUBH 6389 - Nutritional Epidemiology (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)

**Additional Credits (13 credits minimum)**
Select courses in consultation with the advisor. Courses can include biological methods/statistics courses listed above not used to satisfy the biological methods/statistics requirement, or other appropriate courses.

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**Social/Behavioral Epidemiology**
Social/behavioral epidemiology focuses on origins and development of human behavior patterns and how they are influenced and formed by personality, family, culture, and environment.

**Social/Behavioral Track**
A minimum of 23 credits is required.

**Behavioral Methods/Statistics Requirement (6 credits minimum)**
Take one of the following required courses:

- PUBH 6363 - Design and Analysis of Cluster-Randomized Trials in Epidemiology (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

Choose additional credits from the following to complete the Behavioral Methods/Statistics requirement:

Take 1 or more course(s) from the following:

- PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 7407 - Analysis of Categorical Data (3.0 cr)
- PUBH 6915 - Nutrition Assessment (2.0 cr)
- PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)

**Content Area Requirement (4 credits minimum)**
Take at least 4 credits from the following:

- PUBH 6333 - Principles of Human Behavior I (2.0 cr)
- PUBH 6334 - Human Behavior II (2.0 cr)

**Additional Credits (13 credits minimum)**
Select courses in consultation with the advisor. Courses can include biological methods/statistics courses listed above not used to satisfy the biological methods/statistics requirement, or other appropriate courses.
Twin Cities Campus
Gerontology Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The gerontology minor is not currently available.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The gerontology minor is not currently available.

Declaring the gerontology minor is contingent upon enrollment in a University master's or doctoral degree-granting program. Students should first consult with their program advisor about the advisability of a minor in gerontology, then contact the Gerontology director of graduate studies for minor information and to design their course program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The master's and doctoral minors are developed in consultation with, and should be approved in advance by, the Gerontology director of graduate studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's

Doctoral
**Twin Cities Campus**

**Global Health Postbaccalaureate Certificate**

*School of Public Health - Adm*

**School of Public Health**

Link to a list of faculty for this program.

**Contact Information:**

School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street SE, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636; FAX 612-624-4498.

Email: sph-ask@umn.edu  
Website: [http://www.sph.umn.edu](http://www.sph.umn.edu)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Global Health PBacc Certificate

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Global Health Certificate focuses on knowledge, skills, and attitudes to address health issues that transcend national boundaries, and that develop and implement solutions to health problems that requires global cooperation.

The Global Health Certificate is designed for students who have a strong interest in global health, who have a desire to understand cultures, and who want to experience first-hand a global field experience which may prepare them for work in a global setting. Many students may want to complete the Certificate to complement their graduate degree.

It is increasingly recognized that issues that affect health transcend national boundaries, and that development and implementation of solutions to such health problems requires global cooperation. Global health represents an interdisciplinary approach that embraces both disease prevention in populations and clinical care of individuals, with a strong emphasis on health equity and health as a public good.

**Accreditation**

This program is accredited by Council on Education for Public Health (CEPH)

**Program Delivery**

This program is available:

- partially online (between 50% to 80% of instruction is online)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:

Applicants must hold a baccalaureate degree.

**Special Application Requirements:**

Applicants must submit to SOPHAS Express, a centralized online application service:

- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant’s reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application instructions and requirements visit [www.sph.umn.edu](http://www.sph.umn.edu).

International applicants must submit score(s) from one of the following tests:
TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600
IELTS
- Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Coursework Requirements
Foundations Course (2 Credits)
Take one course from the following list for at least 2 credits.
PUBH 6108 - Foundations of Global Health (0.0 - 2.0 cr)
or PUBH 6134 - Sustainable Development and Global Public Health (2.0 cr)

Other Required Courses (3 Credits)
Take the following courses for a total of 3 credits:
PUBH 6131 - Working in Global Health (2.0 cr)
PUBH 6231 - Global Health Capstone (1.0 cr)

Applied Practice Experience (2 Credits)
Take 2 credits of field experience related to global health.
PUBH 7296 - Applied Practice Experience: Public Health Practice (1.0 - 8.0 cr)
or Other Applied Practice Experience course in the SPH. Please consult with the Global Health certificate program staff about seeking approval.

Electives (8 Credits)
Students must complete a minimum of 8 elective credits. Choose from the following list, or select other global health-related courses in consultation with the Global Health certificate staff.
Take 8 or more credit(s) from the following:
- PUBH 6085 - Alcohol and Tobacco: Ongoing Threats to Global Health (2.0 cr)
- PUBH 6132 - Air, Water, and Health (2.0 cr)
- PUBH 6290 - International Humanitarian Crisis Simulation (1.0 cr)
- PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
- PUBH 6601 - Born a Girl: Global Women's Health (1.0 cr)
- PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- PUBH 6732 - Topics and Methods in Global Health Assessment (2.0 cr)
- PUBH 6906 - Global Nutrition (2.0 cr)
- PUBH 7262 - Globalization and Health (1.0 cr)
- PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
Twin Cities Campus
Global Public Health Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819 Mayo, Room A395, 420 Delaware Street SE, Minneapolis, MN 55455
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Association of Schools and Programs of Public Health describes global health as the interdisciplinary and cross-cultural approach to studying the health of populations across the world, irrespective of national or political boundaries. This minor focuses on the basic tenets of global health and gaining the population health skills necessary to promote the health, well being, safety, and wellness of populations at the local and global levels.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission to the global public health minor is contingent upon prior admission to a master's or doctoral degree-granting program at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Coursework (5 Credits)
All students pursuing the minor must complete the following for at least 5 credits:
- PUBH 6131 - Working in Global Health (2.0 cr)
- PUBH 6231 - Global Health Capstone (1.0 cr)
Take PUBH 6108 for 2 credits, if selected as the required foundations course.
- PUBH 6108 - Foundations of Global Health (0.0 - 2.0 cr)
- or PUBH 6134 - Sustainable Development and Global Public Health (2.0 cr)
Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Electives (2 Credits)
Take at least 2 elective credits to complete the 7-credit minimum for the master's-level minor. Other courses may be considered, with program staff approval.
Take 2 or more credit(s) from the following:
• PUBH 6132 - Air, Water, and Health (2.0 cr)
• PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
• PUBH 6365 - Global Challenges in Infectious Disease Epidemiology (2.0 cr)
• PUBH 6390 - Topics: Epidemiology (0.5 - 4.0 cr)
• PUBH 6732 - Topics and Methods in Global Health Assessment (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)
• PUBH 7262 - Globalization and Health (1.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)

Doctoral
Electives (7 Credits)
Take at least 7 elective credits to complete the 12-credit minimum for the doctoral-level minor. Other courses may be considered, with program staff approval.
Take 7 or more credit(s) from the following:
• PUBH 6132 - Air, Water, and Health (2.0 cr)
• PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
• PUBH 6365 - Global Challenges in Infectious Disease Epidemiology (2.0 cr)
• PUBH 6390 - Topics: Epidemiology (0.5 - 4.0 cr)
• PUBH 6732 - Topics and Methods in Global Health Assessment (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)
• PUBH 7262 - Globalization and Health (1.0 cr)
• PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
Twin Cities Campus
Health Care Administration M.H.A.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42 to 60
- This program requires summer semesters for timely completion.
- Degree: Master of Healthcare Administration

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The full-time master of healthcare administration (M.H.A.) program is appropriate for applicants with limited or no healthcare work experience, or individuals who wish to make a career change from industries other than health care. Now ranked second in the nation by U.S. News & World Report, the program is accredited by the CAHME.

The program's consistently high rankings are a reflection of many factors--an outstanding faculty of researchers and practitioners, location in one of the nation's centers of healthcare innovation, an extraordinary alumni association, and a track record of educating outstanding leaders for the healthcare industries.

Accreditation
This program is accredited by Commission on Accreditation of Healthcare Management Education (CAHME)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Full-time program applicants should have a strong commitment to managing people and resources to create and sustain outstanding healthcare services and organizations. Strong quantitative and communication skills are essential; prior experience in health care is not required.

Visit SPH for detailed application requirements at www.sph.umn.edu

Special Application Requirements:
For the executive program: At least three years of management or clinical leadership experience in a healthcare organization is required. The program reserves the right to require the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT) as a part of the admissions process.

For the full-time program: To prepare for the program's rigorous curriculum, the faculty highly recommends the following coursework prior to matriculation:
- Statistics
- Accounting
- Microeconomics
- Finance

Applicants must submit their test score(s) from the following:
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- **IELTS**
  - Total Score: 7
- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, GMAT, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 42 to 60 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** Please see website for information: www.sph.umn.edu

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

**Required Courses**

- PUBH 6560 - Operations Research and Quality in Health Care (3.0 cr)
- PUBH 6556 - Health and Health Systems (3.0 cr)
- PUBH 6541 - Statistics for Health Management Decision Making (3.0 cr)
- PUBH 6562 - Information Technology in Health Care (2.0 cr)
- PUBH 6535 - Managerial Accounting for Health Services (3.0 cr)
- PUBH 6547 - Health Care Human Resources Management (2.0 cr)
- PUBH 6557 - Health Finance I (3.0 cr)
- PUBH 6555 - Topics in Health Economics (2.0 cr)
- PUBH 6562 - Information Technology in Health Care (2.0 cr)
- PUBH 6565 - Innovation of Healthcare Services (2.0 cr)
- PUBH 6568 - Interprofessional Teamwork in Health Care (2.0 cr)
- PUBH 6564 - Private Purchasers of Health Care: Roles of Employers and Health Plans in U.S. Health Care System (2.0 cr)
- PUBH 6553 - Health Care Management Ethics (1.0 cr)
- PUBH 6596 - Legal Considerations in Health Services Organizations (2.0 cr)

**Advanced Problem Solving or New Product Design (Full-time MHA students only)**

Students choose between the full-time or executive MHA program. 42 credits are required for the Executive MHA program, and 60 required for the full-time program. Students in the full-time program have the option of choosing the Advanced Problem Solving or New Product Design EMPHASIS with the consent of their adviser.

**Executive MHA**

The Executive MHA is specifically designed for practicing executives, physicians, and other healthcare professionals seeking to advance their management and leadership capabilities. This is a 42-credit, 25-month program.

- PUBH 7565 - Health Care Delivery, Design & Innovation (2.0 cr)
- PUBH 7556 - Health and Health Systems (2.0 cr)
- PUBH 7551 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 7535 - Managerial Accounting for Health Services (3.0 cr)
PUBH 7566 - The Henry Capstone: Core Concepts in Managing Health Care Organizations (2.0 cr)
PUBH 7536 - Health Finance I (3.0 cr)
PUBH 7576 - Legal Considerations in Health Services Organizations (2.0 cr)
PUBH 7568 - Interdisciplinary Teamwork in Health Care (2.0 cr)
PUBH 7569 - Health Care Policy (1.0 cr)
PUBH 7541 - Statistics for Health Management Decision Making (3.0 cr)
PUBH 7537 - Health Finance II (3.0 cr)
PUBH 7564 - Private Purchasers of Health Care (2.0 cr)
PUBH 7547 - Health Care Human Resource Management (2.0 cr)
PUBH 7555 - Topics in Health Economics (2.0 cr)
PUBH 7562 - Information Technology in Health Care (2.0 cr)
PUBH 7571 - Organizational Integration in Health Care Delivery (2.0 cr)
PUBH 7572 - Health Care Strategies in Competitive Markets (2.0 cr)
PUBH 7573 - Managing the Embedded Medical Practice (2.0 cr)
PUBH 7553 - Health Care Management Ethics (1.0 cr)
PUBH 6570 - Healthcare Administration (1.0 - 4.0 cr)

-OR-

Full-time MHA
This program is appropriate for applicants with limited or no healthcare work experience or individuals who wish to make a career change. This is a 60-credit, two-year program.

Year 1: An Introduction to Healthcare Administration
- PUBH 6544 - Principles of Problem Solving in Health Services Organizations (3.0 cr)
- PUBH 7596 - Clerkship in Health Care Administration (2.0 cr)
- Electives (2-4 cr) - can take up to 4 elective credits during Year I

Year II: Advanced Courses and Specialization in Healthcare Administration
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 6568 - Interprofessional Teamwork in Health Care (2.0 cr)
- ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
- PUBH 6554 - Healthcare Strategy and Marketing (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
- Electives (2-4 cr) - can take up to 4 elective credits during Year II
- ENTR 6041 - Initiating New Product Design and Business Development (2.0 - 4.0 cr)
  or PUBH 6577 (2 cr) Advanced Problem Solving.

Joint- or Dual-degree Coursework: Master of Healthcare Administration (MHA) and Master of Business Administration (MBA)
Student may take a total of 24 credits in common among the academic programs.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Online/Executive MHA Program

Saudi Arabia
Twin Cities Campus
Health Equity Minor
School of Public Health - Adm
School of Public Health

Link to a [list of faculty](#) for this program.

**Contact Information:**
School of Public Health, MMC 819, Room A395, 420 Delaware Street SE, Minneapolis, MN  55455 (612-626-3500 or 1-800-774-8636)
Email: sph-ask@umn.edu
Website: [http://www.sph.umn.edu](http://www.sph.umn.edu)

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 7
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Health Equity Minor is a graduate minor that allows students to specialize in studying health disparities and inequalities. A firm understanding of the structural factors that cause health inequalities will help prepare students to enter the professional world of public health as an effective advocate.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Declaring this minor is contingent upon prior admission to a University master’s or doctoral degree-granting program.

Students should first consult with their program advisor, then contact the Health Equity Director of Graduate Studies regarding requirements.

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

**Required Capstone Seminar (1 Credit)**
All students pursuing the minor must take the following required seminar:

- PUBH 6772 - Health Disparities Capstone Seminar (1.0 cr)

**Program Sub-plans**
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

**Master’s**
**Additional Coursework (6 Credits)**
Select at least 6 credits from the following, in consultation the advisor and the health equity director of graduate studies, to complete the 7-credit minimum requirement:
CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
or PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
or PUBH 6055 - Social Inequalities in Health (2.0 cr)
or PUBH 6855 - Medical Sociology (3.0 cr)

Doctoral
Required Coursework (10 Credits)
Complete the following required courses for a total of 10 credits:
CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
PUBH 6055 - Social Inequalities in Health (2.0 cr)
PUBH 6855 - Medical Sociology (3.0 cr)

Electives (1 Credit)
Select at least 1 elective credit, in consultation with the advisor and the health equity director of graduate studies, to complete the 12-credit minimum requirement.

PubH 6000 Topics: Urban Health and Social Policy (2 cr)
PubH 6570 Topics: Introduction to Population Health: A Health System Perspective
PUBH 6000 - Topics: Community Health Promotion (0.5 - 4.0 cr)
or PUBH 6370 - Social Epidemiology (2.0 cr)
or PUBH 6570 - Healthcare Administration (1.0 - 4.0 cr)
or PUBH 6601 - Born a Girl: Global Women's Health (1.0 cr)
or PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
or PUBH 6675 - Women's Health (2.0 cr)
or PUBH 6804 - Community Mental Health (2.0 cr)
or PUBH 6703 - Health Impact Assessment: A Tool to Promote Health Equity (1.5 cr)
or PUBH 7241 - Culturally Responsive Communication (1.0 cr)
or PUBH 7242 - War and Public Health (1.0 cr)
or PUBH 7244 - Community-based Participatory Research (1.0 cr)
or PA 5211 - Land Use Planning (3.0 cr)
or PA 5290 - Topics in Planning (0.5 - 4.0 cr)
or PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
or PA 5421 - Racial Inequality and Public Policy (3.0 cr)
or PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)
or PA 5452 - Immigration and Public Policy (3.0 cr)
or PA 8203 - Neighborhood Revitalization Strategies and Theories (4.0 cr)
or NURS 5033 - Population-Focused Health in Public Health and Mental Health Nursing (5.0 cr)
or NURS 5800 - Nursing Topics (1.0 - 4.0 cr)
or POL 8360 - Topics in American Politics (3.0 cr)
or SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)
or SOC 8201 (Inactive) (3.0 cr)
or SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
or SOC 8735 - Sociology of Culture (3.0 cr)
or GCC 5003 - Seeking Solutions to Global Health Issues [GP] (3.0 cr)
Twin Cities Campus
Health Services Research, Policy, and Administration M.S.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 34
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MS in Health Services Research, Policy & Administration is for people with an analytical focus who enjoy research and data-driven approaches to solving health care problems.

Our program offers specializations that focus on health economics, access, quality, and social determinants of health, disparities, health policy, quality improvement, data science, analytics, and big data. We will accommodate your interests and fuel your passion. Use this degree to transition into practice or into a doctoral degree.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan B: Plan B requires 34 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: There are two options for completing the master's project: 1) An industry-specific project where the student works on a project with a local organization and presents their findings. 2) Independent research conducted on a relevant topic of interest, with the guidance of the academic advisor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Good math skills are essential. Previous coursework in algebra, statistics, or other quantitative coursework is recommended.

Required Curriculum (21 Credits)

Coursework (19 Credits)
Take at least 19 credits from the following list:
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 6724 - The Health Care System and Public Health (3.0 cr)
- PUBH 6250 - Foundations of Public Health (2.0 cr)
- PUBH 6341 - Epidemiologic Methods I (3.0 cr)
  - or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
  - or PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Plan B Project (2 Credits)
Take 2 Plan B project credits, in consultation with the advisor.
- PUBH 7894 - MS in Health Services Research, Policy, and Administration Plan B Project (1.0 - 5.0 cr)

Specialization Areas (6 to 11 Credits)
Select one of the following specialization areas, or design and propose a specialization area in consultation with the advisor.

Cost Effectiveness (11 Credits)
Take the following specialization courses for 11 credits:
- PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 6809 - Advanced Methods in Health Decision Science (3.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
  - or PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
  - or PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Health Care Quality Improvement/Operations Research (8 Credits)
Take the following specialization courses for 8 credits:
- PUBH 6560 - Operations Research and Quality in Health Care (3.0 cr)
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
  - or PUBH 6560 - Operations Research and Quality in Health Care (3.0 cr)
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)

Health Services Research and Evaluation (6 Credits)
Take 6 credits of specialization courses from the following list:
- PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
  - or PUBH 6863 - Understanding Health Care Quality (2.0 cr)
  - or PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
  - or PUBH 6810 - Survey Research Methods (3.0 cr)
  - or PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
  - or PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
  - or PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
  - or PUBH 6806 - Principles of Public Health Research (2.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
  - or PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
  - or PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

Health Policy (9 Credits)
Take the following specialization courses for at least 9 credits:
- PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
- PUBH 6711 - Public Health Law (2.0 cr)
- PUBH 6702 - Integrative Leadership Seminar (3.0 cr)
- PUBH 6835 - Principles of Health Policy (2.0 cr)
  - or PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)
  - or PUBH 6832 - Economics of the Health Care System (3.0 cr)
  - or PUBH 6555 - Topics in Health Economics (2.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
  - or PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
  - or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
  - or PUBH 6806 - Principles of Public Health Research (2.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
  - or PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

Health Economics (6 Credits)
Take at least 6 specialization credits.
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
or PUBH 6555 - Topics in Health Economics (2.0 cr)
or Social Determinants of Health (6 Credits)
Take 6 credits of specialization courses from the following list:
PUBH 6055 - Social Inequalities in Health (2.0 cr)
or PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
or PUBH 6675 - Women's Health (2.0 cr)
or CSPH 5115 - Cultural Awareness, Knowledge and Health (3.0 cr)
or PUBH 6855 - Medical Sociology (3.0 cr)
or PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
or PUBH 6804 - Community Mental Health (2.0 cr)
or PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
or PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)

Joint- or Dual-degree Coursework: JD/MS-HSRP&AStrong>Student may take a total of 8 credits in common among the academic programs.
Twin Cities Campus
Health Services Research, Policy, and Administration Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: spf-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The HSRP&A minor is available to students who are interested in the social, political, and economic forces that affect the operations, financing, and delivery of health care. This minor offers a high degree of flexibility in course selection, which can be tailored to individual interests and goals of the student.

Doctoral students have the option of declaring the standard HSRP&A minor or the HSRP&A minor with a focus in Health Economics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The Health Services Research, Policy, and Administration graduate minor is contingent upon enrollment and good academic standing in a University master's or doctoral degree-granting program.

Students should confer with their program advisor about the advisability of an HSRP&A minor before contacting the HSRP&A director of graduate studies or graduate program coordinator. Approval of the HSRP&A director of graduate studies is required.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Master’s Minor Requirements
Take at least 6 HSRP&A credits, selected in consultation with the HSRP&A director of graduate studies, from the following course number sequences: PubH 65xx, PubH 67xx, PubH 68xx, or PubH 88xx.

PUBH 6xxx
Doctoral Minor -- Standard (Option 1)

Required Courses
Take one of the following two courses:
- PUBH 6556 - Health and Health Systems (3.0 cr)
- or PUBH 6724 - The Health Care System and Public Health (3.0 cr)
Take one of the following two courses:
- PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
- or PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)

Electives
To complete the 12-credit minimum, select HSRP&A electives in consultation with the HSRP&A director of graduate studies from the following course number sequences: PubH 65xx, PubH 67xx, PubH 68xx, or PubH 88xx
- PUBH 6xxx
- PUBH 8xxx

Doctoral Minor -- Health Economics Focus (Option 2)

Take the following courses for 6 credits:
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 8821 - Health Economics II (3.0 cr)

Electives
To complete the 12-credit minimum, select at least 6 credits in consultation with the HSRP&A director of graduate studies from the following:
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
- PUBH 8811 - Research Methods in Health Care (3.0 cr)
Twin Cities Campus
Health Services Research, Policy, and Administration Ph.D.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 69 to 82
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Health services research is a multidisciplinary field of study. Health services researchers examine how social factors, government policies, financing systems, organizational structures, and personal behaviors affect access to needed care, the quality of care provided, and the cost of care delivery. The focus of research is broad and includes individuals, families, providers, healthcare organizations, communities, and populations. The field of health services research is ultimately interested in both "health," understood as health status and well-being, as well as "health care," understood as the effective delivery of healthcare services.

The doctoral program in health services research, policy, and administration is primarily for students interested in academic careers or senior research positions in government or the private sector. The core curriculum is a multidisciplinary examination of the social, political, and economic forces that affect the organization, financing, and delivery of health care services. The emphasis is on theory, modeling, and quantitative methods. Coursework is complemented by the student's involvement with faculty on health services research projects, through weekly academic research seminars, doctoral colloquia, and conference presentations.

Students come from a variety of educational backgrounds, including decision sciences, economics, political science, sociology, business, engineering, and public affairs. Strong quantitative skills are essential.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Preferred GRE scores from exams taken before August 1, 2012 are: Verbal: 600, Quantitative: 600, Analytical Writing: 5.0. Minimum GRE scores taken after Aug. 1, 2012 are: 300 (combined verbal and quantitative), and 4.0 Analytical Writing.

The PhD program requires prerequisites in calculus and statistics. Applicants who have not completed the prerequisites, but are otherwise qualified for admission, are required to take relevant courses at the University or another accredited institution before beginning the program.

Special Application Requirements:
Please visit www.sph.umn.edu for admission requirements

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144
  - General Test - Analytical Writing: 5
International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
33 to 46 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Required Coursework
Take all of the following core courses, including the biostatistics or econometrics series, for a total of 31 credits.
- PUBH 8810 - Research Studies in Health Care (3.0 cr)
- PUBH 8811 - Research Methods in Health Care (3.0 cr)
- PUBH 8830 - Writing for Research (2.0 cr)
- PUBH 8831 - Writing for Research (2.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 6855 - Medical Sociology (3.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
- PUBH 8341 - Advanced Epidemiologic Methods: Concepts (3.0 cr)

Biostatistics and Econometrics Options
Complete the 31-credit core course requirement by taking the biostatistics or econometrics series.

Biostatistics
To complete the biostatistics series, take the following courses for 8 credits:
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)

or Econometrics
To complete the econometrics series, take the following courses for 8 credits:
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Concentration Areas
Multidisciplinary Social Science

Required Concentration Coursework
- PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
- APEC 5151 - Applied Microeconomics: Firm and Household (3.0 cr)

Required Theory Course
Choose a theory course from the list below, in consultation with your advisor.
PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
or PUBH 8821 - Health Economics II (3.0 cr)
or APEC 8203 - Applied Welfare Economics and Public Policy (3.0 cr)
or SOC 8701 - Sociological Theory (4.0 cr)
or SOC 8721 - Social Psychology: Micro-Sociological Approaches to Inequalities and Identities (3.0 cr)
or PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)
or PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
or PUBH 6809 - Advanced Methods in Health Decision Science (3.0 cr)

Supporting Program Requirement
Take at least 12 outside credits in consultation with the advisor and concentration faculty.

-OR-

Health Organizations and Management Science
Required Concentration Coursework
Take 6 - 8 credit(s) from the following:
• MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
• MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
• SOC 8745 - Research on Quality Management (3.0 cr)
• PUBH 8894 - Directed Research: Health Services Research, Policy, and Administration (1.0 - 8.0 cr)
• HRIR 8802 - Core Seminar: Organizational Behavior (4.0 cr)
• IDSC 8721 - Behavioral Decision Theory (3.0 cr)

Required Methods Foundation Course
Take one of the following methods foundations courses:
SOC 8412 - Social Network Analysis: Theory and Methods (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or HRIR 8812 - Core Seminar: Research Methods in Work and Organizations (4.0 cr)

Supporting Program Requirement
Take at least 12 outside credits in consultation with the advisor and concentration faculty.

-OR-

Health Decision Science
Required Concentration Coursework
PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
PUBH 6809 - Advanced Methods in Health Decision Science (3.0 cr)

Additional Coursework
Take 2 or more credit(s) from the following:
• IDSC 8721 - Behavioral Decision Theory (3.0 cr)
• IDSC 8511 - Conceptual Topics and Research Methods in Information and Decision Sciences (3.0 cr)

Supporting Program Requirement
Take at least 12 outside credits from the list below, or other outside coursework, in consultation with the advisor and concentration faculty.
IE 5112 {Inactive} (3.0 cr)
PUBH 7450 - Survival Analysis (3.0 cr)
PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)

-OR-

Sociology of Health and Illness
Required Concentration Coursework
Theoretical Foundations Courses
Take 6 or more credit(s) from the following:
• PUBH 8805 - Sociological Theory in Health Services Research (3.0 cr)
• SOC 8701 - Sociological Theory (4.0 cr)
• SOC 8731 - Sociology of Knowledge (3.0 cr)
• SOC 8211 - The Sociology of Race & Racialization (3.0 cr)
• MGMT 8302 - Seminar in Organizations Theory (4.0 cr)

Supporting Program Requirements
Take at least 12 outside credits in consultation with the advisor and concentration faculty. At least 8 credits must be from an area of specialization, and at least 4 credits must be advanced methodology coursework.

Specialization Courses
Take at least 8 credits from the following list:
• SOC 8735 - Sociology of Culture (3.0 cr)
SOC 8590 - Topics in Life Course Sociology (3.0 cr)
SOC 8390 - Topics in Political Sociology (3.0 cr)
SOC 8101 - Sociology of Law (3.0 cr)
SOC 8290 - Topics in Social Stratification (3.0 cr)
SOC 8501 - Sociology of the Family (3.0 cr)
SOC 8221 - Sociology of Gender (3.0 cr)

Advanced Methodology Courses
Take at least 4 credits from the following list:

PSY 8881 - Seminar: Quantitative and Psychometric Methods (3.0 cr)
PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
PUBH 6811 - Health Disparities Research: Measures, Methods, and Data (2.0 cr)
POL 8126 - Qualitative Methods (3.0 cr)
PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)

-OR-

Clinical Outcomes Research

Required Concentration Coursework

PUBH 6342 - Epidemiologic Methods II (3.0 cr)
PUBH 6343 - Epidemiologic Methods III (4.0 cr)
PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
PUBH 6863 - Understanding Health Care Quality (2.0 cr)
PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)

Supporting Program Requirement
Take at least outside 12 credits in consultation with the advisor and area of concentration faculty.
Take 12 or more credit(s) from the following:
• PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
• PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
• PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
• PUBH 6810 - Survey Research Methods (3.0 cr)
• PUBH 7450 - Survival Analysis (3.0 cr)

-OR-

Health Policy and Analysis

Required Concentration Coursework

PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)

Supporting Program Requirement
Take at least outside 12 credits in consultation with the advisor and concentration faculty. Students can choose to complete the supporting program requirement one of two ways: a methods focus or a topic-specific focus.

Methods Focus
Students choosing this option are strongly encouraged to take PUBH 6845 and PUBH 8804.
Take 12 or more credit(s) from the following:
• PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
• PUBH 6810 - Survey Research Methods (3.0 cr)
• PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
• PUBH 8813 - Measurement of Health-Related Social Factors (3.0 cr)
• PUBH 6811 - Health Disparities Research: Measures, Methods, and Data (2.0 cr)
• PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
• PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)

or Topic-specific Focus
Take courses in focus areas such as LTC, economics, health disparities, or ethics. Approval of the concentration faculty is required prior to taking the courses.

-OR-

Health Economics

The health economics concentration requires prerequisites in calculus, statistics, and microeconomics. Consult with the advisor and concentration faculty about satisfying this requirement.

Required Concentration Coursework
Take the following coursework, including one microeconomics series.
PUBH 8821 - Health Economics II (3.0 cr)
Required Microeconomics Series

Applied Microeconomics
- APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)
- APEC 8002 - Applied Microeconomic Analysis of Production and Choice Under Uncertainty (2.0 cr)
- APEC 8003 - Applied Microeconomic Analysis of Game Theory and Information (2.0 cr)
- APEC 8004 - Applied Microeconomic Analysis of Social Choice and Welfare (2.0 cr)

or Microeconomic Analysis
- ECON 8001 - Microeconomic Analysis (2.0 cr)
- ECON 8002 - Microeconomic Analysis (2.0 cr)
- ECON 8003 - Microeconomic Analysis (2.0 cr)
- ECON 8004 - Microeconomic Analysis (2.0 cr)

or Microeconomic Theory
- ECON 8101 - Microeconomic Theory (2.0 cr)
- ECON 8102 - Microeconomic Theory (2.0 cr)
- ECON 8103 - Microeconomic Theory (2.0 cr)
- ECON 8104 - Microeconomic Theory (2.0 cr)

Supporting Program Requirement

Take at least 12 outside credits in consultation with the advisor and concentration faculty. At least 8 of the 12 credits must be from the methods coursework list.

Take 12 or more credit(s) including 1 or more sub-requirements(s) from the following:

Methods Coursework

Choose at least two courses from the options below. Multi-course sequences count as one course, e.g. APEC 8211 must be taken with 8212. ECON 8205, must also include 8206, 8207, and 8208. ECON 8117 must also include 8118.

Take 2 or more course(s) totaling 8 or more credit(s) from the following:
- APEC 8211 - Econometric Analysis I (4.0 cr)
- APEC 8212 - Econometric Analysis II (4.0 cr)
- ECON 8205 - Applied Econometrics (2.0 cr)
- ECON 8206 - Applied Econometrics (2.0 cr)
- ECON 8207 - Applied Econometrics (2.0 cr)
- ECON 8208 - Applied Econometrics (2.0 cr)
- HRIR 8812 - Core Seminar: Research Methods in Work and Organizations (4.0 cr)
- ECON 8117 - Noncooperative Game Theory (2.0 cr)
- ECON 8118 - Noncooperative Game Theory (2.0 cr)
- APEC 8202 - Mathematical Optimization in Applied Economics (3.0 cr)
- APEC 8206 - Dynamic Optimization: Applications in Economics and Management (3.0 cr)
- PUBH 8804 - Advanced Quantitative Methods Seminar (3.0 cr)

Additional Supporting Program Coursework

Take additional outside coursework as needed to complete the 12-credit supporting program requirement, in consultation with the advisor and concentration faculty.

Take 0 or more course(s) from the following:
- ECON 8xxx
- APEC 8xxx
- PUBH 8862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)

Joint- or Dual-degree Coursework: Joint Degree with Law & PhD in Health Services Research, Policy & Administration (JD/PhD) Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Management Fundamentals Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Management Fundamentals PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This certificate program provides students with the fundamentals of healthcare management. It includes coursework in the design of health care delivery systems, health economics, cost accounting in health care, introduction to health care finance, teamwork in health care, and an introduction to management principles in health care.

The program includes the core courses of the Executive MHA, but is for individuals who do not desire a full MHA, including those working in health care organizations who are interested in developing a better understanding of management.

Accreditation
This program is accredited by Commission on Accreditation of Healthcare Management.

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Admission to the certificate is decided by the M.H.A. faculty with the advice and counsel of an admissions committee. Admission to the certificate requires the following:
- a bachelor's degree from an accredited college or university
- at least three years experience in a healthcare organization
- current employment in a healthcare organization which affords the opportunity to apply the assignments in the coursework, or an agreement with such an organization in which the applicant is not employed
- a letter of intent describing career interests and the relevance of the certificate to the applicant's personal development

Students may decide to pursue the executive M.H.A. after completing the first or second semester of the certificate curriculum. Students interested in that option will be required to meet the requirements for admission to the executive M.H.A.

Note: All students in the management fundamentals certificate will be expected to bring a personal computer to the on-campus sessions.

Other than the admission requirements, there are no prerequisites.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.

Required Coursework (14 credits)
Take PUBH 7570 for 2 credits.
- PUBH 7565 - Health Care Delivery, Design & Innovation (2.0 cr)
- PUBH 7535 - Managerial Accounting for Health Services (3.0 cr)
- PUBH 7556 - Health and Health Systems (2.0 cr)
- PUBH 7551 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 7536 - Health Finance I (3.0 cr)
- PUBH 7570 - Healthcare Administration (1.0 - 4.0 cr)
Twin Cities Campus
Maternal and Child Health M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42 to 48
- This program requires summer semesters for timely completion.
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While the name of the program, Maternal and Child Health (MCH), may suggest that a focus only on mothers and children, the MPH in maternal and child health program is dedicated to improving the health of youth and families too. The program is especially interested in socially vulnerable populations and the environments, behaviors, and policies that affect their long-term health and well-being.

Students come from a variety of backgrounds, but share a common interest in social justice and public health principles. Graduates quickly assume leadership roles in nonprofit organizations, research settings, state and local public health agencies, and healthcare organizations.

The program has a standard, on-campus curriculum (with the option of an epidemiology emphasis) and an online curriculum.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Prefer at least one year’s work or volunteer experience in a clinical, community-based, public health or managed-care agency/program that focuses on women, children, adolescents, and/or families.

Also prefer a basic understanding of physiological and/or psychological human development as demonstrated by coursework, experience, and/or referenced readings.

Applicants to the advanced standing (online) track must hold either an advanced degree (e.g., MS, MD, MA, MSW) or have 3-5 years of experience directly related to maternal and child health.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5

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Information current as of August 31, 2018
International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 42 to 48 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: See department for more details.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Please visit www.sph.umn.edu for the current curriculum options available.

Standard Program -- Scientific Basis Coursework

Select at least 8 credits from the following list, in consultation with the advisor.

Take 8 or more credit(s) from the following:

- PUBH 6686 - Global Reproductive Health (2.0 cr)
- PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- PUBH 6606 - Children's Health: Issues, Programs, and Policies (2.0 cr)
- PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 cr)
- PUBH 6613 - Children and Youth With Special Health Care Needs (2.0 cr)
- PUBH 6675 - Women's Health (2.0 cr)
- PUBH 6902 [Inactive] (2.0 cr)
- PUBH 6903 [Inactive] (2.0 cr)
- PUBH 6906 - Global Nutrition (2.0 cr)
- PUBH 6123 - Violence Prevention and Control: Theory, Research, and Application (2.0 cr)
- PUBH 6850 - From Kid to Community: Personal, Social and Environmental Influences on Youth Obesity (2.0 cr)
- PUBH 6955 - Using Policy to Address Child and Adolescent Obesity Prevention (1.0 cr)
- PA 5451 - Immigration, Health and Public Policy (3.0 - 4.0 cr)

Standard Program -- Required Methodological and Analytical Skills Course

Take one of the following two courses, in consultation with the advisor.

PUBH 6034 - Evaluation (3.0 cr)
or PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

Standard Program -- Additional Methodological and Analytical Skills Coursework

Take at least 3 courses from the following list, in consultation with the advisor.

Take 4 - 11 credit(s) from the following:

- PUBH 6035 - Applied Research Methods (3.0 cr)
- PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
- PUBH 6342 - Epidemiologic Methods II (3.0 cr)
- PUBH 6420 - Introduction to SAS Programming (1.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 7400 - Topics: Biostatistics (0.5 - 4.0 cr)
- PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
- PUBH 6636 - Qualitative Research Methods in Public Health Practice (2.0 cr)
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
- PUBH 6810 - Survey Research Methods (3.0 cr)
- PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)
- PUBH 6910 *(Inactive)* (1.0 cr)
- PUBH 6914 - Community Nutrition Intervention (3.0 cr)

**Standard Program -- Grant Writing Course**
Take one of the following courses:
- PUBH 6673 - Grant Writing for Public Health (1.0 cr)
  or NURS 5925 - Grant Writing and Critique (1.0 cr)

**Standard Program -- Foundation Course**
Take one of the following courses:
- PUBH 6630 - Foundations of Maternal and Child Health Leadership (3.0 cr)
  or PUBH 6655 - Principles and Programs in Maternal and Child Health (2.0 cr)

**Standard Program -- Management Policy or Advocacy Skills Coursework**
Take one course from the following list, in consultation with the advisor.
Take 1 or more course(s) from the following:
- PUBH 6045 - Skills for Policy Development (1.0 cr)
- PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
- PUBH 6074 - Mass Communication and Public Health (3.0 cr)
- PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
- PUBH 6634 - Children and Families: Public Health Policy and Advocacy (2.0 cr)
- PUBH 6571 - Leading Performance Improvement in Health Care (2.0 cr)
- PUBH 6700 *(Inactive)* (3.0 cr)
- PUBH 6702 - Integrative Leadership Seminar (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
- PUBH 6755 - Planning and Budgeting for Public Health (2.0 cr)
- PUBH 6805 - Introduction to Project Management for Health Professionals (2.0 cr)
- PUBH 6807 *(Inactive)* (3.0 cr)
- PUBH 6835 - Principles of Health Policy (2.0 cr)

**Standard Program -- Public Health Core Coursework**

**Environmental Health**
Take one of the following courses:
- PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental Health (2.0 cr)

**Epidemiology**
Take one of the following courses:
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

**Biostatistics**
Take one of the following courses:
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)

**Ethics**
Take one of the following courses:
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
  or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

**Management**
Take exactly 1 course(s) from the following:
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

**Standard Program -- Field and Culminating Experience**
Take at least 2 credits of PUBH 7696, and 1-2 credits of PUBH 7694.
- PUBH 7696 - Field Experience: Maternal and Child Health (1.0 - 4.0 cr)
- PUBH 7694 - Culminating Experience: Maternal and Child Health (1.0 - 4.0 cr)

**Standard Program -- Electives**
Take elective credits, in consultation with the advisor, to meet the 48-credit requirement.

**Joint- or Dual-degree Coursework:** J.D./M.P.H.-Maternal and Child Health M.S.W./M.P.H.-Maternal and Child Health
Student may take a total of 12 credits in common among the academic programs.

**Program Sub-plans**
A sub-plan is not required for this program.
Students may complete the program with more than one sub-plan.

Online
Online Program -- Required Coursework
Scientific Basis Courses
Take 6 or more credits from the following:
• PUBH 6686 - Global Reproductive Health (2.0 cr)
• PUBH 6606 - Children’s Health: Issues, Programs, and Policies (2.0 cr)
• PUBH 6613 - Children and Youth With Special Health Care Needs (2.0 cr)
• PUBH 6902 [Inactive] (2.0 cr)
• PUBH 6903 [Inactive] (2.0 cr)

Methodological and Analytical Skills -- Required Course
PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

Additional Methods Courses
Take 3 credits in consultation with the advisor.

Management and Communication Skills Courses
Take the following two courses:
NURS 5925 - Grant Writing and Critique (1.0 cr)
PUBH 6655 - Principles and Programs in Maternal and Child Health (2.0 cr)

Culminating and Field Experience Courses
Take 1 to 2 credits of PUBH 7694 and 2 credits of PUBH 7696.
PUBH 7696 - Field Experience: Maternal and Child Health (1.0 - 4.0 cr)
PUBH 7694 - Culminating Experience: Maternal and Child Health (1.0 - 4.0 cr)

Electives
Take elective credits, in consultation with the advisor, to meet the 42-credit minimum. Elective credits can include courses offered during the School of Public Health’s Summer Institute.

Public Health Core Courses
Take the following required courses:
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6101 - Environmental Health (2.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)

Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity and mortality experienced by minority cultural and social groups in the US, as well as unequal quality of and access to healthcare. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota’s ranking as one of the nation’s healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:

- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer and HIV/AIDS are higher for many minority communities compared to the state as a whole.

SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, Interdisciplinary Concentrations Coordinator, at franc004@umn.edu or 612-624-6952.

Public Health Policy Interdisciplinary Concentration Area
PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps MPH majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- Understanding community dynamics
- Developing advocacy skills for public health

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Information current as of August 31, 2018
Analyzing legal and policy structures
Evaluating and implementing policies and programs
Influencing community health
Motivating and educating stakeholders and decision-makers
Using policy as prevention strategy
Eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, Interdisciplinary Concentrations Coordinator, at franc004@umn.edu or 612-624-6952.
Twin Cities Campus
Molecular and Systems Toxicology, PhD
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street SE, Minneapolis, MN 55455. (612-626-3500 OR 1-800-774-8636, FAX 612-624-4498).
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 53
• This program requires summer semesters for timely completion.
• The PhD research project can occur at any of the University of Minnesota coordinate campuses.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program is an interdisciplinary major offering the PhD degree housed in the Division of Environmental Health Sciences within the School of Public Health. All requirements of the University of Minnesota School of Public Health must be completed within a seven-year time frame degree completion. A master's degree is not required for completion of the PhD in molecular and systems toxicology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

B.A. or B.S. in basic sciences from an accredited institution of higher education required.

Other requirements to be completed before admission:
Basic chemistry through organic chemistry, biochemistry, and cell biology.

Special Application Requirements:
Physiology course recommended before starting program.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
23 credits are required in the major.
6 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Current topics in toxicology (PubH 8165) must be taken for 1 credit each over two separate terms.

Required Courses
PUBH 6112 - Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals (2.0 cr)
PUBH 6164 - Toxicological Analysis (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 8163 - Toxicology (5.0 cr)
PUBH 8165 - Current Topics in Toxicology (1.0 cr)
PUBH 8166 - Experiences in Toxicology Research (3.0 cr)

Minimum of six credits of electives

Electives
Selected in consultation with academic advisor
Twin Cities Campus
Public Health Administration and Policy M.P.H.

School of Public Health

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42 to 44
- This program requires summer semesters for timely completion.
- PCAS Data Entry
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Public Health Administration and Policy (PHAP) program offers a core curriculum centering on managing organizations to improve the health of certain populations. Throughout the program, there is a strong emphasis on developing effective communication skills and the ability to work well with various cultures and communities.

To receive this degree, students will need to complete the curriculum, a field experience, and a master's project. Graduates pursue public health careers in a variety of settings including non-profit organizations, state and local public health agencies, and healthcare companies.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Preferred GRE performance expectations (test taken post August 2011): A combination of 300 on the quantitative and verbal sections of the test and a score of 3.5 on the analytical writing assessment. Some programs may have higher preferred minimum scores. Check specific programs for details.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 500
  - General Test - Quantitative Reasoning: 500
  - General Test - Analytical Writing: 3.5
- GMAT
- MCAT
- LSAT
  - Law School Admission Test (LSAT) score: 150

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100

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Information current as of August 31, 2018
Program Requirements

Plan C: Plan C requires 42 to 44 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Culminating Experience

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

Required SPH Core Courses

M.P.H. Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBH 6020</td>
<td>Fundamentals of Social and Behavioral Science</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6751</td>
<td>Principles of Management in Health Services Organizations</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6101</td>
<td>Environmental Health</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6320</td>
<td>Fundamentals of Epidemiology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6414</td>
<td>Biostatistical Literacy</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6741</td>
<td>Ethics in Public Health: Professional Practice and Policy</td>
<td>1.0 cr</td>
</tr>
</tbody>
</table>

PHAP Core Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBH 6700</td>
<td>(Inactive)</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6724</td>
<td>The Health Care System and Public Health</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PUBH 6755</td>
<td>Planning and Budgeting for Public Health</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 6806</td>
<td>Principles of Public Health Research</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 7796</td>
<td>Field Experience: Public Health Administration and Policy</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PUBH 7784</td>
<td>Master's Project Seminar: PHAP and HSRP &amp; A</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>PUBH 7794</td>
<td>Master's Project: Public Health Administration and Policy</td>
<td>2.0 - 3.0 cr</td>
</tr>
<tr>
<td>PUBH 6870</td>
<td>Topics: Public Health Administration and Policy</td>
<td>1.0 - 3.0 cr</td>
</tr>
</tbody>
</table>

Specialty Areas (includes concentrations, emphasis)

Students must complete 7 credits within one specialty area. NOTE: If a student chooses an interdisciplinary concentration, a specialty area need not be chosen.

Management

For this area, PUBH 6727 is a required course; remaining credits will be chosen along with the advisor from a list of courses.

PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)

-OR-

Analysis

For this area, PUBH 6717, 6811, 6845 and 6852 are required courses; remaining credits will be chosen along with the advisor from a list of courses.

PUBH 6717 - Decision Analysis for Health Care (2.0 cr)

PUBH 6811 - Health Disparities Research: Measures, Methods, and Data (2.0 cr)

PUBH 6845 - Using Demographic Data for Policy Analysis (3.0 cr)

PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
Policy
For this area, PubH 6711 and 6835 are required courses; remaining credits will be chosen along with the advisor from a list of courses.
PubH 6711 - Public Health Law (2.0 cr)
PubH 6835 - Principles of Health Policy (2.0 cr)

-OR-

General Health Policy and Management
For this area, PubH 6726 and 6835 are required courses; remaining credits will be chosen along with the advisor from a list of courses.
PubH 6727 - Health Leadership and Effecting Change (2.0 cr)
PubH 6835 - Principles of Health Policy (2.0 cr)

Program Sub-plans
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Executive Public Health Administration and Policy
This sub-plan is limited to students completing the program under Plan C.

The e-PHAP degree is a 42 credit program designed to be completed in 25 months. It is designed for working public health professionals who are in, or would like to move into, leadership or managerial roles in organizations that provide core public health functions. Students enrolled in the program will spend 17 days on campus where they will complete four intensive (7 credits total) in-person courses that include an online component. The remainder of the program is delivered in an online environment.

Three years of professional public health experience.

ePHAP Core Courses
These courses are required for students enrolled in the Executive Public Health Administration and Policy program, along with the required M.P.H core courses (14 credits), plus two credits of electives.
Course will review how to use and understand data to help make decision within a public health organization. First time offered fall 2014. Syllabus currently in development. Course is two credits.
PubH 6700 - [Inactive] (3.0 cr)
PubH 6724 - The Health Care System and Public Health (3.0 cr)
PubH 6727 - Health Leadership and Effecting Change (2.0 cr)
PubH 6755 - Planning and Budgeting for Public Health (2.0 cr)
PubH 6835 - Principles of Health Policy (2.0 cr)
PubH 7796 - Field Experience: Public Health Administration and Policy (2.0 cr)
Course will review how to lead an organization through changes determined via evaluating program effectiveness. First time offered fall 2015. Syllabus currently in development. Course is two credits.
This course will address basic concepts of public health law and the legal bases for the existence and administration of public health programs. First time offered spring 2015. Syllabus currently in development. Course is one credits.
PubH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
PubH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)

Global Health Interdisciplinary Concentration Area
The Global Health Interdisciplinary Concentration (GHIC) provides graduate students who are pursuing an M.P.H. with information necessary to define the constitution, cause, and consequences of health problems worldwide. The program offers a unique opportunity to explore the relationships between health, environment, politics, culture, and economic pressures in developed and developing nations.

Developing countries are currently undergoing profound demographic changes--changes that are accompanied by shifts in patterns of illness. In many of these nations, the major causes of morbidity and mortality are mutating from traditional infectious diseases to chronic, non-communicable maladies like cardiovascular diseases, cancer, and diabetes. As a result, there is increasing demand for qualified public health practitioners who can identify and help reduce the vast and varied global vectors for chronic disease.

Practical application of theory in the field is a major component of the GHIC. Students are encouraged to hone their expertise by pursuing an international field experience. The School of Public Health has established relationships with collaborative institutions abroad.

SPH graduate students must complete a formal program plan if they want the GHIC to appear on their transcripts. For more
Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the U.S., as well as unequal quality of and access to health care. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:
- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer, and HIV/AIDS are higher for many minority communities compared to the state as a whole.

SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Public Health Policy Interdisciplinary Concentration Area
Public Health Policy Interdisciplinary Concentration (PHPIC) coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- understanding community dynamics
- developing advocacy skills for public health
- analyzing legal and policy structures
- evaluating and implementing policies and programs
- influencing community health
- motivating and educating stakeholders and decision-makers
- using policy as prevention strategy
- eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Arizona State University
The Public Health Administration & Policy (PHAP) program hosted by Arizona State University is a 44 credit program designed to be completed by students located in the Phoenix area in a hybrid format.

Students earn a University of Minnesota MPH degree, by taking a combination of online classes from the University of Minnesota and in-person classes at the Arizona State University Campus.

The program is targeted to students in Phoenix and the surrounding area interested in working with government agencies, nonprofits, or private health care organizations that seek to advance public health.

This program prepares students to:
- Lead, manage and evaluate public health programs and agencies
- Design and implement research to guide evidence-based decision-making
- Evaluate and inform public policy that impacts population health

MPH Core
Students will be required to take the MPH core courses for a total of 14 credits.
- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6102 - Issues in Environmental Health (2.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

PHAP Core
Students will be required to take the PHAP Core courses for a total of 17 credits.
- PUBH 6700 [Inactive] (3.0 cr)
- PUBH 6724 - The Health Care System and Public Health (3.0 cr)
- PUBH 6755 - Planning and Budgeting for Public Health (2.0 cr)
- PUBH 6806 - Principles of Public Health Research (2.0 cr)
PUBH 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)
PUBH 7784 - Master's Project Seminar: PHAP and HSRP&A (1.0 cr)
PUBH 7794 - Master's Project: Public Health Administration and Policy (2.0 - 3.0 cr)
PUBH 7796 - Field Experience: Public Health Administration and Policy (2.0 cr)

General Health Policy and Management Specialty Area

These courses are required for students enrolled in the Public Health Administration and Policy program located at Arizona State University. Students will choose an additional 3 credits (for a total of 7) to complete the specialty area from the University of Minnesota approved by the advisor and program coordinator.
PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
PUBH 6835 - Principles of Health Policy (2.0 cr)

Electives

Students will take 6 elective credits from the University of Minnesota that have been approved by the advisor and program coordinator.

JD/MPH with William Mitchell College of Law

The University of Minnesota (UMN) School of Public Health (SPH) created a Joint Degree Program through which qualified students may combine a Master of Public Health (MPH) in Public Health Administration & Policy (PHAP) with a Juris Doctor (JD) degree from William Mitchell College of Law (WMCL JD).

The PHAP MPH degree requires 44 credits, 12 of which may include approved WMCL course credits. The JD requires 83 credits, 12 of which may include approved SPH course credits. Each institution will be entitled to make determinations about which courses from the other program will count towards that institutions degree requirements. Allowing cross-counted (double-counted) transfer credits to fulfill requirements in each degree program will have the effect of reducing the length of the overall joint degree program by two semesters. Careful attention to the content of courses that cross count will ensure that neither institution comprises the core competencies of their individual programs.

MPH Core

(PUBH 6020 and PUBH 6751 and (PUBH 6101 or PUBH 6102 ) and (PUBH 6320 or PUBH 6341 ) and (PUBH 6414 or PUBH 6450 ) and (PUBH 6741 or PUBH 6742 )
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
  or PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
  or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

PHAP/WMCL Core

PUBH 6700 (Inactive) (3.0 cr)
PUBH 6724 - The Health Care System and Public Health (3.0 cr)
PUBH 6835 - Principles of Health Policy (2.0 cr)
PUBH 7784 - Master's Project Seminar: PHAP and HSRP&A (1.0 cr)
PUBH 7794 - Master's Project: Public Health Administration and Policy (2.0 - 3.0 cr)
PUBH 7796 - Field Experience: Public Health Administration and Policy (2.0 cr)

Electives

Remaining courses are a combination of PubH courses with 12 credits transferred from William Mitchell College of Law.
Twin Cities Campus
Public Health Core Concepts Postbaccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 15 to 16
- This program does not require summer semesters for timely completion.
- Degree: Public Health Core Concepts PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The certificate program offers an opportunity to gain the knowledge and skills to understand, assess, and manage population health in public health, health care, and human services settings. Many students will use their public health knowledge and skills to enhance effectiveness and opportunities in their current work or career path. Population science is an increasingly valued area of expertise in many health and human service organizations. It will help prepare public health workers and others to respond to emerging public health issues.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission preferences and prerequisites:
- Applicants must hold a baccalaureate degree.
- Applicant should demonstrate strong written skills.
- The admissions committee looks closely at the applicant's work experience and grades in math and science.

Special Application Requirements:
Applicants must submit to SOPHAS Express, a centralized online application service:
- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application requirements and instructions visit www.sph.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 100
- Paper Based - Total Score: 600

**IELTS**
- Total Score: 7

**MELAB**
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Required Coursework**

The public health core concepts certificate curriculum is the same as the core content taught in the School of Public Health's MPH degree programs. All seven courses are available in online and in-person formats. Students will be able to register, receive materials, interact with faculty and fellow students, and complete this program without traveling to the campus. If completing coursework online, internet access is required.

- PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6250 - Foundations of Public Health (2.0 cr)
- PUBH 6102 - Issues in Environmental Health (2.0 cr)
  - or PUBH 6101 - Environmental Health (2.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  - or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  - or PUBH 6450 - Biostatistics I (4.0 cr)
  - or PUBH 6451 - Biostatistics II (4.0 cr)
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
Twin Cities Campus

Public Health Food Protection Postbaccalaureate Certificate

School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

Program Type: Post-baccalaureate credit certificate/licensure/endorsement
Requirements for this program are current for Fall 2018
Length of program in credits: 14
This program requires summer semesters for timely completion.
Degree: Public Health Food Protection PBacc Certificate

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Public Health Food Protection certificate is designed for professionals working in health or human services. It prepares public health workers and others to respond to incidents of bioterrorism, infectious disease outbreaks, and other emerging public health issues. Many students use the knowledge and skills gained to enhance opportunities in their current work or career path.

The curriculum can be completed by attending at least two sessions of the Public Health Institute, held in May and June every year.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must hold a baccalaureate degree.

Special Application Requirements:
Applicants must submit to SOPHAS Express, a centralized online application service:
- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application instructions and requirements visit www.sph.umn.edu.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7
• MELAB
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework
Take the following courses in consultation with the director of graduate studies:
- PUBH 7210 - Topics: Global Food Systems (0.5 cr)
- PUBH 7213 - Applications of Microbiology to Food Systems Monitoring (1.0 cr)
- PUBH 7214 - Principles of Risk Communication (1.0 cr)
- PUBH 7215 - Food Safety: Risk Assessment and Risk Management (1.0 cr)
- PUBH 7233 - Food System Defense: Vulnerabilities in the Food System (1.5 cr)
- PUBH 6181 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
- PUBH 7231 - Surveillance of Foodborne Diseases in Humans (1.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)
- PUBH 6711 - Public Health Law (2.0 cr)

Elective Courses
Take additional credits as needed to complete the 14-credit requirement. Consult the program staff for appropriate courses.
Twin Cities Campus
Public Health Informatics M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street SE, Minneapolis, MN 55455  (612-626-3500 OR 1-800-774-8636; fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 43
• This program does not require summer semesters for timely completion.
• Courses are available both on campus and in a hybrid format where students attend classes remotely using WebEx or similar technology.
• Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Information is key to effective public health administration. Surveillance systems provide information on infectious disease tracking, disease clusters, food-borne outbreaks, and injuries. Environmental monitoring systems provide information on health risks such as toxic chemicals or airborne pollutants. Registries contain information on vital statistics such as birth, death, and immunization. E-Public Health integrates information from electronic health records to use in improving population health.

Students pursuing the MPH in Public Health Informatics (MPH-PHI) learn how to manage public health information systems, including vital statistics systems, online analytical processing tools, immunization registries, population health surveillance, community health information networks, and more.

The MPH-PHI is offered both in-person and fully online. This program will prepare you to:

Understand the significance of the various public health information systems and how to leverage these systems to improve health of the public
Conceive, design, develop, implement, and use IT by applying informatics skills to population health
Manage information systems within an organization or network of organizations
Create state-of-the-art solutions at the intersection of informatics and global public health

Accreditation
This program is accredited by CEPH (Council on Education for Public Health)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
All application materials are submitted directly to SOPHAS;
Statement of purpose and objectives: Provide an essay describing your past education, experience, and current professional career objectives. You are encouraged to comment on any or all of the following: plans you have to use your education and training; the needs and/or challenges you perceive as important in your field of study; and any personal qualities, characteristics, and skills you believe will enable you to be successful in your chosen field of study.
Resume or CV
Official post-secondary transcripts from all US institutions attended (must be sent directly from the institutions to SOPHAS). This
includes previous study at the University of Minnesota.
Three letters of recommendation from persons qualified to assess your academic work; clinical, public health, or professional experiences; or leadership potential in public health.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan C: Plan C requires 43 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: The purpose of the master's project is to enable students to demonstrate: familiarity with the tools of research and scholarship in the field of public health informatics; the ability to work independently; the ability to plan and carry out a systematic investigation related to a public health issue; and the ability to effectively present, in written and oral form, the results of their investigation.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Required Coursework

M.P.H. Core Coursework
Students must satisfy competency requirements in the six core areas of public health - administration, behavioral science, biostatistics, environmental health, epidemiology, and ethics.

Take 15 credits of MPH core courses from the following list:

Administration
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Behavioral Science
- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)

Biostatistics
- PUBH 6450 - Biostatistics I (4.0 cr)

Environmental Health
- PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental Health (2.0 cr)

Ethics
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
  or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Epidemiology
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

Public Health Informatics Core Coursework
Take 21 credits of PHI core courses from the following list:
- HINF 5430 - Foundations of Health Informatics I (3.0 cr)
PUBH 6806 - Principles of Public Health Research (2.0 cr)  
PUBH 6876 - Public Health Systems Analysis and Design (2.0 cr)  
PUBH 6877 - Public Health Systems Analysis and Design - Practicum (2.0 cr)  
PUBH 6880 - Introduction to Public Health Informatics (2.0 cr)  
PUBH 6881 - Advanced Public Health Informatics Applications (2.0 cr)  
PUBH 6878 - Public Health Systems Analysis and Development Practicum (2.0 cr)  
PUBH 6879 - Public Health Systems Analysis and Development Practicum (2.0 cr)  
PUBH 6813 - Managing Electronic Health Information (2.0 cr)  
PUBH 6814 - Data and Information for Population Health Management (2.0 cr)  

Elective Credits  
Take at least 7 elective credits from the following list. Other graduate-level courses, including courses from outside the School of Public Health, can be taken with prior approval of the program director. Students are strongly encouraged to take PUBH 6805, as most PHI-related work is related to projects.  
Take 7 or more credit(s) from the following:  
• PUBH 6805 - Introduction to Project Management for Health Professionals (2.0 cr)  
• PUBH 6705 - Community Health Assessment (3.0 cr)  
• PUBH 6025 - Designing e-Interventions for Public Health (2.0 cr)  
• PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)  
• NURS 7108 - Population Health Informatics (2.0 cr)  
• HINF 5431 - Foundations of Health Informatics II (3.0 cr)  
• HINF 5520 - Informatics Methods for Health Care Quality, Outcomes, and Patient Safety (2.0 cr)  
• HINF 5540 - Interprofessional Health Informatics (2.0 cr)  
• NURS 5116 - Consumer Health Informatics (1.0 cr)  

Program Sub-plans  
A sub-plan is not required for this program. Students may complete the program with more than one sub-plan.  

Health Disparities Interdisciplinary Concentration Area  
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the US, as well as unequal quality of and access to health care. Achieving optimum health for all segments of society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators.  
SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.  

Public Health Policy Interdisciplinary Concentration Area  
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an MPH, includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care. PHPIC coursework provides a better understanding of the health care system as a whole and prevention policy. The challenging curriculum helps MPH majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:  

Understanding community dynamics  
Developing advocacy skills for public health  
Analyzing legal and policy structures  
Evaluating and implementing policies and programs  
Influencing community health  
Motivating and educating stakeholders and decision-makers  
Using policy as prevention strategy  

Eliminating health disparities through policy SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
Twin Cities Campus
Public Health Informatics Post-Baccalaureate Certificate
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819 Mayo Memorial Building, 420 Delaware Street SE, Minneapolis, MN 55455 (612-626-3500 or 1-800-774-8636; fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 13
- This program does not require summer semesters for timely completion.
- Degree: Public Health Informatics PostBaccalaureate Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

NOTE: Applications to the Public Health Informatics Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.

The certificate in public health informatics (Cert-PHI) is a 9-12 month program designed to prepare professionals for leadership positions that bridge information technology and public health.

Students who complete the certificate will be able to implement and manage public health information systems, including: vital statistics systems, online analytic processing tools that support decision-making, immunization registries, population health surveillance, community health information networks, and electronic public health data interchange.

This certificate is awarded upon successful completion of 12 credits. We expect students who complete the Cert-PHI to have expanded and supplemented their current domain knowledge in a way that opens up new corridors of discovery and employment for them.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Baccalaureate degree or higher

Other requirements to be completed before admission:
Applications to the Public Health Informatics Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7

Key to test abbreviations (TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

In addition to the required courses specified below, Cert PHI students are strongly encouraged to take the following course as most work in PHI involves projects:

PUBH 6805 - Project Management for Health Professionals (2.0 cr).

Required Coursework
- HINF 5430 - Foundations of Health Informatics I (3.0 cr)
- PUBH 6813 - Managing Electronic Health Information (2.0 cr)
- PUBH 6814 - Data and Information for Population Health Management (2.0 cr)
- PUBH 6876 - Public Health Systems Analysis and Design (2.0 cr)
- PUBH 6877 - Public Health Systems Analysis and Design - Practicum (2.0 cr)
- PUBH 6880 - Introduction to Public Health Informatics (2.0 cr)
Twin Cities Campus
Public Health Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 8
• Length of program in credits (Doctorate): 14
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate minor in public health is designed to prepare professionals in health and other fields (e.g., law, business, architecture, urban planning, teaching and engineering, including dual-degree students) to understand how their professional activities impact the health of communities, and to work together across disciplines, organizations, and sectors on innovative strategies to improve population health.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission to the public health graduate minor is contingent upon enrollment in a master's or doctoral degree-granting program at the University of Minnesota. Students enrolled in graduate programs within the School of Public Health are not eligible for this minor.

Consult with the major advisor and the public health director of graduate studies regarding the option of a minor in public health.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Courses (8 Credits)
All students pursuing the minor must take at least one course from each of the following three disciplines, for a total of 8 credits.

Biostatistics
Take one of the following courses:
PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)

Epidemiology
Take one of the following courses:
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

**Environmental Health**
Take one of the following courses:

- PUBH 6101 - Environmental Health (2.0 cr)
- PUBH 6102 - Issues in Environmental Health (2.0 cr)

**Program Sub-plans**
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Masters**
The minimum GPA for coursework applied to the minor is 3.0.

**Doctoral**
The minimum GPA for coursework applied to the minor is 3.0.

**Electives**
Select elective credits, in consultation with the public health director of graduate studies, to complete the 14-credit minimum.
Twin Cities Campus
Public Health Nutrition M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph.oasr@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 44 to 64
• This program requires summer semesters for timely completion.
• Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Public Health Nutrition (PHN) program is designed to meet the needs of students who want graduate training in health promotion, disease prevention, program development, and nutrition interventions.

The program's faculty are internationally recognized for research in obesity prevention, child and adolescent nutrition, eating disorder prevention, nutrition epidemiology, and nutrition intervention.

Coordinated Master's Program (CMP):
In addition to the traditional public health nutrition degree, the program offers the opportunity to gain expertise in a concentrated area of study such as epidemiology, global health, alternative medicine, health policy, and disability policy. It also offers a coordinated master's program. Please note that the coordinated master's program requires that students have their own transportation during the academic year and summer session, since many sites are not located on public transportation routes.

Full- and Part-time Program:
Students may pursue the M.P.H. on a full-time or part-time basis, but should note that the majority of the courses are offered only during the day. (Note: The Coordinated Master's Program must be taken on a full-time basis.)

Accreditation
This program is accredited by Council on Education for Public Health (CEPH) & Commission on Accreditation for Dietetics Education.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The following courses are required for admission: one general biology course with lab; two general chemistry classes with labs; one organic chemistry; one biochemistry; one human nutrition course; and one social science course. In addition, CMP applicants must also complete one physiology course; one microbiology course with lab; one intro to nutrition course; one intro to food science course; one food systems/service management course. All courses MUST be complete before starting the program. If students are currently completing the prerequisites while they are applying, they must indicate on their application materials how their prerequisites will be completed before they start the program.

Preferred GRE performance expectations (test taken post August 2011): A combination of 300 on the quantitative and verbal sections of the test and a score of 3.5 on the analytical writing assessment. Some programs may have higher preferred minimum scores. Check specific programs for details.
Special Application Requirements:
Students applying for the Coordinated Master's Program track go through a two-step process for admission. The first is to be admitted to the M.P.H. degree program. After all CMP applications submitted prior to the Dec. 1 CMP application deadline have been reviewed and admission decisions made, the applicant will receive an email questionnaire and will undergo a phone interview. The top eight candidates will be selected to fill the eight available CMP spots. Students not selected for the CMP may not start the standard track and later transfer to the CMP.

Applicants must submit their test score(s) from the following:
• GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
• IELTS
  - Total Score: 7

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Plan C: Plan C requires 44 to 64 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: Culminating Experience

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Public Health Nutrition Core
PUBH 6901 - Foundations of Public Health Nutrition Leadership (2.0 cr)
PUBH 6914 - Community Nutrition Intervention (3.0 cr)
PUBH 6915 - Nutrition Assessment (2.0 cr)
PUBH 6933 - Nutrition and Chronic Diseases (2.0 cr)
PUBH 7994 - Culminating Experience: Public Health Nutrition (1.0 - 6.0 cr)
PUBH 7996 - Field Experience: Public Health Nutrition (1.0 - 6.0 cr)

Tracks

Standard Track
Lifecycle Courses
Take 2 or more course(s) from the following:
• PUBH 6902 (inactive) (2.0 cr)
• PUBH 6903 (inactive) (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)

Research Methods
PUBH 6910 (inactive) (1.0 cr)

Research Methods Options
Take 3 or more credit(s) from the following:
• PUBH 6034 - Evaluation (3.0 cr)
• PUBH 6035 - Applied Research Methods (3.0 cr)
• PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
• PUBH 6342 - Epidemiologic Methods II (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6420 - Introduction to SAS Programming (1.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
• PUBH 6705 - Community Health Assessment (3.0 cr)
• PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
• PUBH 6806 - Principles of Public Health Research (2.0 cr)
• PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
• PUBH 6389 - Nutritional Epidemiology (2.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)

Public Health Core
PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
  or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
  or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Electives
Students must take enough graduate-level electives to fulfill minimum credit requirements in order to graduate. Students without a nutrition/dietetics background must take PUBH 6355 - Pathophysiology, PUBH 6905 - Nutrition for Public Health Promotion and Disease Prevention, and FSCN 4621 - Nutrition and Metabolism.

-OR-

Coordinated Master's Program
Lifecycle Courses
Students who already have a nutrition/dietetics undergraduate degree need to select two of the following four courses. Students who do NOT have a nutrition/dietetics undergraduate degree must choose PUBH 6902, PUBH 6903, and PUBH 6904.
Take 2 - 3 course(s) from the following:
• PUBH 6902 (Inactive) (2.0 cr)
• PUBH 6903 (Inactive) (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)

Research Methods
PUBH 6910 (Inactive) (1.0 cr)

Research Methods Options
Take 3 or more credit(s) from the following:
• PUBH 6034 - Evaluation (3.0 cr)
• PUBH 6035 - Applied Research Methods (3.0 cr)
• PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
• PUBH 6420 - Introduction to SAS Programming (1.0 cr)
• PUBH 6342 - Epidemiologic Methods II (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)
• PUBH 6705 - Community Health Assessment (3.0 cr)
• PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
• PUBH 6806 - Principles of Public Health Research (2.0 cr)
• PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
• PUBH 6389 - Nutritional Epidemiology (2.0 cr)
• PUBH 7250 - Designing and Conducting Focus Group Interviews (1.0 cr)
• NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 cr)

Field Experience/Nutrition Practicum
CMP students take four credits of PUBH 7996 in addition to the following:
PUBH 6995 - Community Nutrition Practicum (8.0 cr)
PUBH 6996 - Clinical Nutrition Practicum (9.0 cr)

Public Health Core
Environmental Health
PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental Health (2.0 cr)

Epidemiology
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

**Biostatistics**
PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)

**Ethics**
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

**Administration/Management**
Take 2 or more credit(s) from the following:
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

**Electives**
CMP students who do not have a nutrition/dietetics undergraduate degree must take FSCN 4621 - Nutrition and Metabolism or FSCN 4612 - Advanced Nutrition AND FSCN 4665 - Medical Nutrition Therapy I, AND FSCN 4666 - Medical Nutrition Therapy II and enough graduate-level elective credits to fulfill the minimum required to graduate. Students with a nutrition/dietetics undergraduate degree must take 8-12 graduate-level elective credits to fulfill 60 total credits.

-OR-

**Nutritional Epidemiology Track**

*Lifecycle courses*
- PUBH 6902 *(Inactive)* (2.0 cr)
or PUBH 6903 *(Inactive)* (2.0 cr)
or PUBH 6904 - Nutrition and Aging (2.0 cr)
or PUBH 6906 - Global Nutrition (2.0 cr)

**Nutrition Science**
Only students who do not have an undergraduate degree in nutrition/dietetics need to take the following nutrition science courses.
- FSCN 4621W - Nutrition and Metabolism [WI] (4.0 cr)
- PUBH 6905 - Nutrition for Public Health Promotion and Disease Prevention (2.0 cr)

**Epidemiology and Biostatistics Core**
PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6342 - Epidemiologic Methods II (3.0 cr)
PUBH 6343 - Epidemiologic Methods III (4.0 cr)
PUBH 6390 - Topics: Epidemiology (0.5 - 4.0 cr)
PUBH 6389 - Nutritional Epidemiology (2.0 cr)
PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
PUBH 6355 - Pathophysiology of Human Disease (4.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)

“Epi of” Courses
- PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
or PUBH 6386 - Public Health Aspects of Cardiovascular Disease (2.0 cr)
or PUBH 6387 - Cancer Epidemiology (2.0 cr)

**Public Health Core**

**Environmental Health**
PUBH 6101 - Environmental Health (2.0 cr)
or PUBH 6102 - Issues in Environmental Health (2.0 cr)

**Ethics**
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

**Administration/Management**
Take 1 or more course(s) from the following:
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

**Program Sub-plans**
A sub-plan is not required for this program.
Students may complete the program with more than one sub-plan.

**Coordinated Option**
The Coordinated Masters Program (CMP) in public health nutrition provides both a master of public health degree in public health nutrition and the didactic coursework and supervised practice components for registration eligibility and entry into dietetics practice. The program accepts eight students each year. The CMP provides a public health nutrition concentration area that focuses on rural and disadvantaged populations. Supervised practice experiences are integrated throughout the 24-month program utilizing sites both within and outside of Minnesota. Students complete a total of 1,200 hours of supervised practice. Upon successful completion of the program...
(i.e. coursework, supervised practice experiences, master's project and a comprehensive oral examination) students will receive an M.P.H. degree and a verification statement of eligibility to write the national registration examination for dietitians.

See Program Requirements Page

Global Health Interdisciplinary Concentration Area
The Global Health Interdisciplinary Concentration (GHIC) provides graduate students who are pursuing an M.P.H. with information necessary to define the constitution, cause, and consequences of health problems worldwide. The program offers a unique opportunity to explore the relationships between health, environment, politics, culture, and economic pressures in developed and developing nations.

Developing countries are currently undergoing profound demographic changes—changes that are accompanied by shifts in patterns of illness. In many of these nations, the major causes of morbidity and mortality are mutating from traditional infectious diseases to chronic, non-communicable maladies like cardiovascular diseases, cancer, and diabetes. As a result, there is increasing demand for qualified public health practitioners who can identify and help reduce the vast and varied global vectors for chronic disease.

Practical application of theory in the field is a major component of the GHIC. Students are encouraged to hone their expertise by pursuing an international field experience. The School of Public Health has established relationships with collaborative institutions abroad.

SPH graduate students must complete a formal program plan if they want the GHIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the U.S., as well as unequal quality of and access to health care. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:

- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer, and HIV/AIDS are higher for many minority communities compared to the state as a whole.

SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Public Health Policy Interdisciplinary Concentration Area
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an M.P.H., includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care.

PHPIC coursework provides a better understanding of the healthcare system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:

- understanding community dynamics
- developing advocacy skills for public health
- analyzing legal and policy structures
- evaluating and implementing policies and programs
- influencing community health
- motivating and educating stakeholders and decision-makers
- using policy as prevention strategy
- eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
Arizona State University
This sub-plan is limited to students completing the program under Plan C.

Public Health Nutrition Core
Students take PubH 6901, 6914 and 6933 from the U of MN as part of the nutrition core in addition to PubH 69XX nutrition assessment course (to be developed)

Research Methods
Students will take three research methods credits that are approved by the advisor and program coordinator. Students are also required to take PubH 6910 and PubH 7994 from the U of MN.

Electives
Students will take elective credits from the U of MM that have been approved by the advisor and program coordinator.

additional nutrition science courses for non-nutrition/dietetics undergrad majors
- PubH 69XX: Human Pathophysiology (3 cr)
- PubH 69XX: Advanced Macronutrient Metabolism (3 cr)
Twin Cities Campus
Public Health Postbaccalaureate Certificate in Performance Improvement
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Performance Improvement PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

NOTE: Applications to the Performance Improvement Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.

The public health certificate in performance improvement trains students to understand and apply quality improvement methods at both the systems and organizational level. The program will provide the tools needed in order to achieve and maintain high process performance.

The certificate provides participants with hands-on knowledge about how to improve processes in their respective organizations. By so doing, best practices will be diffused, and process performance will improve public health services.

This certificate addresses concerns voiced by the National Board of Public Health Examiners, the Public Health Accreditation Board, and the Council on Education for Public Health to provide more educational opportunities in performance improvement to working public health professionals.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- completely online (all program coursework can be completed online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
NOTE: Applications to the Performance Improvement Certificate program are not being accepted at this time. For more information, please contact sph-ask@umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)
- PUBH 6780 - Advanced Performance Improvement Methods in Public Health (2 cr)
- PUBH 6780 - Public Health Process Improvement Project - Practicum (3 cr)
- PUBH 6780 - Performance Management and Transformational Change (2 cr)

Students choose 2 elective credits with their advisor.
Twin Cities Campus
Public Health Practice M.P.H.
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 42
- This program requires summer semesters for timely completion.
- Degree: Master of Public Health

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The program in public health practice brings together the science and the art of public health, addressing public health as a broad social enterprise that seeks to extend the benefits of current knowledge in ways that will have the maximum impact on the health status of populations.

The school offers academic programs at the master's level that prepare students to be leaders and practitioners in the application of public health principles in agencies delivering preventive health services and public health programs.

Accreditation
This program is accredited by Council on Education for Public Health (CEPH)

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Please visit www.sph.umn.edu for admission requirements.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 80
  - Speaking test score: 0

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Plan C: Plan C requires 42 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: Each student must complete a culminating experience in which they synthesize and integrate knowledge acquired in coursework and other learning experiences and apply theory and principles in a context that reflects an aspect of professional practice. The culminating experience must be used as a means by which faculty judge whether the student has mastered the body of knowledge and can demonstrate proficiency in the required competencies through written and oral presentation.

Students are expected to demonstrate familiarity with the tools of applied research or scholarship in public health practice, the ability to work independently, and the ability to apply skills learned in coursework by completing a Research Paper, Systematic Literature Review, Consultative Report, Grant Proposal. Students also have the option of taking the Certificate Public Health exam (CPH) instead of completing a project.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

Applicants must have an advanced degree or be admitted or enrolled in a DDS, MPP, MURP, LAW, PHARMD, DVM, MD, CMU or DNP program.

Core Courses
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)

Epidemiology
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
- or PUBH 6342 - Epidemiologic Methods II (3.0 cr)

Biostatistics
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
- or PUBH 6450 - Biostatistics I (4.0 cr)
- or PUBH 6451 - Biostatistics II (4.0 cr)

Ethics
- PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
- or PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Environmental Health
- PUBH 6101 - Environmental Health (2.0 cr)
- or PUBH 6102 - Issues in Environmental Health (2.0 cr)

M.P.H. Culminating Experience
- PUBH 7294 - Master's Project: Public Health Practice (0.5 - 4.0 cr)

Field Experience
- PUBH 7296 - Field Experience: Public Health Practice (0.5 - 8.0 cr)

Electives
Students have the opportunity to choose their elective courses based on their career goals and interests. Students are required to choose at least one class from each of the four public health practice domains as established by the APHA Council on Linkages. Minimum of 19 credits

Specialty areas (includes concentrations, dual degree programs)
Students applying to a dual degree program must be admitted to both schools that are listed as official sub-plans. Students have the option to add a concentration area or minor.

DDS/MPH Dual Degree
This dual degree will provide students with a unique opportunity in the Upper Midwest to integrate dentistry and the practice of public health to identify and solve community health problems in areas of oral health. Students are required to take SPH core courses:
- PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and
- PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

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Information current as of August 31, 2018
MPP/MPH or MURP/MPH Dual Degree
This dual degree will provide students with a unique opportunity in the Upper Midwest to gain in-depth training in the planning, public policy, and public health arenas at the master's level. Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

PharmD/MPH Dual Degree
This dual degree will provide students with a unique opportunity in the Upper Midwest to make significant contributions in areas such as health education and prevention of disease in our state and nation. Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

JD/MPH Dual Degree
This dual degree will provide students with a unique opportunity in the Upper Midwest to make significant contributions between the legal and health-care delivery systems in our state and nation. Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

MD/MPH Dual Degree
This dual degree will provide students with a deeper understanding of population-based science and the cultural and environmental factors that affect patients. Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

DVM/MPH Dual Degree
This dual degree will provide students with credentials to work at the interface of human wellness and animal health. Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

Global One Health-CMU
The School of Public Health is collaborating with Chiang Mai University in Northern Thailand to provide their students with a U of MN TC Master of Public Health degree, Executive Program in Public Health Practice. Students are required to have an advanced degree and to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102.

-OR-

DNP/MPH Dual Degree
This dual degree will provide students with a unique opportunity in the Upper Midwest to provide advanced nursing care as leaders of interprofessional health care teams, emphasizing population-focused practice and quality improvement to impact patient outcomes. Students are required to take SPH core courses: PubH 6751, PubH 6020, PubH 6299, PubH 6320 or 6341 or PubH 6342, and PubH 6414 or PubH 6450 or PubH 6451, and PubH 6741 or PubH 6742, and PubH 6101 or PubH 6102.

Joint- or Dual-degree Coursework:DDS/MPH Public Health Dentistry Dual Degree Program, MPP/MPH Public Health Public Policy Dual Degree Program, MURP/MPH Public Health Urban and Regional Planning Dual Degree Program, PharmD/MPH Public Health Pharmacy Dual Degree Program, LAW/MPH Public Health Law Dual Degree Program, MD/MPH Public Health Medicine Dual Degree Program, DVM/MPH Veterinary Public Health Dual Degree Program, Global One Health - CMU, DNP/MPH Public Health Doctor of Nursing PracticeStudent may take a total of 14 credits in common among the academic programs.

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Executive Program in Public Health Practice
This sub-plan is limited to students completing the program under Plan C.

This program builds on the student's work and educational experience. It is possible to complete all work for the M.P.H. degree in 16 months, with 42 graduate credits. On average, students complete the program in three years.
Attending the Public Health Institute during the May Session is a unique opportunity for students from multiple disciplines to connect and immerse themselves in emerging public health issues.

EPPHP is a flexible curriculum that students may tailor to their career and practice. Some established focus areas are:

- Cultural competency
- Food protection
- Preparedness, response, and recovery
- Public health leadership
- Global health*
- Health disparities*
- Public health policy*
- Complementary and alternative medicine*

*These are established interdisciplinary concentrations and the name of the concentration will be listed on the student's transcript. Students must complete and submit a proposal form; please refer to the website for full information.

Students are required to complete the core curriculum, M.P.H. culminating experience, field experience, and elective courses chosen to meet their academic and career interests.

Required courses
Our hybrid executive MPH offers a flexible curriculum that students can tailor to fit their career and practice goals. Online classes comprise the core curriculum, with elective options online or in person at the yearly Public Health Institute.

The program is designed for health professionals with an advanced degree, such as an MD, DDS, DV., PharmD, PhD, MS, or public health professional with significant work experience who have completed a Public Health Core Concept Certificate.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBH 6020</td>
<td>Fundamentals of Social and Behavioral Science (3.0 cr)</td>
</tr>
<tr>
<td>PUBH 6102</td>
<td>Issues in Environmental Health (2.0 cr)</td>
</tr>
<tr>
<td>PUBH 6320</td>
<td>Fundamentals of Epidemiology (3.0 cr)</td>
</tr>
<tr>
<td>PUBH 6414</td>
<td>Biostatistical Literacy (3.0 cr)</td>
</tr>
<tr>
<td>PUBH 6741</td>
<td>Ethics in Public Health: Professional Practice and Policy (1.0 cr)</td>
</tr>
<tr>
<td>PUBH 6751</td>
<td>Principles of Management in Health Services Organizations (2.0 cr)</td>
</tr>
<tr>
<td>PUBH 7294</td>
<td>Master's Project: Public Health Practice (0.5 - 4.0 cr)</td>
</tr>
<tr>
<td>PUBH 7296</td>
<td>Field Experience: Public Health Practice (0.5 - 8.0 cr)</td>
</tr>
</tbody>
</table>

Students may choose up to 23 credits of elective classes.

Public Health Dentistry
This sub-plan is limited to students completing the program under Plan C.

This dual degree will provide students with a unique opportunity in the Upper Midwest to integrate dentistry and the practice of public health to identify and solve community health problems in areas of oral health.

Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102, and PUBH 7294, and PUBH 7296, and PUBH 6299.

Course Group 1
This dual degree will provide students with a unique opportunity in the Upper Midwest to integrate dentistry and the practice of public health to identify and solve community health problems in areas of oral health.

<table>
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</tr>
<tr>
<td>PUBH 6299</td>
<td>Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)</td>
</tr>
<tr>
<td>PUBH 7296</td>
<td>Field Experience: Public Health Practice (0.5 - 8.0 cr)</td>
</tr>
</tbody>
</table>

Students may choose up to 23 credits of electives and may transfer up to 14 credits from a school of dentistry upon approval of the program director.

Public Health Medicine
The Public Health Medicine (PHM) program prepares medical students to have a deeper understanding of population-based science
and the cultural and environmental factors that affect patients.

The classroom requirements of the M.P.H. are completed during a 12-month sabbatical (May through May) from medical school while enrolled full time in the School of Public Health. Most students begin the M.P.H. program after year two of medical school.

Students must complete the basic curriculum, the courses below, and approved electives to meet the required 42-credit minimum.

Students must register for the master's project and field experience while enrolled in the program. They may choose to complete these during their time at the SPH or after returning to medical school. A public health medicine setting is required for field placement but may be double counted for clinical rotation with adviser approval.

**Public Health Medicine**

PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6210 - Public Health Medicine Seminar (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

Take 2 or more course(s) from the following:

• PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)
• PUBH 6724 - The Health Care System and Public Health (3.0 cr)
• PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)

Students must take 10.5 to 11.5 elective credits that are approved by their adviser.

**Public Health Nursing Practice**

This sub-plan is limited to students completing the program under Plan C.

The Public Health Nursing Practice (DNP/MPH) dual degree program provides training in nursing practice and community health.

Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6101 or PUBH 6102 and PUBH 7294 and PUBH 7296

**Required**

As a graduate student pursing a DoDNP/MPH, you seek to lead, deliver and improve patient-centered care by bringing the latest evidence-based knowledge to clinical practice and protect, restore and promote public health. With approval, you may use up to 14 credits of DNP credits towards the MPH and 12 credits of the Public Health courses towards the DNP.

**Public Health Public Policy**

This sub-plan is limited to students completing the program under Plan C.

The Public Policy/Public Health (MPP/MPH) dual degree program provides training in planning, public policy, and in the public health arenas.

Students are required to take SPH core courses: PUBH 6751, PUBH 6020, PUBH 6299, PUBH 6320 or PUBH 6341 or PUBH 6342, and PUBH 6414 or PUBH 6450 or PUBH 6451, and PUBH 6741 or PUBH 6742, and PUBH 6101 or PUBH 6102 and PubH 7296.

**Required**

As a graduate student pursing a Public Policy, you seek to advance the common good; as a School of Public Health student, you seek to protect, restore and promote health. Together, the dual degrees provide the skills to create significant change. With approval, you may use up to 14 credits of MPP courses toward the MPP, and 12 credits of Public Health courses toward the MPP.

PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)
Students may choose up to 23 credits of elective courses and may transfer up to 14 credits from a Master of Public Policy program with approval from the director.

Public Health Urban and Regional Planning
This sub-plan is limited to students completing the program under Plan C.

The Master Urban & Regional Planning/Master Public Health (MURP/MPH) dual degree program provides training in planning, public policy, and in the public health arenas.

As a graduate student pursuing Urban Regional Planning degree, you seek to advance the common good; as a School of Public Health student, you seek to protect, restore and promote health. Together, the dual degrees provide the skills to create significant change.

With approval, you may use up to 14 credits of MURP courses toward the MPH, and 12 credits of Public Health courses toward the MURP.

The dual degree in Master Urban & Regional Planning/Master Public Health (MURP/MPH) provides training in planning, public policy, and in the public health arenas.

Required
The dual degree in Master Urban & Regional Planning/Master Public Health (MURP/MPH) provides you with training in planning, public policy, and in the public health arenas. With approval, you may use up to 14 credits of MURP courses toward the MPH, and 12 credits of Public Health courses toward the MURP.

PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
PUBH 6741 - Ethics in Public Health: Professional Practice and Policy (1.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 7296 - Field Experience: Public Health Practice (0.5 - 8.0 cr)

Students may choose up to 23 credits of elective courses and may transfer up to 14 credits from a Master of Urban and Regional Planning program with approval from the director.

Veterinary Public Health
The Veterinary Public Health D.V.M./M.P.H. dual degree program is part of the public health practice program. It allows students to combine veterinary studies with a public health degree, giving them the credentials to work at the interface of human wellness and animal health, spanning agriculture and food industry concerns, emerging infectious diseases, and other public health issues.

There are formal MOUs with the following Colleges of Veterinary Medicine: Cornell University, Purdue University, Western University of Health Science and Ross University.

The program in public health practice brings together the science and the art of public health. It addresses public health as a broad social enterprise that seeks to extend the benefits of current knowledge in ways that will have the maximum impact on the health status of populations.

The program offers academic study at the master's level that prepares students to be leaders and practitioners in the application of public health principles in agencies delivering preventive health services and public health programs. The major emphasizes the importance and applications of basic scientific knowledge to current societal problems and concerns.

Up to 14 credits may be transferred into the M.P.H. from a school of veterinary medicine upon approval of the adviser and program director. Each of the elective curriculum options outlined below addresses the need for students to have coursework in the following four domains: public health policy and systems development, community intervention, assessment and basic sciences, and program management and communications.

D.V.M./M.P.H. students are also required to take one course to fulfill the veterinary public health competencies: biostatistics, surveillance, infectious disease epidemiology, zoonoses, and environmental health.

Required
PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (0.5 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental Health (2.0 cr)
Global One Health-CMU
This sub-plan is limited to students completing the program under Plan C.

The University of Minnesota, School of Public Health (SPH) recognizes the need for more global presence in the MPH curriculum and for more opportunities for students across the world to share learning experiences. The SPH is collaborating with Chiang Mai University (CMU) in northern Thailand to provide CMU students with a University of Minnesota Master of Public Health degree in Public Health Practice. This is a distance program offered at a new site.

For admission requirements go to www.sph.umn.edu.

Course Group 0
Global One Health - Chiang Mai University (CMU) is designed for Chiang Mai University students with an advanced degree to earn MPH degrees from UMN and CMU within two years. Students will complete 25 credits with the UMN and 17 credits with CMU.

Global Health Interdisciplinary Concentration Area
The Global Health Interdisciplinary Concentration (GHIC) provides graduate students who are pursuing an M.P.H. with information necessary to define the constitution, cause, and consequences of health problems worldwide. The program offers a unique opportunity to explore the relationships between health, environment, politics, culture, and economic pressures in developed and developing nations.

Developing countries are currently undergoing profound demographic changes—changes that are accompanied by shifts in patterns of illness. In many of these nations, the major causes of morbidity and mortality are mutating from traditional infectious diseases to chronic, non-communicable maladies like cardiovascular diseases, cancer, and diabetes. As a result, there is increasing demand for qualified public health practitioners who can identify and help reduce the vast and varied global vectors for chronic disease.

Practical application of theory in the field is a major component of the GHIC. Students are encouraged to hone their expertise by pursuing an international field experience. The School of Public Health has established relationships with collaborative institutions abroad.

SPH graduate students must complete a formal program plan if they want the GHIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Health Disparities Interdisciplinary Concentration Area
The Health Disparities Interdisciplinary Concentration (HDIC) addresses the unequal burden of health risks, morbidity, and mortality experienced by minority cultural and social groups in the U.S., as well as unequal quality of and access to health care. Achieving optimum health for all segments of our society is a central goal of Healthy People 2020, and a concern in Minnesota as well. Despite Minnesota's ranking as one of the nation's healthiest states, Minnesota has some of the largest gaps among cultural and social groups in health indicators. According to the Minnesota Department of Health:

- Infant mortality rates among the American Indians and African Americans are two to three times higher than for the state as a whole.
- Among African American youth aged 15-24, firearm injury mortality rates are 15 times greater than the rates of all ages, races, and genders combined.
- Women from minority communities are less likely to receive sufficient prenatal care compared to other women.
- Death rates for African Americans and American Indians are two to three times that of the state as a whole. Rates of diabetes, hypertension, cancer, and HIV/AIDS are higher for many minority communities compared to the state as a whole.
SPH graduate students must complete a formal program plan if they want the HDIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.

Public Health Policy Interdisciplinary Concentration Area
The School of Public Health's Public Health Policy Interdisciplinary Concentration (PHPIC) focuses on promoting the health of populations and groups through public and organizational policy. PHPIC is open to students pursuing an M.P.H., includes coursework that explores the way in which federal, state, local, and institutional entities affect the financing, structure, and delivery of public health and medical care.

PHPIC coursework provides a better understanding of the healthcare system as a whole and prevention policy. The challenging curriculum helps M.P.H. majors hone practical skills that are highly sought after in the public health and policy arenas. Students who pursue the concentration can choose courses that emphasize:
- understanding community dynamics
- developing advocacy skills for public health
- analyzing legal and policy structures
- evaluating and implementing policies and programs
- influencing community health
- motivating and educating stakeholders and decision-makers
- using policy as prevention strategy
- eliminating health disparities through policy

SPH graduate students must complete a formal program plan if they want the PHPIC to appear on their transcripts. For more information, contact Carol Francis, interdisciplinary concentrations coordinator, at franc004@umn.edu or 612-624-6952.
**Twin Cities Campus**

Public Health Preparedness, Response, and Recovery Postbaccalaureate Certificate

School of Public Health - Adm

School of Public Health

Link to a list of faculty for this program.

**Contact Information:**
School of Public Health, MMC 819, A395 Mayo Memorial Building, 420 Delaware Street, Minneapolis, MN 55455 (612-626-3500 OR 1-800-774-8636, Fax: 612-624-4498)
Email: sph-ask@umn.edu
Website: [http://www.sph.umn.edu](http://www.sph.umn.edu)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Public Hlth Prepared/Response/Recovery PBacc Cert

Along with the program-specific requirements listed below, please read the [General Information](http://www.sph.umn.edu) section of the catalog website for requirements that apply to all major fields.

Part of the Public Health Practice major, this certificate program helps to prepare public health workers and others to respond to incidents of bioterrorism, infectious disease outbreaks, and other emerging public health issues.

**Accreditation**
This program is accredited by Council on Education for Public Health (CEPH)

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants must hold a baccalaureate degree.

**Special Application Requirements:**
Applicants must submit to SOPHAS Express, a centralized online application service:
- Completed SOPHAS Express application and application fee, designating the University of Minnesota School of Public Health
- Personal statement describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- One letter of recommendation
- Unofficial transcripts of record from each college/university where a degree was earned. (If admitted, official transcripts will need to be sent directly to the School of Public Health.)
- Resume or C.V.

For detailed application requirements and instructions visit [www.sph.umn.edu](http://www.sph.umn.edu).

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of August 31, 2018
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework
Take at least one course in each group below. Courses at the Public Health Institute are topical and will change from year to year. PUBH 7200 can meet the requirements of each group, depending on the topic. Please consult the program staff for appropriate courses.

Policy Development/Program Planning
Take 1 or more course(s) from the following:
- PUBH 5231 - Emergency Preparedness: A Public Health Perspective (2.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

Analytical/Assessment Skills
Take 1 or more course(s) from the following:
- PUBH 7230 - Topics in Infectious Disease (0.5 - 4.0 cr)
- PUBH 7231 - Surveillance of Foodborne Diseases in Humans (1.0 cr)
- PUBH 7235 - Surveillance of Zoonotic Pathogens in Animals (1.0 cr)

Communications Skills
Take 1 or more course(s) from the following:
- PUBH 7214 - Principles of Risk Communication (1.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

Cultural Competency Skills
Take 1 or more course(s) from the following:
- PUBH 7223 - Concepts of Disaster Behavioral Health (1.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

Community Dimensions of Practice Skills
Take 1 or more course(s) from the following:
- PUBH 7227 - Incident Management Systems: The Public Health Role (1.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

Leadership and Systems Thinking, Financial Planning and Management Skills
Take 1 or more course(s) from the following:
- PUBH 6711 - Public Health Law (2.0 cr)
- PUBH 7221 - Planning for Urgent Threats (1.0 cr)
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

Electives
Students select remaining credits from an approved list to complete the certificate's 12-credit minimum. Courses at the Public Health Institute are topical and will change from year to year. Please consult the program staff for appropriate courses.

Take 1 or more course(s) from the following:
- PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)
- PUBH 7210 - Topics: Global Food Systems (0.5 cr)
- PUBH 7237 - Using Risk Analysis Tools: Estimating Food Safety on the Farm to Table Continuum (1.0 cr)
- PUBH 7253 - Introduction to GIS (1.0 cr)
Twin Cities Campus

Sexual Health Minor
School of Public Health - Adm
School of Public Health

Link to a list of faculty for this program.

Contact Information:
Student Services Center, School of Public Health
420 Delaware St SE, A-395 Mayo, MMC 819
Minneapolis, MN 55455
612-626-3500
Email: sph-ask@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Graduate free-standing minor
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Sexual Health minor is a graduate minor that allows students to specialize in sex, sexuality, reproductive health, and sexual health. A firm understanding of the structural factors involved in sexual health will prepare students to enter the professional world with the confidence and ability needed to handle complex questions and issues related to sexuality.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Admission to the sexual health graduate minor is contingent upon prior admission to a master's or doctoral degree-granting program at the University of Minnesota.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Foundation Course
PUBH 6081 - Sex, Sexuality, and Sexual Health (2.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
Supporting Coursework for Master's Students
Students need to take a minimum of 6 credits, including the Foundation course (PubH 6081).
Public Health Admitted Students
The following coursework is for master's students admitted into the School of Public Health.
- PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- or PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
- or PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
- or PUBH 6675 - Women's Health (2.0 cr)

Non-public Health Students
The following coursework is required for master's students enrolled in colleges other than the School of Public Health.

Required for Non-public Health Students
- PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)

Non-public Health Student Course Options
- PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
- or PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
- or PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- or PUBH 6675 - Women's Health (2.0 cr)

Elective Coursework
All master's students declaring the Sexual Health Minor must select from the electives list to reach a minimum of 6 credits.
Take 1 or more credit(s) from the following:
- AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
- BTHX 8510 - Gender and the Politics of Health (3.0 cr)
- FMCH 5955 - Directed Study (1.0 - 10.0 cr)
- FSOS 4101 - Sexuality and Gender in Families and Close Relationships (3.0 cr)
- FSOS 4152 - Gay, Lesbian, Bisexual, and Transgender People in Families (3.0 cr)
- LAW 6046 - Human Trafficking (2.0 cr)
- LAW 6060 - Assisted Reproduction and the Family (3.0 cr)
- LAW 6827 - Women's International Human Rights (2.0 cr)
- PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)
- PA 5690 - Topics in Women, Gender and Public Policy (0.5 - 3.0 cr)

Doctoral
Course Group Name: Supporting Coursework for Doctoral Students

Supporting Coursework for Doctoral Students
Students need to take a minimum of 12 credits, including the Foundation course (PubH 6081).

Public Health Admitted Students
The following coursework is for doctoral students admitted into the School of Public Health.
- PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- or PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
- or PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
- or PUBH 6675 - Women's Health (2.0 cr)

Non-public Health Students
The following coursework is for doctoral students enrolled in colleges other than the School of Public Health.

Required courses
- PUBH 6020 - Fundamentals of Social and Behavioral Science (2.0 cr)

Course options
- PUBH 6627 - Sexuality Education: Criteria, Curricula, and Controversy (1.0 cr)
- or PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
- or PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
- or PUBH 6675 - Women's Health (2.0 cr)

Elective Coursework
All doctoral students declaring the Sexual Health Minor must select from the electives list to reach a minimum of 12 credits.
Take 7 or more credit(s) from the following:
- AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
- BTHX 8510 - Gender and the Politics of Health (3.0 cr)
- FMCH 5955 - Directed Study (1.0 - 10.0 cr)
- FSOS 4101 - Sexuality and Gender in Families and Close Relationships (3.0 cr)
- FSOS 4152 - Gay, Lesbian, Bisexual, and Transgender People in Families (3.0 cr)
- LAW 6046 - Human Trafficking (2.0 cr)
- LAW 6060 - Assisted Reproduction and the Family (3.0 cr)
- LAW 6827 - Women's International Human Rights (2.0 cr)
- PA 5601 - Global Survey of Gender and Public Policy (3.0 cr)
- PA 5690 - Topics in Women, Gender and Public Policy (0.5 - 3.0 cr)
Twin Cities Campus
Aerospace Engineering and Mechanics M.S.
Aerospace Engineering & Mechanics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Aerospace Engineering and Mechanics, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-8000; fax: 612-626-1558)
Email: aem-dgs@umn.edu
Website: http://www.aem.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Aerospace Engineering and Mechanics offers MS and PhD degrees. The graduate programs emphasize engineering sciences that are basic to fluid mechanics, aerospace systems, and solid mechanics. Theoretical, analytical, experimental, and computational aspects of these fields are covered by the courses and research opportunities offered by the department.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

A four-year BS degree in an engineering, basic science, or mathematics program is required.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's undergraduate record and letters of recommendation.

Special Application Requirements:
GRE scores are not required but are strongly recommended for students applying for graduate fellowships. In all cases, these test scores are taken into account if provided. Students are admitted fall semester only. Only under unusual circumstances are students allowed to begin their studies at another time during the academic year.

The application deadline is December 15. Additional information is available at aem.umn.edu/teaching/graduate/

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 to 24 major credits and 6 to 16 credits outside the major. The final exam is oral.

Plan C: Plan C requires 14 to 24 major credits and 6 to 16 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

This program emphasizes coursework in engineering sciences that are basic to this field: fluid mechanics, aerospace systems, and solid mechanics. Options include coursework in aerodynamics and aerospace systems, dynamical systems, material properties, and fluid and solid behavior.

The MS in aerospace engineering and mechanics requires 30 credits and is offered under Plan A (thesis), Plan B (project), and Plan C (coursework). All plans require a minimum of 14 major credits, of which 12 must be at the 5xxx or 8xxx level, and a minimum of 6 credits outside the major. In addition, Plan A requires 10 thesis credits, and Plan B requires 3 project credits (which may be counted toward the 14 major credits). The remaining course credits may be taken in the major field or in any related field. Two semesters of seminar (AEM 8000) attendance are required, but only one credit may be used towards the course credit requirements. No more than 8 credits of 4xxx courses and no more than 8 credits (6 for Plan A) taken as S/N are allowed.

Required Courses
Take one 2-course sequence in fluids, solids or dynamics

Fluids
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)

Solids
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)

Dynamics
- AEM 5401 - Intermediate Dynamics (3.0 cr)
- AEM 8411 - Advanced Dynamics (3.0 cr)

Additional Major Credits
Take an additional 8 credits in AEM. The following sequences in controls or computational fluid mechanics may be used, or any other AEM courses chosen in consultation with advisor.

Controls
- AEM 5321 - Modern Feedback Control (3.0 cr)
- AEM 5451 - Optimal Estimation (3.0 cr)
- AEM 8421 - Robust Multivariable Control Design (3.0 cr)

Computational Fluid Mechanics
- AEM 5253 - Computational Fluid Mechanics (3.0 cr)
- AEM 8253 - Computational Methods in Fluid Mechanics (3.0 cr)

Seminar
1 credit of AEM 8000 may be used towards program credit requirements.
- AEM 8000 - Seminar: Aerospace Engineering and Mechanics (1.0 cr)

Minor or Related Field
For all plans, take a minimum of 6 credits in a minor or in related fields outside AEM

Plan A
Take a minimum of 10 thesis credits
- AEM 8777 - Thesis Credits: Master’s (1.0 - 18.0 cr)

Plan B
Take 3 credits of AEM 8880 and complete a final project.
- AEM 8880 - Plan B Project (1.0 - 3.0 cr)
Twin Cities Campus

Aerospace Engineering and Mechanics Minor

Aerospace Engineering & Mechanics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Aerospace Engineering and Mechanics, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-8000; fax: 612-626-1558)
Email: aem-dgs@umn.edu
Website: http://www.aem.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Aerospace Engineering and Mechanics offers MS and PhD degrees in aerospace engineering and mechanics. The graduate programs emphasize engineering sciences that are basic to fluid mechanics, aerospace systems, and solid mechanics. Theoretical, analytical, experimental, and computational aspects of these fields are covered by the courses and research opportunities offered by the department.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A four-year BS degree in an engineering, basic science, or mathematics program is required. Admission depends primarily on the applicant’s undergraduate record and letters of recommendation.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The minor in Aerospace Engineering and Mechanics requires 6 credits in AEM courses for the master’s minor and 12 credits in AEM courses for the doctoral minor.

One course sequence in one of the following research areas must be included: fluids, solids, dynamics, controls, or computational fluid dynamics.

Courses cross listed with AEM courses must be registered for under the AEM course designation to be counted towards a minor.

Required Courses
One course sequence must be included for either a master’s minor or a doctoral minor.

Fluids
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)

Solids
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)

Dynamics
- AEM 5401 - Intermediate Dynamics (3.0 cr)
AEM 8411 - Advanced Dynamics (3.0 cr)

Controls
AEM 5321 - Modern Feedback Control (3.0 cr)
AEM 5451 - Optimal Estimation (3.0 cr)
AEM 8421 - Robust Multivariable Control Design (3.0 cr)

Computational Fluid Dynamics
AEM 5253 - Computational Fluid Mechanics (3.0 cr)
AEM 8253 - Computational Methods in Fluid Mechanics (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's Minor
At least 6 credits in Aerospace Engineering and Mechanics are required, including one sequence of two 5xxx or 8xxx courses.

Doctoral Minor
At least 12 credits in Aerospace Engineering and Mechanics are required, including one sequence of two 5xxx or 8xxx courses.
Twin Cities Campus
Aerospace Engineering and Mechanics Ph.D.
Aerospace Engineering & Mechanics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Aerospace Engineering and Mechanics, University of Minnesota, 107 Akerman Hall, 110 Union Street S.E., Minneapolis, MN 55455 (612-625-8000; fax: 612-626-1558)
Email: aem-dgs@umn.edu
Website: http://www.aem.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 66
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Aerospace Engineering and Mechanics offers a PhD degree in aerospace engineering and mechanics. The PhD program emphasizes engineering sciences that are basic to fluid mechanics, aerospace systems, and solid mechanics. Theoretical, analytical, experimental, and computational aspects of these fields are covered by the courses and research opportunities offered by the department.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

A four-year BS degree in an engineering, basic science, or mathematics program is required.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's undergraduate record, personal statement, and letters of recommendation.

Special Application Requirements:
GRE scores are not required but are strongly recommended for students applying for graduate fellowships. In all cases, these test scores are taken into account if provided. Students are admitted fall semester only. Only under unusual circumstances are students allowed to begin their studies at another time during the academic year.

The application deadline is December 15. Additional information is available at aem.umn.edu/teaching/graduate/.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
12 to 30 credits are required in the major.
12 to 30 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The PhD program emphasizes coursework and research in engineering sciences that are basic to this field. Options include coursework and research in aerodynamics and aerospace systems, dynamical systems, material properties, and fluid and solid behavior.

The PhD requires about two years of coursework, but the heart of the program is the student's thesis research. The first year of the PhD program is similar to the master's program and most PhD students receive the master's degree. The second year is devoted to more advanced courses and beginning research. Subsequent years include some coursework with increased focus on research. The time required to complete a research project varies, but most students finish the PhD within five years after the bachelor's degree.

The program must include a minimum of 42 credits of approved courses; of these, a minimum of 12 credits must be in AEM courses at the 5xxx or 8xxx level and a minimum of 12 credits outside the major are required. Four semesters of seminar attendance are required (AEM 8000), but only one credit may be used towards the course credit requirements. The remaining 18 course credits may be taken in the major or in any supporting field. No more than 8 credits of 4xxx level courses and no more than 13 credits taken as S/N are allowed.

Required Courses
Take one 2-course sequence in fluids, solids or dynamics
Fluids
AEM 8201 - Fluid Mechanics I (3.0 cr)
AEM 8202 - Fluid Mechanics II (3.0 cr)
Solids
AEM 5501 - Continuum Mechanics (3.0 cr)
AEM 5503 - Theory of Elasticity (3.0 cr)
Dynamics
AEM 5401 - Intermediate Dynamics (3.0 cr)
AEM 8411 - Advanced Dynamics (3.0 cr)

Additional Major Credits
Take an additional 6 credits in AEM at the 5xxx or 8xxx level. The following sequences in controls or computational fluid mechanics may be used, or any other AEM courses chosen in consultation with adviser.
Controls
AEM 5321 - Modern Feedback Control (3.0 cr)
AEM 5451 - Optimal Estimation (3.0 cr)
AEM 8421 - Robust Multivariable Control Design (3.0 cr)
 Computational Fluid Dynamics
AEM 5253 - Computational Fluid Mechanics (3.0 cr)
AEM 8253 - Computational Methods in Fluid Mechanics (3.0 cr)

Minor or Supporting Program
Take 12 credits in a minor or supporting program outside AEM

Seminar
1 credit of AEM 8000 may be used towards program credit requirements.
AEM 8000 - Seminar: Aerospace Engineering and Mechanics (1.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam
AEM 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
**Twin Cities Campus**

Astrophysics M.S.

Astrophysics, Minnesota Institute for

College of Science and Engineering

Link to a list of faculty for this program.

**Contact Information:**
Minnesota Institute for Astrophysics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax: 612-626-2029)
Email: MIfA-gradreq@umn.edu
Website: [http://www.astro.umn.edu](http://www.astro.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Astrophysics is the study of the universe and its constituent parts. The department conducts research in observational, theoretical, and computational astrophysics, as well as instrument development. The main research areas include minor planetary bodies, solar system properties, dynamics of normal and active galaxies, stellar evolution, interaction of stars with their environments, the interstellar medium, astrophysical magnetohydrodynamics, and galactic and cosmological structure. Observational research includes activities that cover X-ray, ultraviolet, optical, infrared, and radio wavelengths. Extensive research programs in space physics, nucleosynthesis, and the elementary particle-cosmology interface are also carried out in interdisciplinary connections with the graduate program in physics.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.50.

An undergraduate degree in astronomy or physics or the equivalent is required. Contact the Graduate Studies Committee for exceptions.

Other requirements to be completed before admission:
A statement of career goals, scores from the GRE General (Aptitude) Test and Subject (Advanced) Test in physics, and three letters of recommendation are required. Applications are due by January 1 to be considered for fellowships and by January 15 for teaching and research assistantships. Students are admitted fall semester only. Additional application information is available at [www.astro.umn.edu/grad/apply/](http://www.astro.umn.edu/grad/apply/).

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the
Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 to 24 major credits and 6 to 16 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The master's degree requires a minimum of 30 credits and is offered under Plan A (thesis) or Plan B (project). Completion of the degree normally takes two years.

Required Coursework

All students are required to take the following course

PHYS 5011 - Classical Physics I (4.0 cr)

Plan A

Plan A requires 14 credits in astrophysics, 6 credits in a minor or in related fields outside AST, and 10 thesis credits

AST 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B

Plan B requires 14 credits in astrophysics and 6 credits in a minor or in related fields outside of AST. The remaining 10 credits may be taken in the major field or any supporting field. The Plan B also requires the completion of 1-3 papers written in connection with three courses taken in the program.
Twin Cities Campus

Astrophysics Minor

Astrophysics, Minnesota Institute for
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Minnesota Institute for Astrophysics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax: 612-626-2029)
Email: MIfA+gradreq@umn.edu
Website: http://www.astro.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Astrophysics is the study of the universe and its constituent parts. The department conducts research in observational, theoretical, and computational astrophysics, as well as instrument development. The main research areas include minor planetary bodies, solar system properties, dynamics of normal and active galaxies, stellar evolution, interaction of stars with their environments, the interstellar medium, astrophysical magnetohydrodynamics, and galactic and cosmological structure. Observational research includes activities that cover X-ray, ultraviolet, optical, infrared, and radio wavelengths. Extensive research programs in space physics, nucleosynthesis, and the elementary particle-cosmology interface are also carried out in interdisciplinary connections with the graduate program in physics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
Current enrollment in a related University graduate program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

AST courses at the 5xxx-level or higher may be used for the minor with the exception of AST 8990 and 8200.

Courses at the 4xxx-level may be used with approval from the Director of Graduate Studies.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

- Masters
- Doctoral
Twin Cities Campus
Astrophysics Ph.D.
Astrophysics, Minnesota Institute for
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Minnesota Institute for Astrophysics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax: 612-626-2029)
Email: MIfA-gradreq@umn.edu
Website: http://www.astro.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Astrophysics is the study of the universe and its constituent parts. The department conducts research in observational, theoretical, and computational astrophysics, as well as instrument development. The main research areas include minor planetary bodies, solar system properties, dynamics of normal and active galaxies, stellar evolution, interaction of stars with their environments, the interstellar medium, astrophysical magnetohydrodynamics, and galactic and cosmological structure. Observational research includes activities that cover X-ray, ultraviolet, optical, infrared, and radio wavelengths. Extensive research programs in space physics, nucleosynthesis, and the elementary particle-cosmology interface are also carried out in interdisciplinary connections with the graduate program in physics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Undergraduate astronomy, physics or equivalent degree required.

Other requirements to be completed before admission:
Coursework in analytical mechanics, electrodynamics, quantum mechanics, thermodynamics, and statistical physics.

Special Application Requirements:
A statement of career goals, scores from the GRE General (Aptitude) Test and Subject (Advanced) Test in physics, and three letters of recommendation are required. Applications are due by January 1 to be considered for fellowships and by January 15 for teaching and research assistantships. Students are admitted fall semester only. Additional application information is available at www.astro.umn.edu/grad/apply/

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
28 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The PhD degree requires a minimum of 40 course credits, including 28 credits in the major, and 12 credits in a minor or supporting program; 24 thesis credits are also required.

The graduate written examination, typically held during the week prior to the start of fall semester, must be passed on the second “real” attempt (first-year students are given a free trial). A second-year project must be defended by the end of the fall semester of the third year. The preliminary oral exam must be passed by the end of the third year. Normally, the preliminary oral exam includes a presentation on the second-year project.

Required Courses
The following 2 courses are required for all students. The remaining 20 major credits are chosen in consultation with advisor.
PHYS 5011 - Classical Physics I (4.0 cr)
PHYS 5012 - Classical Physics II (4.0 cr)

Supporting Program
Students must take a minimum of 12 credits in coursework from related fields. Specific courses are chosen in consultation with advisor.

Thesis Credits
Take 24 credits after passing preliminary oral exam.
AST 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Biomedical Engineering M.S.
Department of Biomedical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Biomedical Engineering Graduate Program, 7-105 Nils Hasselmo Hall, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax 612-626-6583)
Email: bmengps@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Biomedical engineering is the application of engineering principles and methods to problems in biology and medicine. The discipline includes the study of fundamental processes in biology and physiology, the study of the diagnosis and treatment of disease and injury, and the design and development of medical devices and techniques. Students take courses in mathematics, biology, biomedical engineering, and areas of science and engineering that are relevant to the degree objectives.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

A baccalaureate degree in engineering or in a physical or biological science is required.

Other requirements to be completed before admission:
Applicants with an engineering degree do not need to complete any specific coursework prior to applying. Applicants without an engineering degree must complete (1) math coursework through calculus I, calculus II, linear algebra, and differential equations; and (2) at least 1 year of college-level physics, preferably calculus-based.

There are no minimum GPA, GRE, or English language test score requirements. A GPA of at least 3.2 on a 4.0 scale is preferred, but not required. Applicants with a lower GPA may still apply, but they will have a much lower chance of admission.

Special Application Requirements:
The fall application deadline for M.S. applicants is March 31. Local applicants applying for the program as part-time students may, under certain circumstances, be considered for spring admission. Application instructions are available at http://bme.umn.edu/grad/appinfo.html.

Students applying through the Combined B.Bm.E./M.S. Program (see below, under Program Sub-Plans) should refer to the application instructions and deadline information at http://bme.umn.edu/grad/appcombined.html.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

The preferred English language test is Test of English as Foreign Language.
Program Requirements

Plan A: Plan A requires 8 to 20 major credits, 0 to 12 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 10 to 30 major credits and 0 to 20 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B Project (BMEn 8820, minimum of 2 credits) should entail approximately 50-75 hours of work per credit, performed in collaboration with a faculty advisor. Students must submit a written report of approximately 10 double-spaced pages per credit to the advisor, who will assign a letter grade for BMEn 8820 based on the report. The report must then be defended before the student's committee.

Plan C: Plan C requires 8 to 30 major credits and 0 to 22 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

The MS program requires a minimum of 30 total credits in mathematics, biology, biomedical engineering, and relevant areas of science and engineering.

PLAN A
BMEn Core - 6 credits
BMEn Seminars - 2 credits
Biology Electives - 6 credits
Technical Electives - 6 credits
Thesis - 10 credits

PLAN B
BMEn Core - 6 credits
BMEn Seminars - 2 credits
Biology Electives - 6 credits
Technical Electives - 9 credits
Free Electives - 5 credits
Capstone Project - 2 credits

PLAN C
BMEn Core - 6 credits
BMEn Seminars - 2 credits
Biology Electives - 6 credits
Technical Electives - 9 credits
Free Electives - 7 credits

A single course may NOT be counted simultaneously toward more than one of the requirements listed above.

Math/Statistics (Plans A, B, and C) - Included in the Core/Elective requirements listed above must be a minimum of 3 credits designated as math/statistics-intensive. These are not additional credits but will overlap with coursework already satisfying the BMEn Core, Technical Elective, and/or Free Elective requirements.

8000 Level (Plans A and B only) - Core/Elective coursework must include at least 3 credits at the 8000 level, from any department (does not need to be BMEn). Credits of seminar, directed research, internship, project, thesis, and/or independent study cannot be used to fulfill this requirement. Plan C students are not required to complete 8000-level coursework.

Approved courses for each category are listed below. All coursework (excluding seminars and internships) must be taken for a letter grade (A-F). A minimum grade of B- is required for coursework to be counted toward degree requirements.
BMEn Core
Take 6 or more credit(s) from the following:
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
- BMEN 5351 - Cell Engineering (3.0 cr)
- BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
- BMEN 8001 - Polymeric Biomaterials (3.0 cr)
- BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
- BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
- BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
- BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
- BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
- BMEN 8421 - Biophotonics (3.0 cr)
- BMEN 8431 - Advanced Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
- BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
- BMEN 8502 - Physiological Control Systems (3.0 cr)
- BMEN 8511 - Systems and Synthetic Biology (3.0 cr)

BME Seminar
Seminars are 1 credit per semester, repeatable for credit, and may be taken in any order.
Take 2 or more credit(s) from the following:
- BMEN 8601 - Biomedical Engineering Seminar (1.0 cr)
- BMEN 8602 - Biomedical Engineering Seminar (1.0 cr)

Biology Electives
Additional courses may be approved by the director of graduate studies.
Take 6 or more credit(s) from the following:
- BIOC 5216 - Current Topics in Signal Transduction (3.0 cr)
- BIOC 5444 - Muscle (3.0 cr)
- BIOC 6021 - Biochemistry (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 5701 - Cancer Bioengineering (3.0 cr)
- BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
- CGSC 8041 - Cognitive Neuroscience (4.0 cr)
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)
- EEB 5371 - Principles of Systematics (3.0 cr)
- GCD 5036 - Molecular Cell Biology (3.0 cr)
- GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- GCD 8103 - Human Histology (5.0 cr)
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
- MEDC 5245 - Introduction to Drug Design (3.0 cr)
- MEDC 8461 - Design of Cancer Therapeutics (3.0 cr)
- MEDC 8760 - Design of Peptidomimetics (2.0 cr)
- MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- MICA 8003 - Immunity and Immunopathology (4.0 cr)
- MICA 8004 - Cellular and Cancer Biology (4.0 cr)
- MICA 8009 - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
- MLSP 5111 - Concepts of Diagnostic Microbiology (3.0 cr)
- MLSP 5511 - Principles of Immunobiology (3.0 cr)
- MPHY 5172 - Radiation Biology (3.0 cr)
- NEUR 5290 - Cerebrovascular Hemodynamics and Diseases I (4.0 cr)
- NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
- NSC 5540 - Survey of Biomedical Neuroscience (2.0 cr)
- NSC 5561 - Systems Neuroscience (4.0 cr)
- NSC 5661W - Behavioral Neuroscience [WI] (3.0 cr)
- NSC 5667 - Neurobiology of Disease (2.0 - 3.0 cr)
- NSC 8211 - Developmental Neurobiology (3.0 cr)
- NSC 8221 - Neurobiology of Pain and Analgesia (3.0 cr)
- NSCI 5101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBIO 8012</td>
<td>Basic Concepts in Skeletal Biology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OBIO 8028</td>
<td>Molecular Basis of Cellular and Microbial Adhesion</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>PHAR 5700</td>
<td>Applied Fundamentals of Pharmacotherapy</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHSL 5061</td>
<td>Principles of Physiology for Biomedical Engineering</td>
<td>4.0 cr</td>
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<tr>
<td>PHSL 5115</td>
<td>Clinical Physiology I</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHSL 5116</td>
<td>Clinical Physiology II</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHSL 5444</td>
<td>Muscle</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHSL 5510</td>
<td>Advanced Cardiac Physiology and Anatomy</td>
<td>2.0 - 3.0 cr</td>
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<tr>
<td>PHSL 5525</td>
<td>Anatomy and Physiology of the Pelvis and Urinary System</td>
<td>1.0 - 2.0 cr</td>
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<tr>
<td>PSY 5015</td>
<td>Cognition, Computation, and Brain</td>
<td>3.0 cr</td>
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<tr>
<td>PSY 5062</td>
<td>Cognitive Neuropsychology</td>
<td>3.0 cr</td>
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<tr>
<td>PSY 8041</td>
<td>Proseminar in Perception</td>
<td>3.0 cr</td>
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<tr>
<td>RSC 5200</td>
<td>Introduction to Neuromodulation</td>
<td>1.0 - 3.0 cr</td>
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<tr>
<td>RSC 5231</td>
<td>Clinical Biomechanics</td>
<td>2.0 - 5.0 cr</td>
</tr>
<tr>
<td>RSC 5281</td>
<td>Scientific Foundations: Exercise Theory</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>RSC 8282</td>
<td>Problems in Human Movement</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>SCB 8181</td>
<td>Stem Cell Biology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>SLHS 5808</td>
<td>Pathophysiology of Hearing Disorders</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

### Technical Electives

PLAN A students must take 6 or more Technical Elective credits. PLAN B and PLAN C students must take 9 or more Technical Elective credits. Additional courses may be approved by the director of graduate studies.

Take 6 or more credit(s) from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEM 5401</td>
<td>Intermediate Dynamics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>AEM 5451</td>
<td>Optimal Estimation</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>AEM 5501</td>
<td>Continuum Mechanics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>AEM 5503</td>
<td>Theory of Elasticity</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>AEM 8511</td>
<td>Advanced Topics in Continuum Mechanics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>AEM 8531</td>
<td>Fracture Mechanics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BIOC 5351</td>
<td>Protein Engineering</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BIOC 5352</td>
<td>Biotechnology and Bioengineering for Biochemists</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BIOC 5528</td>
<td>Spectroscopy and Kinetics</td>
<td>4.0 cr</td>
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<tr>
<td>BIOC 8005</td>
<td>Biochemistry: Structure and Catalysis</td>
<td>2.0 cr</td>
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<tr>
<td>BMEN 5001</td>
<td>Advanced Biomaterials</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5041</td>
<td>Tissue Engineering</td>
<td>3.0 cr</td>
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<tr>
<td>BMEN 5101</td>
<td>Advanced Bioelectricity and Instrumentation</td>
<td>3.0 cr</td>
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<tr>
<td>BMEN 5111</td>
<td>Biomedical Ultrasound</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5151</td>
<td>Introduction to BioMEMS and Medical Microdevices</td>
<td>2.0 cr</td>
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<tr>
<td>BMEN 5201</td>
<td>Advanced Biomechanics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5311</td>
<td>Advanced Biomedical Transport Processes</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5321</td>
<td>Microfluidics in Biology and Medicine</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5351</td>
<td>Cell Engineering</td>
<td>3.0 cr</td>
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<tr>
<td>BMEN 5401</td>
<td>Advanced Biomedical Imaging</td>
<td>3.0 cr</td>
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<tr>
<td>BMEN 5411</td>
<td>Neural Engineering</td>
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<tr>
<td>BMEN 5412</td>
<td>Neuromodulation</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5413</td>
<td>Neural Decoding and Interfacing</td>
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</tr>
<tr>
<td>BMEN 5421</td>
<td>Introduction to Biomedical Optics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 5601</td>
<td>Cardiovascular Devices</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>BMEN 8001</td>
<td>Polymeric Biomaterials</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8101</td>
<td>Biomedical Digital Signal Processing</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8151</td>
<td>Biomedical Electronics and Implantable Microsystems</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8201</td>
<td>Advanced Tissue Mechanics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8381</td>
<td>Bioheat and Mass Transfer</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8401</td>
<td>New Product Design and Business Development</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>BMEN 8421</td>
<td>Biophotonics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8431</td>
<td>Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>BMEN 8501</td>
<td>Dynamical Systems in Biology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8502</td>
<td>Physiological Control Systems</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>BMEN 8511</td>
<td>Systems and Synthetic Biology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEM 8021</td>
<td>Computational Chemistry</td>
<td>4.0 cr</td>
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<tr>
<td>CHEM 8157</td>
<td>Bioanalytical Chemistry</td>
<td>4.0 cr</td>
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<tr>
<td>CHEN 5751</td>
<td>Biochemical Engineering</td>
<td>3.0 cr</td>
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<tr>
<td>CHEN 8101</td>
<td>Fluid Mechanics I: Change, Deformation, Equations of Flow</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8201</td>
<td>Applied Math</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8221</td>
<td>Synthetic Polymer Chemistry</td>
<td>4.0 cr</td>
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</tbody>
</table>
•NSCI 5300 - Biological Microscopy & Digital Imaging (3.0 cr)
•PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
•PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
•PHYS 5402 - Radiological Physics (4.0 cr)
•PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
•PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
•PUBH 6415 - Biostatistical Methods II (3.0 cr)
•PUBH 6450 - Biostatistics I (4.0 cr)
•PUBH 6451 - Biostatistics II (4.0 cr)
•PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
•PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
•RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
•RSC 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
•RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
•RSC 8135 - Human Kinematics (3.0 cr)
•RSC 8235 - Human Kinetics (3.0 cr)
•STAT 5021 - Statistical Analysis (4.0 cr)
•STAT 5102 - Theory of Statistics II (4.0 cr)
•STAT 5302 - Applied Regression Analysis (4.0 cr)
•STAT 5303 - Designing Experiments (4.0 cr)

Free Electives
PLAN A students are not required to take any Free Electives; PLAN B students must take at least 5 credits; PLAN C students must take at least 7 credits. Additional courses may be approved by the director of graduate studies.
Take 0 or more credit(s) from the following:
•BMEN 8402 - New Product Design and Business Development (4.0 cr)
•MILI 5589 - Medical Technology Evaluation and Market Research (2.0 cr)
•MOT 5001 - Technological Business Fundamentals (2.0 cr)
•MOT 5002 - Creating Technological Innovation (2.0 cr)
•MOT 5003 - Technological Business Planning Workshop (1.0 cr)
•PDES 5701 - Creativity, Idea Generation, and Innovation (3.0 cr)
•PDES 5702 - Concept Sketching and Rendering (3.0 cr)
•PDES 5704 - Computer-Aided Design Methods (3.0 cr)
•PHYS 5401 - Physiological Physics (4.0 cr)
•PSY 5036W - Computational Vision [WI] (3.0 cr)
•PUBH 6161 - Regulatory Toxicology (2.0 cr)
•PUBH 6414 - Biostatistical Literacy (3.0 cr)
•PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
•RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)

•Additional Bio/Tech/Core
•Any course(s) from the BMEn Core, Biology Elective, and/or Technical Elective lists that are not being used toward another degree requirement.

•Coursework Relevant to Science and Technology
Max 3 credits in coursework relevant to science and technology (e.g., public policy, ethical/historical aspects, etc).
Take 0 - 3 credit(s) from the following:
•BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
•BTHX 5120 - Dying in Contemporary Medical Culture (2.0 cr)
•BTHX 5210 - Ethics of Human Subjects Research (3.0 cr)
•BTHX 5300 - Foundations of Bioethics (3.0 cr)
•BTHX 5325 - Biomedical Ethics (3.0 cr)
•BTHX 5650 - Disability Ethics (3.0 cr)
•BTHX 8120 - Dying in Contemporary Medical Culture (2.0 cr)
•MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
•MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
•PHAR 5200 - Drugs and the US Health Care System (3.0 cr)

Math-/Statistics-Intensive
Included in the Core and/or Elective coursework must be at least 3 credits designated as Math-/Statistics-Intensive. These are not additional credits but will overlap with coursework already satisfying the BMEn Core, Technical Elective, and/or Free Elective requirements. Additional courses may be approved by the director of graduate studies.
Take 3 or more credit(s) from the following:
•AEM 5451 - Optimal Estimation (3.0 cr)
•AEM 5501 - Continuum Mechanics (3.0 cr)
•AEM 5503 - Theory of Elasticity (3.0 cr)
• AEM 8511 - Advanced Topics in Continuum Mechanics (3.0 cr)
• BMEN 5111 - Biomedical Ultrasound (3.0 cr)
• BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
• BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
• BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
• CHEN 8201 - Applied Math (3.0 cr)
• CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
• CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• EE 5251 - Optimal Filtering and Estimation (3.0 cr)
• EE 5531 - Probability and Stochastic Processes (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EE 5545 - Digital Signal Processing Design (3.0 cr)
• EE 5561 - Image Processing and Applications (3.0 cr)
• EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
• EE 5621 - Physical Optics (3.0 cr)
• EE 8591 - Predictive Learning from Data (3.0 cr)
• IE 5522 - Quality Engineering and Reliability (4.0 cr)
• MATH 5248 - Cryptology and Number Theory (4.0 cr)
• MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
• MATH 5447 - Theoretical Neuroscience (4.0 cr)
• MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
• MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
• MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
• MATH 8202 - General Algebra (3.0 cr)
• MATH 8253 - Algebraic Geometry (3.0 cr)
• ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
• ME 5351 - Computational Heat Transfer (4.0 cr)
• ME 8341 - Conduction (3.0 cr)
• ME 8342 - Convection (3.0 cr)
• ME 8343 - Radiation (3.0 cr)
• ME 8345 - Computational Heat Transfer and Fluid Flow (3.0 cr)
• MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)

Thesis/Project Requirements

PLAN A
Take 10 or more credit(s) from the following:
• BMEN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

OR

PLAN B
Take 2 or more credit(s) from the following:
• BMEN 8820 - Plan B Project (2.0 - 3.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

**Combined B.Bm.E./M.S.**
The College Science & Engineering offers an early-admission opportunity for eligible University of Minnesota B.Bm.E. students also interested in completing the Biomedical Engineering MS degree (Plan A or Plan B only). The Early Admission sub-plan, also referred to as the Combined B.Bm.E./MS Biomedical Engineering program, enables B.Bm.E. majors to take 3-16 credits toward the MS requirements during their senior (fourth) year, in addition to the courses required for the B.Bm.E. degree. The MS degree may then be completed in the fifth year of study. Students are NOT permitted to count a single course toward both the undergraduate and graduate degrees; each course must be counted either toward the B.Bm.E. requirements or the MS requirements.

Interested B.Bm.E. students should visit the program website at http://bme.umn.edu/grad/appcombined.html for detailed application and admission information, deadlines, and instructions.

Students admitted to the Combined B.Bm.E./M.S. must maintain timely degree progress to ensure that all undergraduate degree requirements are completed by the end of their fourth year. They must also be able to take additional courses during their senior year, beyond those required by the B.Bm.E. curriculum, to be eligible for this program.
Twin Cities Campus
Biomedical Engineering Minor
Department of Biomedical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Biomedical Engineering Graduate Program, 7-105 Nils Hasselmo Hall, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax: 612-626-6583)
Email: bmengqs@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Biomedical engineering is the application of engineering principles and methods to problems in biology and medicine. The discipline includes the study of fundamental processes in biology and physiology, the study of the diagnosis and treatment of disease and injury, and the design and development of medical devices and techniques. Students take courses in mathematics, biology, biomedical engineering, and areas of science and engineering that are relevant for the degree objectives.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

All courses for the biomedical engineering minor must be completed for a letter grade (A-F). A minimum grade of B- is required for a course to count toward the minor.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's
BMEn Core
Take 1 or more course(s) from the following:
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
- BMEN 5351 - Cell Engineering (3.0 cr)
- BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
- BMEN 8001 - Polymeric Biomaterials (3.0 cr)
- BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
- BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
### Additional BMEn Courses

Three additional graduate level BMEn credits are required. Coursework from the BMEn Core list can be applied toward this requirement. The following courses cannot be used to satisfy any minor requirements: BMEn 8334, 8335, 8601, 8602, 8611, 8710, 8720, 8820, 8910.

Take 1 or more course(s) from the following:
- BMEN 5xxx
- BMEN 8xxx

### Doctoral

The Ph.D. minor in BME requires two courses from the BMEn Core list, one course from the Biology Electives list, and one course from the Technical Electives list, for a minimum of 12 credits.

A single course may not be counted toward more than one requirement.

### BMEn Core

Take 2 or more course(s) from the following:
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
- BMEN 5351 - Cell Engineering (3.0 cr)
- BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
- BMEN 8001 - Polymeric Biomaterials (3.0 cr)
- BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
- BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
- BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
- BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
- BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
- BMEN 8421 - Biophotonics (3.0 cr)
- BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
- BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
- BMEN 8502 - Physiological Control Systems (3.0 cr)
- BMEN 8511 - Systems and Synthetic Biology (3.0 cr)

### Biology Elective

Additional courses may be approved by the director of graduate studies.

Take 1 or more course(s) from the following:
- BIOC 5216 - Current Topics in Signal Transduction (3.0 cr)
- BIOC 5444 - Muscle (3.0 cr)
- BIOC 5021 - Biochemistry (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 5701 - Cancer Bioengineering (3.0 cr)
- BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
- CGSC 8041 - Cognitive Neuroscience (4.0 cr)
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)
- EEB 5371 - Principles of Systematics (3.0 cr)
- GCD 5036 - Molecular Cell Biology (3.0 cr)
- GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- GCD 8103 - Human Histology (5.0 cr)
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
- MEDC 5245 - Introduction to Drug Design (3.0 cr)
- MEDC 8461 - Design of Cancer Therapeutics (3.0 cr)
- MEDC 8760 - Design of Peptidomimetics (2.0 cr)
- MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
• MICA 8003 - Immunity and Immunopathology (4.0 cr)
• MICA 8004 - Cellular and Cancer Biology (4.0 cr)
• MICA 8009 - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
• MLSP 5111 - Concepts of Diagnostic Microbiology (3.0 cr)
• MLSP 5511 - Principles of Immunobiology (3.0 cr)
• MPHY 5172 - Radiation Biology (3.0 cr)
• NEUR 5230 - Cerebrovascular Hemodynamics and Diseases I (4.0 cr)
• NSC 5461 - Cellular and Molecular Neuroscience (4.0 cr)
• NSC 5540 - Survey of Biomedical Neuroscience (2.0 cr)
• NSC 5561 - Systems Neuroscience (4.0 cr)
• NSC 5661W - Behavioral Neuroscience [WI] (3.0 cr)
• NSC 5667 - Neurobiology of Disease (2.0 - 3.0 cr)
• NSC 8211 - Developmental Neurobiology (3.0 cr)
• NSC 8221 - Neurobiology of Pain and Analgesia (3.0 cr)
• NSCI 5101 - Neurobiology: Molecules, Cells, and Systems (3.0 cr)
• OBIO 5002 - Basic Concepts in Skeletal Biology (2.0 cr)
• OBIO 8028 - Molecular Basis of Cellular and Microbial Adhesion (2.0 cr)
• PHAR 5700 - Applied Fundamentals of Pharmacotherapy (3.0 cr)
• PHSL 5061 - Principles of Physiology for Biomedical Engineering (4.0 cr)
• PHSL 5115 - Clinical Physiology I (3.0 cr)
• PHSL 5116 - Clinical Physiology II (3.0 cr)
• PHSL 5444 - Muscle (3.0 cr)
• PHSL 5510 - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
• PHSL 5525 - Anatomy and Physiology of the Pelvis and Urinary System (1.0 - 2.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
• PSY 5062 - Cognitive Neuropsychology (3.0 cr)
• PSY 8041 - Proseminar in Perception (3.0 cr)
• RSC 5200 - Introduction to Neuromodulation (1.0 - 3.0 cr)
• RSC 5231 - Clinical Biomechanics (2.0 - 5.0 cr)
• RSC 5281 - Scientific Foundations: Exercise Theory (3.0 cr)
• RSC 8282 - Problems in Human Movement (4.0 cr)
• SCB 8181 - Stem Cell Biology (3.0 cr)
• SLHS 5808 - Pathophysiology of Hearing Disorders (3.0 cr)

**Technical Elective**

Additional courses may be approved by the director of graduate studies.

Take 1 or more course(s) from the following:

• AEM 5401 - Intermediate Dynamics (3.0 cr)
• AEM 5451 - Optimal Estimation (3.0 cr)
• AEM 5501 - Continuum Mechanics (3.0 cr)
• AEM 5503 - Theory of Elasticity (3.0 cr)
• AEM 8511 - Advanced Topics in Continuum Mechanics (3.0 cr)
• AEM 8531 - Fracture Mechanics (3.0 cr)
• BIOC 5351 - Protein Engineering (3.0 cr)
• BIOC 5352 - Biototechnology and Bioengineering for Biochemists (3.0 cr)
• BIOC 5526 - Spectroscopy and Kinetics (4.0 cr)
• BIOC 8005 - Biochemistry: Structure and Catalysis (2.0 cr)
• BMEN 5001 - Advanced Biomaterials (3.0 cr)
• BMEN 5041 - Tissue Engineering (3.0 cr)
• BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
• BMEN 5111 - Biomedical Ultrasound (3.0 cr)
• BMEN 5151 - Introduction to BioMEMs and Medical Microdevices (2.0 cr)
• BMEN 5201 - Advanced Biomechanics (3.0 cr)
• BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
• BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
• BMEN 5351 - Cell Engineering (3.0 cr)
• BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
• BMEN 5411 - Neural Engineering (3.0 cr)
• BMEN 5412 - Neuromodulation (3.0 cr)
• BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
• BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
• BMEN 5601 - Cardiovascular Devices (1.0 cr)
• BMEN 8001 - Polymeric Biomaterials (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
• BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
• BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
• BMEN 8401 - New Product Design and Business Development (4.0 cr)
• BMEN 8421 - Biophotonics (3.0 cr)
• BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
• CHEM 8021 - Computational Chemistry (4.0 cr)
• CHEM 8157 - Bioanalytical Chemistry (4.0 cr)
• CHEN 5751 - Biochemical Engineering (3.0 cr)
• CHEN 8021 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
• CHEN 8201 - Applied Math (3.0 cr)
• CHEN 8221 - Synthetic Polymer Chemistry (4.0 cr)
• CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
• CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
• CHEM 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CSCI 5103 - Operating Systems (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
• EE 5141 - Introduction to Microsystem Technology (4.0 cr)
• EE 5171 - Microelectronic Fabrication (4.0 cr)
• EE 5251 - Optimal Filtering and Estimation (3.0 cr)
• EE 5323 - VLSI Design I (3.0 cr)
• EE 5333 - Analog Integrated Circuit Design (3.0 cr)
• EE 5393 - Circuits, Computation, and Biology (3.0 cr)
• EE 5531 - Probability and Stochastic Processes (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EE 5545 - Digital Signal Processing Design (3.0 cr)
• EE 5561 - Image Processing and Applications (3.0 cr)
• EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
• EE 5621 - Physical Optics (3.0 cr)
• EE 5691 - Predictive Learning from Data (3.0 cr)
• HINF 5430 - Foundations of Health Informatics I (3.0 cr)
• HINF 5431 - Foundations of Health Informatics II (3.0 cr)
• HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• HUMF 5211 - Human Factors and Work Analysis (4.0 cr)
• IE 5111 - Systems Engineering I (2.0 cr)
• IE 5113 - Systems Engineering II (4.0 cr)
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5522 - Quality Engineering and Reliability (4.0 cr)
• IE 5541 - Project Management (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5553 - Simulation (4.0 cr)
• KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
• MATH 5248 - Cryptology and Number Theory (4.0 cr)
• MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
• MATH 5447 - Theoretical Neuroscience (4.0 cr)
• MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
• MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
• MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
• MATH 8202 - General Algebra (3.0 cr)
• MATH 8253 - Algebraic Geometry (3.0 cr)
• MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
• MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
• MATS 8003 - Electronic Properties (3.0 cr)
• ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
• ME 5241 - Computer-Aided Engineering (4.0 cr)
• ME 5243 - Advanced Mechanism Design (4.0 cr)
• ME 5247 - Stress Analysis, Sensing, and Transducers (4.0 cr)
• ME 5281 - Analog and Digital Control (4.0 cr)
• ME 5286 - Robotics (4.0 cr)
• ME 5341 - Case Studies in Thermal Engineering and Design (4.0 cr)
• ME 5351 - Computational Heat Transfer (4.0 cr)
• ME 8254 - Fundamentals of Microelectromechanical Systems (MEMS) (4.0 cr)
• ME 8341 - Conduction (3.0 cr)
• ME 8342 - Convection (3.0 cr)
• ME 8343 - Radiation (3.0 cr)
• ME 8345 - Computational Heat Transfer and Fluid Flow (3.0 cr)
• MPHY 5170 - Basic Radiological Physics (3.0 cr)
• MPHY 5178 - Physical Principles of Magnetic Resonance Imaging (3.0 cr)
• MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
• NSCI 5300 - Biological Microscopy & Digital Imaging (3.0 cr)
• PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
• PHYS 5402 - Radiophysical Physics (4.0 cr)
• PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
• PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
• RSC 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
• RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
• RSC 8135 - Human Kinematics (3.0 cr)
• RSC 8235 - Human Kinetics (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)
Twin Cities Campus
Biomedical Engineering Ph.D.
Department of Biomedical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Biomedical Engineering Graduate Program, 7-105 Nils Hasselmo Hall, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax: 612-626-6583)
Email: bmenps@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 54
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Biomedical engineering is the application of engineering principles and methods to problems in biology and medicine. The discipline includes the study of fundamental processes in biology and physiology, the study of the diagnosis and treatment of disease and injury, and the design and development of medical devices and techniques. Students take courses in mathematics, biology, biomedical engineering, and areas of science and engineering that are relevant for the degree objectives.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

A baccalaureate degree in engineering or in a physical or biological science is required.

Other requirements to be completed before admission:
Applicants with an engineering degree do not need to complete any specific coursework prior to applying. Applicants without an engineering degree must complete (1) math coursework through calculus I, calculus II, linear algebra, and differential equations; and (2) at least one year of college-level physics, preferably calculus-based.

There are no minimum required GPA, GRE, or English language test scores. A GPA of at least 3.5 on a 4.0 scale is preferred, but not required. Applicants with a lower GPA may still apply, but they will have a much lower chance of admission.

Special Application Requirements:
Fall application deadline is December 15. PhD applications are not accepted for the spring or summer terms. Application instructions are available at http://bme.umn.edu/grad/appinfo.html.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- IELTS

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
11 to 30 credits are required in the major.
0 to 19 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD program requires 30 credits of coursework in mathematics, biology, biomedical engineering, and relevant areas of science and engineering.

BMEn Core - 6 credits
BMEn Seminars - 3 credits
Biology Electives - 6 credits
Technical Electives - 9 credits
Free Electives - 6 credits

A single course may NOT be counted simultaneously toward more than one of the requirements listed above.

Math/Statistics - Included in the Core/Elective requirements listed above must be a minimum of 6 credits designated as Math-/Statistics-Intensive. These are not additional credits but will overlap with coursework already satisfying the BMEn Core, Technical Elective, and/or Free Elective requirements.

Approved courses for each category are listed below. All coursework (excluding seminars and internships) must be taken for a letter grade (A-F). A minimum grade of B- is required for coursework to be counted toward degree requirements.

In addition to the 30 credits of coursework, 24 thesis credits (BMEn 8888) are required.

BMEn 8000-Level Core
Take 6 or more credit(s) from the following:
• BMEN 8001 - Polymeric Biomaterials (3.0 cr)
• BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
• BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
• BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
• BMEN 8421 - Biophotonics (3.0 cr)
• BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• BMEN 8511 - Systems and Synthetic Biology (3.0 cr)

BMEn Seminars
Seminars are 1 credit per semester, repeatable for credit, and may be taken in any order. Another department/program graduate seminar may be substituted for 1 credit of this requirement, with prior approval from the director of graduate studies.
Take 3 or more credit(s) from the following:
• BMEN 8601 - Biomedical Engineering Seminar (1.0 cr)
• BMEN 8602 - Biomedical Engineering Seminar (1.0 cr)

Biology Electives
Additional courses may be approved by the director of graduate studies.
Take 6 or more credit(s) from the following:
• BIOC 5216 - Current Topics in Signal Transduction (3.0 cr)
• BIOC 5444 - Muscle (3.0 cr)
• BIOC 6021 - Biochemistry (3.0 cr)
• BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
• BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
• BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
• BMEN 5701 - Cancer Bioengineering (3.0 cr)
• **BMEN 8041** - Advanced Tissue Engineering Lab (3.0 cr)
• **CGSC 8041** - Cognitive Neuroscience (4.0 cr)
• **CPMS 5101** - Introduction to Clinical Physiology and Movement Science (3.0 cr)
• **EEB 5371** - Principles of Systematics (3.0 cr)
• **GCD 5036** - Molecular Cell Biology (3.0 cr)
• **GCD 8008** - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
• **GCD 8103** - Human Histology (5.0 cr)
• **GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
• **GCD 8151** - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
• **GCD 8161** - Advanced Cell Biology and Development (3.0 cr)
• **MEDC 5245** - Introduction to Drug Design (3.0 cr)
• **MEDC 8461** - Design of Cancer Therapeutics (3.0 cr)
• **MEDC 8760** - Design of Peptidomimetics (2.0 cr)
• **MICA 8002** - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
• **MICA 8003** - Immunity and Immunopathology (4.0 cr)
• **MICA 8004** - Cellular and Cancer Biology (4.0 cr)
• **MICA 8009** - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
• **MLSP 5111** - Concepts of Diagnostic Microbiology (3.0 cr)
• **MLSP 5511** - Principles of Immunobiology (3.0 cr)
• **MPHY 5172** - Radiation Biology (3.0 cr)
• **NEUR 5230** - Cerebrovascular Hemodynamics and Diseases I (4.0 cr)
• **NSC 5461** - Cellular and Molecular Neuroscience (4.0 cr)
• **NSC 5540** - Survey of Biomedical Neuroscience (2.0 cr)
• **NSC 5561** - Systems Neuroscience (4.0 cr)
• **NSC 5661W** - Behavioral Neuroscience [WI] (3.0 cr)
• **NSC 5667** - Neurobiology of Disease (2.0 - 3.0 cr)
• **NSC 8211** - Developmental Neurobiology (3.0 cr)
• **NSC 8221** - Neurobiology of Pain and Analgesia (3.0 cr)
• **NSCI 5101** - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
• **OBIO 8012** - Basic Concepts in Skeletal Biology (2.0 cr)
• **OBIO 8028** - Molecular Basis of Cellular and Microbial Adhesion (2.0 cr)
• **PHAR 5700** - Applied Fundamentals of Pharmacotherapy (3.0 cr)
• **PHSL 5061** - Principles of Physiology for Biomedical Engineering (4.0 cr)
• **PHSL 5115** - Clinical Physiology I (3.0 cr)
• **PHSL 5116** - Clinical Physiology II (3.0 cr)
• **PHSL 5444** - Muscle (3.0 cr)
• **PHSL 5510** - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
• **PHSL 5525** - Anatomy and Physiology of the Pelvis and Urinary System (1.0 - 2.0 cr)
• **PSY 5015** - Cognition, Computation, and Brain (3.0 cr)
• **PSY 5062** - Cognitive Neuropsychology (3.0 cr)
• **PSY 8041** - Proseminar in Perception (3.0 cr)
• **RSC 5200** - Introduction to Neuromodulation (1.0 - 3.0 cr)
• **RSC 5231** - Clinical Biomechanics (2.0 - 5.0 cr)
• **RSC 5281** - Scientific Foundations: Exercise Theory (3.0 cr)
• **RSC 8282** - Problems in Human Movement (4.0 cr)
• **SCB 8181** - Stem Cell Biology (3.0 cr)
• **SLHS 5808** - Pathophysiology of Hearing Disorders (3.0 cr)

**Technical Electives**

Additional courses may be approved by the director of graduate studies. Take 9 or more credit(s) from the following:

- **AEM 5401** - Intermediate Dynamics (3.0 cr)
- **AEM 5451** - Optimal Estimation (3.0 cr)
- **AEM 5501** - Continuum Mechanics (3.0 cr)
- **AEM 5503** - Theory of Elasticity (3.0 cr)
- **AEM 8511** - Advanced Topics in Continuum Mechanics (3.0 cr)
- **AEM 8531** - Fracture Mechanics (3.0 cr)
- **BIOC 5351** - Protein Engineering (3.0 cr)
- **BIOC 5352** - Biotechnology and Bioengineering for Biochemists (3.0 cr)
- **BIOC 5528** - Spectroscopy and Kinetics (4.0 cr)
- **BIOC 8005** - Biochemistry: Structure and Catalysis (2.0 cr)
- **BMEN 5001** - Advanced Biomaterials (3.0 cr)
- **BMEN 5041** - Tissue Engineering (3.0 cr)
- **BMEN 5101** - Advanced Bioelectricity and Instrumentation (3.0 cr)
- **BMEN 5111** - Biomedical Ultrasound (3.0 cr)

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• BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
• BMEN 5201 - Advanced Biomechanics (3.0 cr)
• BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
• BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
• BMEN 5351 - Cell Engineering (3.0 cr)
• BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
• BMEN 5411 - Neural Engineering (3.0 cr)
• BMEN 5412 - Neuromodulation (3.0 cr)
• BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
• BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
• BMEN 5601 - Cardiovascular Devices (1.0 cr)
• BMEN 8001 - Polymeric Biomaterials (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
• BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
• BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
• BMEN 8401 - New Product Design and Business Development (4.0 cr)
• BMEN 8421 - Biophotonics (3.0 cr)
• BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
• CHEM 8021 - Computational Chemistry (4.0 cr)
• CHEM 8157 - Bioanalytical Chemistry (4.0 cr)
• CHEM 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
• CHEM 8201 - Applied Math (3.0 cr)
• CHEM 8221 - Synthetic Polymer Chemistry (4.0 cr)
• CHEM 8301 - Physical Rate Processes I: Transport (3.0 cr)
• CHEM 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
• CHEM 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CSCI 5103 - Operating Systems (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
• EE 5141 - Introduction to Microsystem Technology (4.0 cr)
• EE 5171 - Microelectronic Fabrication (4.0 cr)
• EE 5251 - Optimal Filtering and Estimation (3.0 cr)
• EE 5323 - VLSI Design I (3.0 cr)
• EE 5333 - Analog Integrated Circuit Design (3.0 cr)
• EE 5393 - Circuits, Computation, and Biology (3.0 cr)
• EE 5531 - Probability and Stochastic Processes (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EE 5545 - Digital Signal Processing Design (3.0 cr)
• EE 5561 - Image Processing and Applications (3.0 cr)
• EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
• EE 5621 - Physical Optics (3.0 cr)
• EE 5851 - Predictive Learning from Data (3.0 cr)
• HINF 5430 - Foundations of Health Informatics I (3.0 cr)
• HINF 5431 - Foundations of Health Informatics II (3.0 cr)
• HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• HUMF 5211 - Human Factors and Work Analysis (4.0 cr)
• IE 5111 - Systems Engineering I (2.0 cr)
• IE 5113 - Systems Engineering II (4.0 cr)
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5522 - Quality Engineering and Reliability (4.0 cr)
• IE 5541 - Project Management (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5553 - Simulation (4.0 cr)
• KIN 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
• KIN 5643 - Applied Motion Capture and Movement Analysis Technology (3.0 cr)
• MATH 5248 - Cryptology and Number Theory (4.0 cr)
• MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
• MATH 5447 - Theoretical Neuroscience (4.0 cr)
• MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
• MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
• MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
• MATH 8202 - General Algebra (3.0 cr)
• MATH 8253 - Algebraic Geometry (3.0 cr)
• MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
• MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
• MATS 8003 - Electronic Properties (3.0 cr)
• ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
• ME 5241 - Computer-Aided Engineering (4.0 cr)
• ME 5243 - Advanced Mechanism Design (4.0 cr)
• ME 5247 - Stress Analysis, Sensing, and Transducers (4.0 cr)
• ME 5281 - Analog and Digital Control (4.0 cr)
• ME 5286 - Robotics (4.0 cr)
• ME 5341 - Case Studies in Thermal Engineering and Design (4.0 cr)
• ME 5351 - Computational Heat Transfer (4.0 cr)
• ME 8254 - Fundamentals of Microelectromechanical Systems (MEMS) (4.0 cr)
• ME 8341 - Conduction (3.0 cr)
• ME 8342 - Convection (3.0 cr)
• ME 8343 - Radiation (3.0 cr)
• ME 8345 - Computational Heat Transfer and Fluid Flow (3.0 cr)
• MPHYS 5170 - Basic Radiological Physics (3.0 cr)
• MPHYS 5177 - Physical Principles of Magnetic Resonance Imaging (3.0 cr)
• MPHYS 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
• NSCI 5300 - Biological Microscopy & Digital Imaging (3.0 cr)
• PHMH 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
• PHYS 5401 - Physiological Physics (4.0 cr)
• PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
• PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
• PUBH 6415 - Biostatistical Methods II (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
• RSC 5200 - Introduction to Neuromodulation (1.0 - 3.0 cr)
• RSC 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
• RSC 5841 - Applied Data Acquisition and Processing (3.0 cr)
• RSC 8135 - Human Kinematics (3.0 cr)
• RSC 8235 - Human Kinetics (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)

Free Electives
6 credits total, must include BMEn 8611. Additional courses may be approved by the director of graduate studies.

BMEN 8611 - Professional Skills and Ethics for Biomedical Engineers (2.0 cr)

Take 4 or more credit(s) from the following:
• BMEN 8402 - New Product Design and Business Development (4.0 cr)
• MLLI 5589 - Medical Technology Evaluation and Market Research (2.0 cr)
• MOT 5001 - Technological Business Fundamentals (2.0 cr)
• MOT 5002 - Creating Technological Innovation (2.0 cr)
• MOT 5003 - Technological Business Planning Workshop (1.0 cr)
• PDES 5701 - Creativity, Idea Generation, and Innovation (3.0 cr)
• PDES 5702 - Concept Sketching and Rendering (3.0 cr)
• PDES 5704 - Computer-Aided Design Methods (3.0 cr)
• PHYS 5401 - Physiological Physics (4.0 cr)
• PSY 5036W - Computational Vision [WI] (3.0 cr)

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• PUBH 6161 - Regulatory Toxicology (2.0 cr)
• PUBH 6414 - Biostatistical Literacy (3.0 cr)
• PUBH 7415 - Introduction to Clinical Trials (3.0 cr)
• RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
• Additional Core/Bio/Tech
  Any course(s) from the BMEn Core, Biology Elective, and/or Technical Elective lists that are not being used toward another degree requirement.
• Coursework Relevant to Science and Technology
  Max 3 credits in coursework relevant to science and technology (e.g., public policy, ethical/historical aspects, etc).
  Take 0 - 3 credit(s) from the following:
  • BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
  • BTHX 5120 - Dying in Contemporary Medical Culture (2.0 cr)
  • BTHX 5210 - Ethics of Human Subjects Research (3.0 cr)
  • BTHX 5300 - Foundations of Bioethics (3.0 cr)
  • BTHX 5325 - Biomedical Ethics (3.0 cr)
  • BTHX 5650 - Disability Ethics (3.0 cr)
  • BTHX 8120 - Dying in Contemporary Medical Culture (2.0 cr)
  • MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
  • MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
  • PHAR 5200 - Drugs and the US Health Care System (3.0 cr)

Math-/Statistics-Intensive
  Included in the Core and/or Elective coursework must be at least 6 credits designated as Math-/Statistics-Intensive. These are not additional credits but will overlap with coursework already satisfying the BMEn Core, Technical Elective, and/or Free Elective requirements.
  Take 6 or more credit(s) from the following:
  • AEM 5451 - Optimal Estimation (3.0 cr)
  • AEM 5501 - Continuum Mechanics (3.0 cr)
  • AEM 5503 - Theory of Elasticity (3.0 cr)
  • AEM 8511 - Advanced Topics in Continuum Mechanics (3.0 cr)
  • BMEN 5111 - Biomedical Ultrasound (3.0 cr)
  • BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
  • BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
  • BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
  • BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
  • BMEN 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
  • BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
  • BMEN 8502 - Physiological Control Systems (3.0 cr)
  • CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
  • CHEN 8201 - Applied Math (3.0 cr)
  • CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
  • CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
  • CSCI 5521 - Introduction to Machine Learning (3.0 cr)
  • CSCI 5525 - Machine Learning (3.0 cr)
  • EE 5251 - Optimal Filtering and Estimation (3.0 cr)
  • EE 5531 - Probability and Stochastic Processes (3.0 cr)
  • EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
  • EE 5545 - Digital Signal Processing Design (3.0 cr)
  • EE 5561 - Image Processing and Applications (3.0 cr)
  • EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
  • EE 5621 - Physical Optics (3.0 cr)
  • EE 8591 - Predictive Learning from Data (3.0 cr)
  • IE 5522 - Quality Engineering and Reliability (4.0 cr)
  • MATH 5248 - Cryptology and Number Theory (4.0 cr)
  • MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
  • MATH 5447 - Theoretical Neuroscience (4.0 cr)
  • MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
  • MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
  • MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
  • MATH 8202 - General Algebra (3.0 cr)
  • MATH 8253 - Algebraic Geometry (3.0 cr)
  • ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
  • ME 5351 - Computational Heat Transfer (4.0 cr)
  • ME 8341 - Conduction (3.0 cr)
  • ME 8342 - Convection (3.0 cr)
• ME 8343 - Radiation (3.0 cr)
• ME 8345 - Computational Heat Transfer and Fluid Flow (3.0 cr)
• MPH 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• PHM 8431 - Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models (4.0 cr)
• PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
• PUBH 6450 - Biostatistics I (4.0 cr)
• PUBH 6451 - Biostatistics II (4.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• STAT 5021 - Statistical Analysis (4.0 cr)
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5303 - Designing Experiments (4.0 cr)

**Thesis Credits**
Take 24 credits after passing preliminary oral exam

**BMEN 8888** - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Chemical Engineering M.Ch.E.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Abumson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Chemical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Research activities in the Chemical Engineering and Materials Science (CEMS) Department focus on the development of renewable energy technologies, the solution of important medical and biological engineering challenges, the development of advanced materials, and the application of sophisticated mathematical and theoretical models.

Graduate courses offered cover core areas of chemical engineering (fluid mechanics, applied mathematics: linear and nonlinear analysis, transport, chemical thermodynamics, statistical thermodynamics and kinetics, and analysis of chemical reactors) and core areas of materials science (structure and symmetry of materials, thermodynamics and kinetics, electronic properties of materials, and mechanical properties of materials). In addition, several specialized topics are offered, including biochemical engineering, biological transport processes, food processing technology, colloids, principles of mass transfer in engineering and biological engineering, rheology, coating process fundamentals, process control, finite elements methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, introduction to polymer chemistry, polymer laboratory, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, physical chemistry of polymers, solid state reaction kinetics, electronic structure of materials, electronic properties and applications of organic materials, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and science of porous media.

The master of chemical engineering (M.Ch.E.), also known as the professional master's, is designed for working professionals who are interested in obtaining a master's degree part-time. This degree requires a design project. Part-time students may also choose the M.S.Ch.E. Plan C, which is coursework only.

The CEMS department focuses on the PhD, and does not generally admit students directly to the M.S.Ch.E. Plan A degree, which is a thesis-based master's and is intended for current graduate students who choose not to seek a PhD.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in chemical engineering or other related field.

Other requirements to be completed before admission:
This professional master of engineering degree is designed for employees of local industries who wish to pursue their studies part-time. No financial support is available. Applicants should contact the program before applying for admission.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Applications are accepted for fall semester only. December 15 is the application deadline; late applications are considered if space is available.
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 560
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 12 to 14 major credits, 6 to 8 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

In addition to the coursework, MChE students are required to complete a design project. The work-related MChE design project consists of an in-depth study of an engineering design. It need not represent a publishable research project. While the amount of work should be the same as for a master’s thesis, the project can contain elements that the thesis would not, such as economic considerations, design consultation, and social relevance.

**Core Courses (12 Credits)**
Take at least 12 credits from the following, in consultation with the advisor.

- CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
- CHEN 8201 - Applied Math (3.0 cr)
- CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
- CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
- CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
- CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)

**Thesis Credits**
10 thesis credits are required for the design project.

- CHEN 8777 - Thesis Credits: Master’s (1.0 - 18.0 cr)

**Electives**
Select remaining coursework, in consultation with the advisor, to complete the 20 course credits required.

- AEM 5321 - Modern Feedback Control (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)
- AEM 8203 - Fluid Mechanics III (3.0 cr)
- AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
- AEM 8421 - Robust Multivariable Control Design (3.0 cr)
- AEM 8541 - Mechanics of Crystalline Solids (3.0 cr)
- BIOC 4332 - Biochemistry II: Molecular Mechanics of Signal Transduction and Gene Expression (4.0 cr)
- BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
- BIOC 6021 - Biochemistry (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
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<td>Advanced Biomedical Transport Processes</td>
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<td>BMEN 5551</td>
<td>Cell Engineering</td>
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<td>Biology for Biomedical Engineers</td>
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<td>Numerical Methods for Free and Moving Boundary Problems</td>
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<td>Fundamentals of Finite Element Method</td>
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<td>Environmental Fluid Mechanics II</td>
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<td>CHEN 8402</td>
<td>Statistical Thermodynamics and Kinetics</td>
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<tr>
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<td>Systems Analysis of Biological Processes</td>
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<td>Semiconductor Properties and Devices I</td>
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<tr>
<td>EE 5164</td>
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<td>Micro and Nanotechnology by Self Assembly</td>
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<td>EE 5231</td>
<td>Linear Systems and Optimal Control</td>
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<td>EE 5239</td>
<td>Introduction to Nonlinear Optimization</td>
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<td>EE 5657</td>
<td>Physical Principles of Thin Film Technology</td>
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<td>EE 8160</td>
<td>Physics of Semiconductors</td>
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<td>GCD 4034</td>
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<tr>
<td>GCD 8151</td>
<td>Cellular Biochemistry and Cell Biology</td>
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<tr>
<td>GCD 8161</td>
<td>Advanced Cell Biology and Development</td>
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<td>MATH 4428</td>
<td>Mathematical Modeling</td>
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<td>MATH 4512</td>
<td>Differential Equations with Applications</td>
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<td>MATH 5485</td>
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<td>MATH 5525</td>
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<td>Dynamical Systems and Chaos</td>
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<td>MATH 5651</td>
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<tr>
<td>MATS 4212</td>
<td>Ceramics</td>
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<tr>
<td>MATS 4214</td>
<td>Polymers</td>
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</table>
MATS 4223W - Polymer Laboratory [WI] (2.0 cr)
MATS 5517 - Electron Microscopy (3.0 cr)
MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
MATS 8003 - Electronic Properties (3.0 cr)
MATS 8004 - Mechanical Properties (3.0 cr)
MATS 8211 - Physical Chemistry of Polymers (4.0 cr)
MATS 8221 - Synthetic Polymer Chemistry (4.0 cr)
MATS 8301 - Physical Rate Processes I: Transport (3.0 cr)
ME 5113 - Aerosol/Particle Engineering (4.0 cr)
ME 5446 - Introduction to Combustion (4.0 cr)
ME 8341 - Conduction (3.0 cr)
ME 8390 - Advanced Topics in the Thermal Sciences (1.0 - 3.0 cr)
MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

**Special Topics Electives**

The following electives are topics courses. Only the approved topic titles below may be used.

- AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
- CEGE 5180 Special Topics - Membrane Science and Technology
- EE 5940 Special Topics - Infrared Technology and Environmental Sensing
- Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
- Mats 8995 Special Topics - Scattering from Soft Materials
**Twin Cities Campus**

**Chemical Engineering M.S.Ch.E.**

**Chemical Engineering & Materials Science**

**College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Ave SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: [http://www.cems.umn.edu](http://www.cems.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science in Chemical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The CEMS Department offers two types of master's degrees: the MSChE (Plan A or C) and the MChE degree, also known as the professional master's. The MSChE Plan A degree is a thesis-based master's and is generally reserved only for current graduate students who choose not to seek a PhD. Working professionals who are interested in obtaining a master's degree part time should follow the requirements for the MChE degree, which requires a design project, or the MSChE Plan C, which is coursework only.

Research activities in CEMS focus on the development of renewable energy technologies, the solution of important medical and biological engineering challenges, the development of advanced materials, and the application of sophisticated mathematical and theoretical models.

Graduate courses offered cover core areas of chemical engineering (fluid mechanics, applied mathematics: linear and nonlinear analysis, transport, chemical thermodynamics, statistical thermodynamics and kinetics, and analysis of chemical reactors) and core areas of materials science (structure and symmetry of materials, thermodynamics and kinetics, electronic properties of materials, and mechanical properties of materials). In addition, several specialized topics are offered, including biochemical engineering, biological transport processes, food processing technology, colloids, principles of mass transfer in engineering and biological engineering, rheology, coating process fundamentals, process control, finite elements methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, introduction to polymer chemistry, polymer laboratory, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, physical chemistry of polymers, solid state reaction kinetics, electronic structure of materials, electronic properties and applications of organic materials, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and science of porous media.

**Program Delivery**
This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
A bachelor's degree in chemical engineering or other related field.

Other requirements to be completed before admission:
With the exception of the professional master's degree (the MChE) and the MSChE Plan C, the CEMS Department focuses on the PhD and does not generally admit students directly to the MSChE Plan A degree.

**Special Application Requirements:**
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Applications are accepted for fall semester only. December 15 is the application deadline; late applications are considered if space is available. More information is available at [http://www.cems.umn.edu/graduate/admissions](http://www.cems.umn.edu/graduate/admissions)
Applicants must submit their test score(s) from the following:
- **GRE**

International applicants must submit score(s) from one of the following tests:
- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 560
- **IELTS**
  - Total Score: 6.5
- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements

**Plan A:** Plan A requires 12 to 14 major credits, 6 to 8 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan C:** Plan C requires 12 to 18 major credits and 12 to 18 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

### Core Courses

Take 4 or more course(s) totaling 12 or more credit(s) from the following:
- CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
- CHEN 8201 - Applied Math (3.0 cr)
- CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
- CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
- CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
- CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)

**Plan A**

Plan A requires 12 credits in the major, 6 credits outside the major, and 10 thesis credits. The remaining course credits may be taken in the major or in any supporting field.

CHEN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan C**

Plan C requires 12 credits in the major and a minimum of 12 credits outside the major. The remaining 6 credits may be taken in the major or in any supporting field.

### Electives

The remaining credits may be chosen from the following list or consult with advisor for further options.
- AEM 5321 - Modern Feedback Control (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)
- AEM 8203 - Fluid Mechanics III (3.0 cr)
- AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
- AEM 8421 - Robust Multivariable Control Design (3.0 cr)
- AEM 8541 - Mechanics of Crystalline Solids (3.0 cr)
- BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
- BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
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<td>MATS 4212</td>
<td>Ceramics (3.0 cr)</td>
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<td>MATS 4214</td>
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<td>Structure and Symmetry of Materials (3.0 cr)</td>
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<tr>
<td>MATS 8002</td>
<td>Thermodynamics and Kinetics (3.0 cr)</td>
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<td>Electronic Properties (3.0 cr)</td>
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<td>STAT 5021</td>
<td>Statistical Analysis (4.0 cr)</td>
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</tr>
</tbody>
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**Special Topics Electives**

The following electives are topics courses. Only the approved topic titles below may be used.

- AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
- CEGE 5180 Special Topics - Membrane Science and Technology
- EE 5940 Special Topics - Infrared Technology and Environmental Sensing
- Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
- Mats 8995 Special Topics - Scattering from Soft Materials
Twin Cities Campus

Chemical Engineering Minor
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Ave SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Research activities in the Chemical Engineering and Materials Science (CEMS) Department focus on the development of renewable energy technologies, the solution of important medical and biological engineering challenges, the development of advanced materials, and the application of sophisticated mathematical and theoretical models.

Graduate courses offered cover core areas of chemical engineering (fluid mechanics, applied mathematics: linear and nonlinear analysis, transport, chemical thermodynamics, statistical thermodynamics and kinetics, and analysis of chemical reactors). In addition, several specialized topics are offered, including biochemical engineering, biological transport processes, food processing technology, colloids, principles of mass transfer in engineering and biological engineering, rheology, coating process fundamentals, process control, finite elements methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, introduction to polymer chemistry, polymer laboratory, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, physical chemistry of polymers, solid state reaction kinetics, electronic structure of materials, electronic properties and applications of organic materials, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and science of porous media.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor programs must be approved by the director of Graduate Studies in Chemical Engineering.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Core Courses
Take 2 or more course(s) totaling 6 or more credit(s) from the following:

- CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
- CHEN 8201 - Applied Math (3.0 cr)
- CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
- CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
- CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
- CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)

**Doctoral Core Courses**

Take 4 or more course(s) totaling 12 or more credit(s) from the following:

- CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
- CHEN 8201 - Applied Math (3.0 cr)
- CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
- CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
- CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
- CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)
Twin Cities Campus
Chemical Engineering Ph.D.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 57
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Research activities in the Chemical Engineering and Materials Science (CEMS) Department focus on the development of renewable energy technologies, the solution of important medical and biological engineering challenges, the development of advanced materials, and the application of sophisticated mathematical and theoretical models.

Graduate courses offered cover core areas of chemical engineering (fluid mechanics, applied mathematics: linear and nonlinear analysis, transport, chemical thermodynamics, statistical thermodynamics and kinetics, and analysis of chemical reactors) and core areas of materials science (structure and symmetry of materials, thermodynamics and kinetics, electronic properties of materials, and mechanical properties of materials). In addition, several specialized topics are offered, including biochemical engineering, biological transport processes, food processing technology, colloids, principles of mass transfer in engineering and biological engineering, rheology, coating process fundamentals, process control, finite elements methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, introduction to polymer chemistry, polymer laboratory, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, physical chemistry of polymers, solid state reaction kinetics, electronic structure of materials, electronic properties and applications of organic materials, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and science of porous media.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in chemical engineering or related field.

Other requirements to be completed before admission:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Special Application Requirements:
Applications are accepted for fall semester only. Submission of all application materials by December 15 is strongly encouraged to ensure priority consideration for fellowships and assistantships; late applications are considered if space is available. More information is available at http://www.cems.umn.edu/graduate/admissions

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21

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Information current as of August 31, 2018
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 560
  - IELTS - Total Score: 6.5
  - MELAB - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
21 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires 33 course credits and 24 thesis credits. The course credits must include 12 credits in CHEN core courses and a minimum of 12 credits outside the major. The remaining 9 credits may be taken in the major or in any supporting field.

Students must attend, but not enroll in, the departmental seminar for six semesters. Informal attendance will be done within the department.

Core Courses
Take 4 or more course(s) totaling 12 or more credit(s) from the following:
- CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
- CHEN 8201 - Applied Math (3.0 cr)
- CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
- CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
- CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
- CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam.
CHEN 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Electives
The remaining credits may be chosen from this list or consult with advisor for further options.
AEM 5321 - Modern Feedback Control (3.0 cr)
AEM 5501 - Continuum Mechanics (3.0 cr)
AEM 5503 - Theory of Elasticity (3.0 cr)
AEM 8201 - Fluid Mechanics I (3.0 cr)
AEM 8202 - Fluid Mechanics II (3.0 cr)
AEM 8203 - Fluid Mechanics III (3.0 cr)
AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
AEM 8421 - Robust Multivariable Control Design (3.0 cr)
AEM 8541 - Mechanics of Crystalline Solids (3.0 cr)
BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (4.0 cr)
BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
BIOC 6021 - Biochemistry (3.0 cr)
BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
BMEN 5001 - Advanced Biomatertials (3.0 cr)
BMEN 5201 - Advanced Biomechanics (3.0 cr)
BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
BMEN 5351 - Cell Engineering (3.0 cr)
BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
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<tr>
<td>CEGE 8022</td>
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<td>Fundamentals of Finite Element Method</td>
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<td>CEGE 8501</td>
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<td>CEGE 8502</td>
<td>Environmental Fluid Mechanics II</td>
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<td>CEGE 8504</td>
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<td>CEGE 8505</td>
<td>Biological Processes</td>
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<td>CHEM 8011</td>
<td>Mechanisms of Chemical Reactions</td>
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<td>CHEM 8021</td>
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<td>CHEM 8151</td>
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<td>CHEM 8152</td>
<td>Analytical Spectroscopy</td>
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<td>CHEM 8201</td>
<td>Materials Chemistry</td>
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<td>CHEM 8551</td>
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<td>Thermodynamics, Statistical Mechanics, and Reaction Dynamics I</td>
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<td>Colloids and Dispersions</td>
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<td>Fluid Mechanics I: Change, Deformation, Equations of Flow</td>
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<td>CHEN 8102</td>
<td>Principles and Applications of Rheology</td>
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<td>CHEN 8104</td>
<td>Coating Process Fundamentals</td>
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<td>Applied Math</td>
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<td>Synthetic Polymer Chemistry</td>
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<td>CHEN 8301</td>
<td>Physical Rate Processes I: Transport</td>
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<td>CHEN 8401</td>
<td>Physical and Chemical Thermodynamics</td>
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<td>CHEN 8402</td>
<td>Statistical Thermodynamics and Kinetics</td>
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<td>CHEN 8501</td>
<td>Chemical Rate Processes: Analysis of Chemical Reactors</td>
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<td>CHEN 8754</td>
<td>Systems Analysis of Biological Processes</td>
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<td>CSCI 8363</td>
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<td>Semiconductor Properties and Devices I</td>
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<td>EE 5164</td>
<td>Semiconductor Properties and Devices II</td>
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<td>Micro and Nanotechnology by Self Assembly</td>
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<td>Linear Systems and Optimal Control</td>
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<td>EE 5657</td>
<td>Physical Principles of Thin Film Technology</td>
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<td>EE 8161</td>
<td>Physics of Semiconductors</td>
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<td>Cellular Biochemistry and Cell Biology</td>
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<td>GCD 8161</td>
<td>Advanced Cell Biology and Development</td>
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<td>Mathematical Modeling</td>
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<td>Differential Equations with Applications</td>
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<td>MATH 5486</td>
<td>Introduction To Numerical Methods II</td>
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<td>MATH 5525</td>
<td>Introduction to Ordinary Differential Equations</td>
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<td>MATH 5535</td>
<td>Dynamical Systems and Chaos</td>
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<td>MATH 5587</td>
<td>Elementary Partial Differential Equations I</td>
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<td>MATH 5588</td>
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<td>Basic Theory of Probability and Statistics</td>
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Information current as of August 31, 2018
MATS 8004 - Mechanical Properties (3.0 cr)
MATS 8211 - Physical Chemistry of Polymers (4.0 cr)
MATS 8221 - Synthetic Polymer Chemistry (4.0 cr)
MATS 8301 - Physical Rate Processes I: Transport (3.0 cr)
ME 5113 - Aerosol/Particle Engineering (4.0 cr)
ME 5446 - Introduction to Combustion (4.0 cr)
ME 8341 - Conduction (3.0 cr)
ME 8390 - Advanced Topics in the Thermal Sciences (1.0 - 3.0 cr)
MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

Special Topics Electives
The following electives are topics courses. Only the approved topic titles below may be used.
AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
CEGE 5180 Special Topics - Membrane Science and Technology
EE 5940 Special Topics - Infrared Technology and Environmental Sensing
Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
Mats 8995 Special Topics - Scattering from Soft Materials
Twin Cities Campus
Chemical Physics M.S.
Chemistry
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Chemical Physics Program, University of Minnesota, 137 Smith Hall, 207 Pleasant St SE, Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://chem.umn.edu/academics/graduate/chemical-physics

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Chemical physics focuses on research areas where the techniques of chemistry and physics are combined for the study of atoms and molecules; their interactions in gases, liquids, and solids; and the detailed structure and dynamics of material changes. Areas of research and specialization include spectroscopy, optical properties, laser applications, molecular collisions, chemical dynamics, quantum mechanics, computational chemistry, statistical mechanics, thermodynamics, low-temperature behavior, polymers and macromolecules, surface science, biochemistry, and biochemical and heterogeneous catalysis.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
An undergraduate degree in chemistry, physics or a related field is required for admission. The preferred minimum undergraduate GPA for admittance to the program is 3.2.

Other requirements to be completed before admission:
Prospective graduate students should have adequate undergraduate preparation in chemistry, physics and mathematics.

Three letters of recommendation and scores from the GRE general test are required for all applications. In addition, international applicants are expected to provide scores of at least 587 (paper), 240 (computer), or 95 (Internet) on the TOEFL.

A Subject GRE score is not required but if available will help the admission committee to make better decisions, in particular in cases where undergraduate transcripts are more difficult to evaluate (which is especially true for international applicants, who are strongly encouraged to submit the GRE subject score). The Subject GRE can be taken in Chemistry, Physics, or a related discipline.

Special Application Requirements:
Applications for fall semester must be completed by December 15 in order to be considered for financial support. Applications received after December 15 will be reviewed on a space available basis. The department prefers to admit for fall semester and will only consider spring admission under extenuating circumstances. More application information is available at www.chem.umn.edu/chemphys

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 95
  - Internet Based - Speaking Score: 23
• IELTS
  - Total Score: 7
• MELAB
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is written. A capstone project is required.

Capstone Project: Each Plan B project should involve a combined total of approximately 160 hours (the equivalent of four full-time weeks) of library research, reading, and/or writing resulting in the preparation of a significant written document. Students who plan to work on Plan B projects independent of the Preliminary Examination should present a plan, after consultation with the chosen instructor for the Plan B project, outlining the number and content of their projects to the director of graduate studies. Projects should be completed to the satisfaction of the instructor; the final grade is determined by the instructor.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

Students are expected to pass a proficiency exam in physical chemistry during their first academic year in residence.

The MS degree requires a minimum of 30 credits and is offered under Plan A (thesis) and Plan B (project). The course credits must include at least 6 credits each in chemistry (CHEM) and physics (PHYS) or at least 3 credits each in quantum mechanics, thermodynamics, and statistical mechanics.

All first-year students must register for CHPH 8601 during both fall and spring semesters and for CHEM 8066 during the spring semester of their first year in residence.

Required Courses

Any CHPH, CHEM, and PHYS courses at the 5xxx or 8xxx level may be used to satisfy degree requirements. Up to 8 credits in 4xxx-level courses may be used with approval from the director of graduate studies.

Students may count one credit each of the following towards the degree.

- CHEM 8066 - Professional Conduct of Chemical Research (1.0 cr)
- CHPH 8601 - Seminar: Modern Problems in Chemical Physics (1.0 cr)

Plan A

Plan A requires 20 course credits and 10 thesis credits.

CHPH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B

Plan B requires 30 credits of coursework, including 8 credits in the two Plan B project courses.

- CHPH 8081 - M.S. Plan B Project I (4.0 cr)
- CHPH 8082 - M.S. Plan B Project II (4.0 cr)
Twin Cities Campus

Chemical Physics Minor
Chemistry
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Chemical Physics Program, University of Minnesota, 137 Smith Hall, 207 Pleasant Street SE, Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://chem.umn.edu/academics/graduate/chemical-physics

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Chemical physics focuses on research areas where the techniques of chemistry and physics are combined for the study of atoms and molecules; their interactions in gases, liquids, and solids, and the detailed structure and dynamics of material changes. Areas of research and specialization include spectroscopy, optical properties, laser applications, molecular collisions, chemical dynamics, quantum mechanics, computational chemistry, statistical mechanics, thermodynamics, low-temperature behavior, polymers and macromolecules, surface science, biochemistry, and biochemical and heterogeneous catalysis.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor field coursework, determined by the chemical physics director of graduate studies, student, and advisor, may include any 5xxx- or 8xxx-level CPH, CHEM, or PHYS courses taken on the A-F grading basis.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
The master's minor requires a minimum of 3 credits each in chemistry (CHEM) and physics (PHYS).

Doctoral
The doctoral minor requires a minimum of 6 credits each in chemistry (CHEM) and physics (PHYS).
Twin Cities Campus  
Chemical Physics Ph.D.  
Chemistry  
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:  
Chemical Physics Program, University of Minnesota, 137 Smith Hall, 207 Pleasant St SE, Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)  
Email: chmapply@umn.edu  
Website: http://chem.umn.edu/academics/graduate/chemical-physics

- Program Type: Doctorate  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 48  
- This program requires summer semesters for timely completion.  
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Chemical physics focuses on research areas where the techniques of chemistry and physics are combined for the study of atoms and molecules; their interactions in gases, liquids, and solids; and the detailed structure and dynamics of material changes. Areas of research and specialization include spectroscopy, optical properties, laser applications, molecular collisions, chemical dynamics, quantum mechanics, computational chemistry, statistical mechanics, thermodynamics, low-temperature behavior, polymers and macromolecules, surface science, biochemistry, and biochemical and heterogeneous catalysis.

Program Delivery  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission  
An undergraduate degree in chemistry, physics, or a related field is required for admission. The preferred minimum undergraduate GPA for admittance to the program is 3.2

Other requirements to be completed before admission:  
Prospective graduate students should have adequate undergraduate preparation in chemistry, physics and mathematics.

Three letters of recommendation and scores from the GRE general test are required for all applications. In addition, international applicants are expected to provide scores of at least 587 (paper), 240 (computer), or 95 (Internet) on the TOEFL.

A Subject GRE score is not required but if available will help the admission committee to make better decisions, in particular in cases where undergraduate transcripts are more difficult to evaluate (which is especially true for international applicants, who are strongly encouraged to submit the GRE subject score). The Subject GRE can be taken in chemistry, physics, or a related discipline.

Special Application Requirements:  
Applications for fall semester must be completed by December 15 in order to be considered for financial support. Applications received after December 15 will be reviewed on a space available basis. The program prefers to admit for fall semester and will only consider spring admission under extenuating circumstances. More application information is available at www.chem.umn.edu/chemphys

Applicants must submit their test score(s) from the following:  
- GRE

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Total Score: 95  
  - Internet Based - Speaking Score: 23  
- IELTS  
  - Total Score: 7  
- MELAB

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Information current as of August 31, 2018
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students are expected to pass a proficiency exam in physical chemistry during their first academic year in residence.

Each first-year chemical physics student will choose a program of study in consultation with his or her TMC (three-member committee).

The 24 course credits required must include either:

(a) At least 5 credits in chemistry (CHEM) and at least 5 credits in physics (PHYS), or
(b) At least 16 credits in chemistry and/or physics combined, including at least 5 credits of quantum mechanics and at least 5 credits chosen from among the areas of thermodynamics, statistical mechanics, statistical physics, and chemical dynamics.

All first-year students must register for CHPH 8601 during both fall and spring semesters and for CHEM 8066 during the spring semester of their first year in residence.

Required Courses
Any CHPH, CHEM, and PHYS courses at the 5xxx or 8xxx level may be used to satisfy degree requirements. Up to 8 credits in 4xxx-level courses may be used with approval from the director of graduate studies.

Students may count 1 credit each of the following towards the degree.

CHEM 8066 - Professional Conduct of Chemical Research (1.0 cr)
CHPH 8601 - Seminar: Modern Problems in Chemical Physics (1.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam.
CHPH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Chemistry M.S.
Chemistry
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Assistant to the Director of Graduate Studies, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant St SE, Minneapolis, MN 55455 (612-626-7444 or 1-800-777-2431; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://www.chem.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While modern research in chemistry is very interdisciplinary, graduate work in the Department of Chemistry falls broadly into the focus areas of analytical chemistry, chemical biology, environmental chemistry, inorganic chemistry, materials chemistry, organic chemistry, polymer chemistry, experimental physical chemistry, and computational chemistry.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
An undergraduate degree in chemistry or a related field is required for admission. The preferred minimum undergraduate GPA for admittance to the program is 3.20.

Other requirements to be completed before admission:
Applicants must offer the substantial equivalent of the courses in analytical, inorganic, organic, and physical chemistry that are required of undergraduate majors in the University of Minnesota chemistry curriculum. They must also have at least one year of college physics, plus college mathematics through calculus.

Three letters of recommendation and scores from the GRE general test are required for all applications. International applicants are expected to provide scores of at least 587 (paper), 240 (computer), or 95 (Internet) on the TOEFL, as well as GRE scores.

A Subject GRE score is not required but if available will help the admission committee to make better decisions, in particular in cases where undergraduate transcripts are more difficult to evaluate (which is especially true for international applicants, who are strongly encouraged to submit the GRE subject score). The Subject GRE can be taken in chemistry or a related discipline.

Special Application Requirements:
Applications for fall semester must be completed by December 15 in order to be considered for fellowship support and teaching and research assistantships. Applications received after December 15 will be reviewed on a space available basis. The department prefers to admit for fall semester and will only consider spring admission under extenuating circumstances. More information is available at chem.umn.edu/academics/graduate/prospective-students

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Internet Based - Speaking Score: 23
- IELTS
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is written. A capstone project is required.

Capstone Project: Each Plan B project should involve a combined total of approximately 160 hours (the equivalent of four full-time weeks) of library research, reading, and/or writing resulting in the preparation of a significant written document. Students who plan to work on Plan B projects independent of the Preliminary Examination should present a plan, after consultation with the chosen instructor for the Plan B project, outlining the number and content of their projects to the director of Graduate Studies. Projects should be completed to the satisfaction of the instructor; the final grade is determined by the instructor.

Plan C: Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

MS students are expected to pass a proficiency exam during their first academic year in residence.

All first-year students must register for CHEM 8601 during both fall and spring semesters and for CHEM 8066 during the spring semester of their first year in residence.

All CHEM courses must be taken at the 5xxx or 8xxx level. Up to 8 credits in 4xxx-level courses from another department may be used with approval from the director of graduate studies.

Required Courses

Any 8xxx-level CHEM course can be used to satisfy degree requirements. Chem 5210 and 5755 will be accepted or consult with advisor for further 5xxx level course options.

Students may count one credit each of the following towards the degree.

CHEM 8066 - Professional Conduct of Chemical Research (1.0 cr)
CHEM 8601 - Seminar: Modern Problems in Chemistry (1.0 cr)

Plan A

Plan A requires 20 course credits and 10 thesis credits.

CHEM 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B

Plan B requires 30 credits of coursework, including 8 credits in the two Plan B project courses.

CHEM 8081 - M.S. Plan B Project I (1.0 - 4.0 cr)
CHEM 8082 - M.S. Plan B Project II (1.0 - 4.0 cr)

Plan C

Plan C requires 30 course credits chosen in consultation with advisor.
Twin Cities Campus
Chemistry Minor
Chemistry
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Assistant to the Director of Graduate Studies, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant St SE, Minneapolis, MN 55455 (612-626-7444 or 1-800-777-2431; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://www.chem.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While modern research in chemistry is very interdisciplinary, graduate work in the Department of Chemistry falls broadly into the focus areas of analytical chemistry, chemical biology, environmental chemistry, inorganic chemistry, materials chemistry, organic chemistry, polymer chemistry, experimental physical chemistry, and computational chemistry.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Courses
Any 8xxx-level CHEM course taken on the A-F grading basis will satisfy the requirements for the minor. The following 5xxx-level courses will be accepted. Consult with the chemistry director of graduate studies for further options.
CHEM 5210 - Materials Characterization (4.0 cr)
CHEM 5755 - X-Ray Crystallography (4.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Six credits from CHEM courses at the 5xxx- or 8xxx-level are required.

Doctoral
Twelve credits from CHEM courses at the 5xxx- or 8xxx-level are required.
Twin Cities Campus
Chemistry Ph.D.
Chemistry
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Assistant to the Director of Graduate Studies, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant St SE, Minneapolis, MN 55455 (612-626-7444 or 1-800-777-2431; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://www.chem.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

While modern research in chemistry is very interdisciplinary, graduate work in the Department of Chemistry falls broadly into the focus areas of analytical chemistry, chemical biology, environmental chemistry, inorganic chemistry, materials chemistry, organic chemistry, polymer chemistry, experimental physical chemistry, and computational chemistry.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
An undergraduate degree in chemistry or a related field is required for admission. The preferred minimum undergraduate GPA for admittance to the program is 3.20.

Other requirements to be completed before admission:
Applicants must offer the substantial equivalent of the courses in analytical, inorganic, organic, and physical chemistry that are required of undergraduate majors in the University of Minnesota chemistry curriculum. They must also have at least one year of college physics, plus college mathematics through calculus.

Three letters of recommendation and scores from the GRE general test are required for all applications. International applicants are expected to provide scores of at least 587 (paper), 240 (computer), or 95 (Internet) on the TOEFL, as well as GRE scores.

A Subject GRE score is not required but if available will help the admission committee to make better decisions, in particular in cases where undergraduate transcripts are more difficult to evaluate (which is especially true for international applicants, who are strongly encouraged to submit the GRE subject score). The subject GRE can be taken in chemistry or a related discipline.

Special Application Requirements:
Applications for fall semester must be completed by December 15 in order to be considered for fellowship support and teaching and research assistantships. Applications received after December 15 will be reviewed on a space available basis. The department prefers to admit for fall semester and will only consider spring admission under extenuating circumstances. More information is available at chem.umn.edu/academics/graduate/prospective-students

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 95
  - Internet Based - Speaking Score: 23
- IELTS

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Information current as of August 31, 2018
- Total Score: 7
  • MELAB
    - Final score: 83

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Students in the PhD program are expected to pass four of five proficiency examinations during their first year in residence. The exams, which are at the level of an advanced undergraduate course, are in analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. The exams are given during the chemistry first-year orientation program in August. In the event that a student does not pass the first exam, the exams are offered two more times during the academic year.

A minimum GPA of 3.00, 18 credits of coursework with a grade of B- or better, and passing grades on all four proficiency exams are required for students to remain in good standing.

All first-year students must register for CHEM 8601 during both fall and spring semesters and for CHEM 8066 during the spring semester of their first year in residence.

All CHEM courses must be taken at the 5xxx or 8xxx level. Up to 8 credits in 4xxx-level courses from another department may be used with approval from the director of graduate studies.

Required Courses
Any 8xxx-level CHEM course can be used to satisfy degree requirements. CHEM 5210 and 5755 will be accepted or consult with advisor for other 5xxx-level course options.
Students may count one credit each of the following towards the degree.
  CHEM 8066 - Professional Conduct of Chemical Research (1.0 cr)
  CHEM 8601 - Seminar: Modern Problems in Chemistry (1.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam.
CHEM 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus

Civil Engineering M.C.E.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegesps@umn.edu
Website: http://www.cege.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Civil Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Civil engineering emphases are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics (e.g., fracture and localization, groundwater flow, stability and liquefaction, wave and shock propagation), structural engineering (e.g., computational and structural mechanics, earthquake engineering, infrastructure performance and durability, new systems and materials), transportation engineering (e.g., intelligent transportation systems, pavement design and materials, transportation economics, traffic safety), and water resources engineering (e.g., earthscape processes, environmental and biological systems, hydrologic and climate dynamics, hydrodynamics, and turbulence).

The master of civil engineering (MCE) degree is designed for the practicing engineer who would like to obtain an advanced degree on a part-time or full-time basis. Students who intend to proceed to the Ph.D. program or who think they may later wish to be admitted to the Ph.D. program should apply for the master of science program. Students are expected to follow a coherent program of coursework in one of the following subareas of civil engineering: environmental, geomechanics, structural, transportation, or water resources engineering. The program is selected with the help of a faculty adviser and approved by the director of graduate studies. In addition to completing graduate-level courses, students must demonstrate professional competence either by carrying out and defending a design project or by taking a coursework-related final oral exam (without a project).

The degree typically takes 2-3 semesters (12-18 months) to complete on a full-time basis or 6-8 semesters on a part-time basis.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

An ABET-accredited, four-year bachelor's degree in engineering is required for admission.

Other requirements to be completed before admission:
The application deadlines are December 3 for fall admission and August 31 for spring admission. All materials must be submitted to the online application. Additional information is available at http://www.cege.umn.edu/prospective/graduate/how-to-apply.html

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
**IELTS**
- Total Score: 6.5

**MELAB**
- Final score: 80

Key to **test abbreviations** (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements

**Plan A:** Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MCE degree requires 30 credits and is offered under two plans. Plan A requires preparation of a thesis/design project. The thesis/design project must be carried out by the student in consultation with a faculty adviser. Plan C is a coursework-only degree program.

### Required Courses

Any courses at the 5xxx and 8xxx level from the following programs may be used: AEM, AST, BBE, BMEN, CEGE, CHEM, CHEN, CSCI, EE, ESCI, IE, MATH, MATS, ME, PHYS, STAT. Use of 4xxx level courses must be approved by the Director of Graduate Studies and a maximum of 9 credits may be included. The following 4xxx courses may not be used: CEGE 4301, 4401, 4501, 4502, and 4522. Six credits in a minor may be included in the course credit total.

**Seminar**

Students may include one seminar credit in the course credit total.

- CEGE 8200 - Seminar: Transportation (1.0 cr)
- CEGE 8300 - Seminar: Geomechanics (1.0 - 3.0 cr)
- CEGE 8400 - Seminar: Structures (1.0 cr)
- CEGE 8500 - Environmental Seminar (1.0 cr)

**Plan A**

Plan A requires a minimum of 20 course credits and 10 thesis credits for the design project.

- CEGE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan C**

Plan C requires a minimum of 30 credits of coursework chosen in consultation with adviser and must include at least two courses at the 8xxx level. Students must also complete 100 hours of project work, give an oral presentation of no less than 10 minutes, and complete two hours of ethics training.
Twin Cities Campus
Civil Engineering M.S.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Twin Cities Campus
Civil Engineering M.S.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegesps@umn.edu
Website: http://www.cege.umn.edu

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Civil engineering emphases are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics (e.g., fracture and localization, groundwater flow, stability and liquefaction, wave and shock propagation), structural engineering (e.g., computational and structural mechanics, earthquake engineering, infrastructure performance and durability, new systems and materials), transportation engineering (e.g., intelligent transportation systems, pavement design and materials, transportation economics, traffic safety), and water resources engineering (e.g., earthscape processes, environmental and biological systems, hydrologic and climate dynamics, hydrodynamics, and turbulence).

The master of science (M.S.) degree balances education in engineering fundamentals and design, and provides preparation for students wishing to pursue a career in industry, as well as those wanting to continue studies toward a Ph.D. degree. Programs range from the Plan C, which is a coursework-only program, to the Plan A, which balances coursework with research and development. The Plan C program is intended for practicing engineers who want to pursue a degree on a part-time basis, self-funded full-time students, as well as students who plan to continue on for a Ph.D. degree.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in an engineering, basic science, or mathematics program is preferred.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's academic record and letters of recommendation. Applicants who lack civil engineering training are often required to complete one or more appropriate courses from the undergraduate civil engineering program. Graduate credit is not awarded for such preparatory work.

Special Application Requirements:
The application deadlines are December 3 for fall admission and August 31 for spring admission. All materials must be submitted to the online application. Additional information is available at http://www.cege.umn.edu/prospective/graduate/how-to-apply.html

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19

- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

**Plan A:** Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral.

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MS requires at least 30 credits and is offered under three plans. Plan A emphasizes research and preparation of a thesis; Plan B emphasizes coursework and a project; Plan C is coursework only. The Plan A thesis is written on a research project carried out in consultation with a faculty adviser. Under Plan B, students complete one to three Plan B papers as determined by the faculty adviser. Plan B papers can include computer programs, annotated bibliographies, field investigations, and analysis/design of special engineering problems. A program typically takes 18 to 24 months to complete.

**Required Courses**

Any courses at the 5xxx and 8xxx level from the following programs may be used: AEM, AST, BBE, BMEN, CEGE, CHEM, CHEN, CSCI, EE, ESCI, IE, MATH, MATS, ME, PHYS, STAT. Use of 4xxx level courses must be approved by the Director of Graduate Studies and a maximum of 9 credits may be included. The following 4xxx courses may not be used: CEGE 4301, 4401, 4501, 4502, and 4522. Six credits in a minor may be included in the course credit total.

**Seminar**

Students may count one seminar credit towards the course credit requirement.

- **CEGE 8200** - Seminar: Transportation (1.0 cr)
- **CEGE 8300** - Seminar: Geomechanics (1.0 - 3.0 cr)
- **CEGE 8400** - Seminar: Structures (1.0 cr)
- **CEGE 8500** - Environmental Seminar (1.0 cr)

**Plan A**

Plan A requires a minimum of 20 course credits and 10 thesis credits.

- **CEGE 8777** - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B**

Plan B requires a minimum of 30 credits, which includes at least 27 course credits and a maximum of 3 credits of CEGE 8094 for the Plan B project.

- **CEGE 8094** - Civil Engineering Research (1.0 - 4.0 cr)

**Plan C**

Plan C requires 30 course credits and must include at least 2 courses at the 8xxx-level. Students must also complete 100 hours of project work, give an oral presentation of no less than 10 minutes, and complete two hours of ethics training.

**Joint- or Dual-degree Coursework:** Dual Master's Degree in Civil Engineering and Industrial and Systems Engineering (Transportation Engineering Focus): Student may take a total of 15 credits in common among the academic programs. Dual Master's Degree in Civil Engineering and Urban and Regional Planning (Transportation or Environmental Engineering Focus): Student may take a total of 18 credits in common among the academic programs.
Program Sub-plans

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

Integrated B.C.E./M.S. - Civil Engineering

The department offers an integrated Bachelor of Civil Engineering (BCE) and Master of Science (MS) in Civil Engineering. The integrated BCE/MS program offers students the opportunity to earn a bachelor's degree and a master's degree in five years. These programs offer several benefits: streamlined admissions from the undergraduate to the graduate program (GRE not required); flexibility in fulfilling required courses for both degrees during the senior year (up to 16 credits can be transferred to the graduate program); and eligibility for teaching and research assistantships.

Both the BCE and MS degrees must be completed in their entirety, with no courses shared between them. The graduate degree cannot be earned before the undergraduate requirements are satisfied. Admitted students who decide not to complete the MS degree are permitted to count credits originally planned for the graduate program toward their BCE technical electives.

Eligibility Requirements:

Application to the Combined Program is open to civil engineering undergraduates who:

- are within 32 credits of completing the requirements for the bachelor's degree;
- have a faculty advisor selected prior to admission; and
- hold a cumulative GPA of 3.3 or higher.

Integrated B.GeoE./M.S. - Civil Engineering

The department offers an integrated Bachelor of Geoengineering (B.GeoE.) and Master of Science (MS) in Civil Engineering. Benefits, eligibility requirements, and degree-completion requirements outlined for the BCE/MS integrated program also apply to the B.GeoE./MS.

Integrated B.Env.E./M.S. - Civil Engineering

The department offers an integrated Bachelor of Environmental Engineering (B.Env.E.) and Master of Science (MS) in Civil Engineering. Benefits, eligibility requirements, and degree-completion requirements outlined for the BCE/MS integrated program also apply to the B.Env.E./MS.
Civil Engineering Minor
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegeseps@umn.edu
Website: http://www.cege.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Civil engineering emphases are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics (e.g., fracture and localization, groundwater flow, stability and liquefaction, wave and shock propagation), structural engineering (e.g., computational and structural mechanics, earthquake engineering, infrastructure performance and durability, new systems and materials), transportation engineering (e.g., intelligent transportation systems, pavement design and materials, transportation economics, traffic safety), and water resources engineering (e.g., earthscape processes, environmental and biological systems, hydrologic and climate dynamics, hydrodynamics, and turbulence).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor courses should be chosen from one of the following subareas.

Environmental/Water Resources Engineering
CEGE 55xx
CEGE 85xx

Geomechanics
CEGE 53xx
CEGE 83xx

Structural Engineering
CEGE 54xx
CEGE 84xx

Transportation Engineering
CEGE 52xx
CEGE 82XX
Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Master's
For a master's minor, two or more 5xxx or 8xxx level courses from the same subarea of civil engineering are required, for a total of 6 or more credits.

Doctoral
For the doctoral minor, four or more 5xxx or 8xxx level courses from one or two subareas of civil engineering are required for a total of 12 or more credits.
Twin Cities Campus
Civil Engineering Ph.D.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegesps@umn.edu
Website: http://www.cege.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Civil engineering emphases are available in environmental engineering (e.g., pollutant fate and transport, process modeling, soil and groundwater remediation, water and wastewater treatment), geomechanics (e.g., fracture and localization, groundwater flow, stability and liquefaction, wave and shock propagation), structural engineering (e.g., computational and structural mechanics, earthquake engineering, infrastructure performance and durability, new systems and materials), transportation engineering (e.g., intelligent transportation systems, pavement design and materials, transportation economics, traffic safety), and water resources engineering (e.g., earthscape processes, environmental and biological systems, hydrologic and climate dynamics, hydrodynamics, and turbulence).

The PhD degree couples independent research with coursework in a comprehensive program for those wishing to attain mastery of their field. The PhD degree demands the ability and desire to pursue independent and original studies and can be earned with emphasis in environmental, geomechanics, structural, transportation, or water resources engineering. Research performance, as judged by preparation of a dissertation on an independently pursued research topic, is the primary requirement for the PhD degree.

Students enter the PhD program two to four years following the bachelor's degree, normally after completing the MS degree. The PhD program is typically completed in four to six years following the bachelor's degree. Each program of study is designed in consultation with a faculty adviser to meet the special needs of the student, although programs must be approved by the director of graduate studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in an engineering, basic science, or mathematics program is preferred.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's academic record and letters of recommendation. Applicants who lack civil engineering training are often required to complete one or more appropriate courses from the undergraduate civil engineering program. Graduate credit is not awarded for such preparatory work.

Special Application Requirements:
The application deadlines are December 3 for fall admission and August 31 for spring admission. All materials must be submitted to the online application. Additional information is available at http://www.cege.umn.edu/prospective/graduate/how-to-apply.html

Applicants must submit their test score(s) from the following:
- GRE
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements

36 credits are required in the major.

24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

A typical program consists of 36 credits of coursework beyond the bachelor's degree, plus 24 thesis credits. Credits earned in a MS program may be presented in partial fulfillment of the PhD requirements. Rigid requirements for the number of 8xxx courses appropriate for PhD programs have not been set; nonetheless, the PhD represents the highest level of scholarly achievement and coursework should be selected accordingly.

### Required Courses

Any courses at the 5xxx and 8xxx level from the following programs may be used: AEM, AST, BBE, BMEN, CEGE, CHEM, CHEN, CSCI, EE, ESCI, IE, MATH, MATS, ME, PHYS, STAT. Use of 4xxx level courses must be approved by the Director of Graduate Studies and a maximum of 9 credits may be included. The following 4xxx courses may not be used: CEGE 4301, 4401, 4501, 4502, and 4522. The 36 course credits may include 12 credits in a minor.

### Seminar

Students may count up to two seminar credits for the Ph.D. program in the 36-credit total.

- CEGE 8200 - Seminar: Transportation (1.0 cr)
- or CEGE 8300 - Seminar: Geomechanics (1.0 - 3.0 cr)
- or CEGE 8400 - Seminar: Structures (1.0 cr)
- or CEGE 8500 - Environmental Seminar (1.0 cr)

### Thesis Credits

Take 24 credits after passing preliminary oral exam

- CEGE 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Computer Science M.C.S.
Computer Science and Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street SE, Minneapolis, MN 55455 (612- 625-4002; fax: 612-625-0572)
Email: csgradmn@umn.edu
Website: http://www.cs.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Computer Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in computer science offers coursework from across a broad spectrum of theoretical and applied computer science, combined with research opportunities in nearly all areas of the field. Faculty members advise students in such areas as algorithms and theoretical computer science; numerical, parallel, and high-performance computing; distributed computing and systems; artificial intelligence, robotics, and computer vision; databases and data mining; human-computer interaction and information systems; graphics and visualization; software engineering and programming languages; computer architecture and compilers; networking; bioinformatics and computational biology; and computer security. In addition, students may choose a course of study that integrates research in computer science with applications in other fields.

Computer science degrees include the M.C.S., a professional coursework-only degree designed for the professional student that is intended to be a terminal degree.

The department also offers the MS (Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects) and the PhD. In addition, the department supports a master of science in software engineering (M.S.S.E.) degree.

Faculty from the Department of Computer Science and Engineering also participate in a variety of other graduate programs, including Bioinformatics and Computational Biology, Health Informatics, Cognitive Science, Scientific Computation, and Human Factors and Ergonomics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Applicants must have a undergraduate or graduate degree in a major with a substantial background in computer science and engineering.

Other requirements to be completed before admission:
The names and email addresses of three recommenders are required; they will be asked to upload their letters of recommendation to the university system. The department only accepts students for fall admission; the application deadline is March 1. Additional information is available at https://www.cs.umn.edu/admissions/graduate/mcs

Special Application Requirements:
Applicants with an inadequate background must resolve any deficiencies before applying to the program.
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

### Program Requirements

**Plan C:** Plan C requires 31 major credits and 0 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The M.C.S. is a coursework-only degree requiring 31 course credits. At least 16 credits must be in computer science courses, including one course from each of the 3 breadth areas: theory, systems, and applications (9 credits); and 1 credit of colloquium (CSCI 8970). At least 6 credits must be in computer science 8xxx-level courses, in addition to the colloquium. The remaining 15 course credits may be taken in the major field or any supporting field as defined in the graduate handbook.

All major courses must be taken on the A-F grading option and students must maintain a GPA above 3.00 after completing 8 credits.

**Breadth Courses**

Take one course from each subject area.

**Applications**

Take 1 or more course(s) from the following:

- CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
- CSCI 5125 - Collaborative and Social Computing (3.0 cr)
- CSCI 5271 - Introduction to Computer Security (3.0 cr)
- CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
- CSCI 5471 - Modern Cryptography (3.0 cr)
- CSCI 5511 - Artificial Intelligence I (3.0 cr)
- CSCI 5512 - Artificial Intelligence II (3.0 cr)
- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5523 - Introduction to Data Mining (3.0 cr)
- CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
- CSCI 5551 - Computer Vision (3.0 cr)
- CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
- CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
- CSCI 5609 - Visualization (3.0 cr)
- CSCI 5611 - Animation & Planning in Games (3.0 cr)
- CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
- CSCI 5707 - Principles of Database Systems (3.0 cr)

**Architecture, Systems and Software**

Take 1 or more course(s) from the following:

- CSCI 5103 - Operating Systems (3.0 cr)
- CSCI 5106 - Programming Languages (3.0 cr)
- CSCI 5161 - Introduction to Compilers (3.0 cr)
- CSCI 5204 - Advanced Computer Architecture (3.0 cr)
- CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
•CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
•CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
•CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
•CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
•CSCI 5801 - Software Engineering I (3.0 cr)
•CSCI 5802 - Software Engineering II (3.0 cr)

Theory and Algorithms
Take 1 or more course(s) from the following:
•CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
•CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
•CSCI 5403 - Computational Complexity (3.0 cr)
•CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
•CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
•CSCI 5525 - Machine Learning (3.0 cr)

Colloquium Credits
Take 1 credit of CS colloquium
CSCI 8970 - Computer Science Colloquium (1.0 cr)

Computer Science Courses
Students may choose additional coursework from this list or consult with their adviser for further options.
Take 0 or more credit(s) from the following:
•CSCI 5103 - Operating Systems (3.0 cr)
•CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
•CSCI 5106 - Programming Languages (3.0 cr)
•CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
•CSCI 5125 - Collaborative and Social Computing (3.0 cr)
•CSCI 5143 - Real-Time and Embedded Systems (3.0 cr)
•CSCI 5161 - Introduction to Compilers (3.0 cr)
•CSCI 5204 - Advanced Computer Architecture (3.0 cr)
•CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
•CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
•CSCI 5271 - Introduction to Computer Security (3.0 cr)
•CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
•CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
•CSCI 5403 - Computational Complexity (3.0 cr)
•CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
•CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
•CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
•CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
•CSCI 5511 - Artificial Intelligence I (3.0 cr)
•CSCI 5512 - Artificial Intelligence II (3.0 cr)
•CSCI 5521 - Introduction to Machine Learning (3.0 cr)
•CSCI 5523 - Introduction to Data Mining (3.0 cr)
•CSCI 5525 - Machine Learning (3.0 cr)
•CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
•CSCI 5552 - Sensing and Estimation in Robotics (3.0 cr)
•CSCI 5561 - Computer Vision (3.0 cr)
•CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
•CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
•CSCI 5611 - Animation & Planning in Games (3.0 cr)
•CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
•CSCI 5707 - Principles of Database Systems (3.0 cr)
•CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
•CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
•CSCI 5801 - Software Engineering I (3.0 cr)
•CSCI 5802 - Software Engineering II (3.0 cr)
•CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
•CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
•CSCI 8205 - Parallel Computer Organization (3.0 cr)
•CSCI 8211 - Advanced Computer Networks and Their Applications (3.0 cr)
•CSCI 8271 - Security and Privacy in Computing (3.0 cr)
•CSCI 8363 - Numerical Linear Algebra in Data Exploration (3.0 cr)
•CSCI 8551 - Intelligent Agents (3.0 cr)
•CSCI 8715 - Spatial Data Science Research (3.0 cr)
• CSCI 8735 - Advanced Database Systems (3.0 cr)
Twin Cities Campus
Computer Science M.S.
Computer Science and Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street SE, Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572)
Email: csgradmn@umn.edu
Website: http://www.cs.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in computer science offers coursework from across a broad spectrum of theoretical and applied computer science, combined with research opportunities in nearly all areas of the field. The graduate program's faculty members advise students in such areas as algorithms and theoretical computer science; numerical, parallel, and high-performance computing; distributed computing and systems; artificial intelligence, robotics, and computer vision; databases and data mining; human-computer interaction and information systems; graphics and visualization; software engineering and programming languages; computer architecture and compilers; networking; bioinformatics and computational biology; and computer security. In addition, students may choose a course of study that integrates research in computer science with applications in other fields.

Computer science degrees include the MS (offered Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects), the MCS (a terminal, coursework-only degree), and the PhD. The department also supports a master of science in software engineering (MSSE) degree.

Faculty from the Department of Computer Science and Engineering also participate in a variety of other graduate programs, including bioInformatics and computational biology, health informatics, cognitive science, scientific computation, and human factors and ergonomics.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.25.

A degree in any major with a substantial background in computer science is required; a computer science major is preferred.

Other requirements to be completed before admission:
Applicants with an inadequate background must resolve any deficiencies before applying to the program.

The program requires all applicants to complete the University's online application. The names and email addresses of three recommenders are required; Scores from the General (Aptitude) Test of the GRE are required for MS program applicants. Master's students are accepted for fall admission only. The application deadline is March 1. Additional information is available at https://www.cs.umn.edu/admissions/graduate

Applicants must submit their test score(s) from the following:
- GRE
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 85
  - Internet Based - Writing Score: 23
  - Internet Based - Reading Score: 23
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 21 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 31 major credits and 0 credits outside the major. The final exam is oral.

**Plan C:** Plan C requires 31 major credits and 0 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

The MS requires a minimum of 31 credits and is offered under three plans. All plans require students to take one course from each of the 3 breadth areas in computer science (9 credits): theory and algorithms; architecture, systems and software; and applications; and 1 credit of colloquium (CSCI 8970).

A minimum of 6 credits in computer science 8xxx-level courses, in addition to the colloquium, must be included in the required coursework for Plan A and Plan C; Plan B students must include a minimum of 3 credits in computer science 8xxx-level courses, in addition to the colloquium and Plan B project credits.

Plan A requires 13 credits in computer science coursework, including the breadth courses and colloquium credit, plus 10 thesis credits. The remaining 8 credits may be taken in the major field or any related field as defined by the graduate handbook.

Plan B and Plan C require 16 credits in computer science coursework, including the breadth courses and colloquium credit. Plan B students must also include 3 credits of the project course, CSCI 8760. The remaining 15 credits may be taken in the major field or in any related field.

**Breadth Courses**

Students in all plans must take 3 breadth requirement courses, one from each subject area.

**Applications**

Take 1 or more course(s) from the following:

- **CSCI 5115** - User Interface Design, Implementation and Evaluation (3.0 cr)
- **CSCI 5125** - Collaborative and Social Computing (3.0 cr)
- **CSCI 5271** - Introduction to Computer Security (3.0 cr)
- **CSCI 5461** - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
- **CSCI 5471** - Modern Cryptography (3.0 cr)
- **CSCI 5511** - Artificial Intelligence I (3.0 cr)
- **CSCI 5512** - Artificial Intelligence II (3.0 cr)
- **CSCI 5521** - Introduction to Machine Learning (3.0 cr)
- **CSCI 5523** - Introduction to Data Mining (3.0 cr)
- **CSCI 5551** - Introduction to Intelligent Robotic Systems (3.0 cr)
• CSCI 5561 - Computer Vision (3.0 cr)
• CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
• CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 5611 - Animation & Planning in Games (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)

**Architecture, Systems and Software**

Take 1 or more course(s) from the following:

• CSCI 5103 - Operating Systems (3.0 cr)
• CSCI 5106 - Programming Languages (3.0 cr)
• CSCI 5161 - Introduction to Compilers (3.0 cr)
• CSCI 5204 - Advanced Computer Architecture (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
• CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
• CSCI 5801 - Software Engineering I (3.0 cr)
• CSCI 5802 - Software Engineering II (3.0 cr)

**Theory and Algorithms**

Take 1 or more course(s) from the following:

• CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
• CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
• CSCI 5403 - Computational Complexity (3.0 cr)
• CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
• CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)

**Colloquium Credits**

Students must take 1 credit of CS Colloquium

CSCI 8970 - Computer Science Colloquium (1.0 cr)

**Computer Science Courses**

Students may choose additional coursework from this list or consult with their advisor for further options. Take 0 or more credit(s) from the following:

• CSCI 5103 - Operating Systems (3.0 cr)
• CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
• CSCI 5106 - Programming Languages (3.0 cr)
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 5125 - Collaborative and Social Computing (3.0 cr)
• CSCI 5143 - Real-Time and Embedded Systems (3.0 cr)
• CSCI 5161 - Introduction to Compilers (3.0 cr)
• CSCI 5204 - Advanced Computer Architecture (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
• CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
• CSCI 5403 - Computational Complexity (3.0 cr)
• CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
• CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5512 - Artificial Intelligence II (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
• CSCI 5552 - Sensing and Estimation in Robotics (3.0 cr)
• CSCI 5561 - Computer Vision (3.0 cr)
• CSCI 5607 - Fundamentals of Computer Graphics I (3.0 cr)
• CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
• CSCI 5611 - Animation & Planning in Games (3.0 cr)
Plan A
Plan A students must take 10 thesis credits.
CSCI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Plan B requires 3 credits of the Plan B project course, CSCI 8760. The Plan B project is a significant project demonstrating the student's familiarity with the tools of research, the capability to work independently, and the ability to effectively relate their results to their committee. A written report describing the Plan B project must be approved by the advisor. A copy of the report should be provided to the committee members at least 1 week before the oral presentation.
CSCI 8760 - Plan B Project (3.0 cr)

Plan C
Plan C is a coursework only degree. Students must complete a minimum of 100 hours of course-based project work, a written research report, and an oral presentation within CSCI courses taken for graduate credit. Students can count at most 3 credits of the following directed research/independent study courses toward their degree plan: CSCI 5994, 8994, 5991, and 8991.
**Twin Cities Campus**

**Computer Science Minor**

*Computer Science and Engineering*

*College of Science and Engineering*

Link to a list of faculty for this program.

**Contact Information:**

Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572)

Email: admissions@cs.umn.edu

Website: http://www.cs.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 13
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in computer science offers coursework from across a broad spectrum of theoretical and applied computer science, combined with research opportunities in nearly all areas of the field. Faculty members advise students in such areas as algorithms and theoretical computer science; numerical, parallel, and high-performance computing; distributed computing and systems; artificial intelligence, robotics, and computer vision; databases and data mining; human-computer interaction and information systems; graphics and visualization; software engineering and programming languages; computer architecture and compilers; networking; bioinformatics and computational biology; and computer security. In addition, students may choose a course of study that integrates research in computer science with applications in other fields.

Computer science degrees include the M.C.S., the M.S. (Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects), and the Ph.D. The department also supports a master of science in software engineering (M.S.S.E.) degree.

Faculty from the Department of Computer Science and Engineering also participate in a variety of other graduate programs, including BioInformatics and Computational Biology, Health Informatics, Cognitive Science, Scientific Computation and Human Factors and Ergonomics.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

**Program Sub-plans**

Students are required to complete one of the following sub-plans.

Students may not complete the program with more than one sub-plan.

**Master's**

A minor in computer science for master's students majoring in other fields must include 9 credits of graduate courses in CSCI. The
colloquium credit may not be included. There is a limit of one 4xxx course and a requirement of at least one 8xxx course or a 5xxx course that has a prerequisite of a 5xxx course. These courses must be taken on the A/F grading scale and a minimum GPA of 3.00 is expected.

Doctoral
A minor in computer science for Ph.D. students majoring in other fields must include 13 credits of graduate courses in CSCI, and should include the colloquium credit. There is a limit of one 4xxx course and a requirement of at least one 8xxx course or a 5xxx course that has a prerequisite of a 5xxx course. These courses must be taken on the A/F grading scale and a minimum GPA of 3.25 is expected.

Colloquium Credit
CSCI 8970 - Computer Science Colloquium (1.0 cr)


**Twin Cities Campus**

**Computer Science Ph.D.**

**Computer Science and Engineering**

**College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**
Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572)
Email: csadmit@umn.edu
Website: http://www.cs.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 55
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate program in computer science offers coursework from across a broad spectrum of theoretical and applied computer science, combined with research opportunities in nearly all areas of the field. Faculty members advise students in such areas as algorithms and theoretical computer science; numerical, parallel, and high-performance computing; distributed computing and systems; artificial intelligence, robotics, and computer vision; databases and data mining; human-computer interaction and information systems; graphics and visualization; software engineering and programming languages; computer architecture and compilers; networking; bioinformatics and computational biology; machine learning; and computer security. In addition, students may choose a course of study that integrates research in computer science with applications in other fields.

Computer science degrees include the PhD, as well as the M.C.S. (a terminal, coursework-only degree), and the MS (offered Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects). The department also supports a master of science in software engineering (M.S.S.E.) degree.

Faculty from the Department of Computer Science and Engineering also participate in a variety of other graduate programs, including BioInformatics and Computational Biology, Health Informatics, Cognitive Science, Scientific Computation and Human Factors and Ergonomics.

**Program Delivery**
This program is available:
• via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**
The preferred undergraduate GPA for admittance to the program is 3.45.

A degree in any major with a substantial background in computer science is required; a computer science major is preferred.

Other requirements to be completed before admission:
The program requires all applicants to complete the department's online application, as well as the University's online application. The names and email addresses of three recommenders are required; they will be asked to upload their letters of recommendation to the CS&E online application only. Scores from the General (Aptitude) Test of the GRE are required for PhD program applicants. PhD students are accepted for fall admission only. The application deadline is April 1. Students seeking financial aid must apply by December 5. Additional information is available at https://www.cs.umn.edu/admissions/graduate

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 85
  - Internet Based - Writing Score: 23

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Information current as of August 31, 2018
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
16 to 25 credits are required in the major.
6 to 15 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.45 is required for students to remain in good standing.

The PhD requires a total of 55 credits consisting of 31 course credits and 24 thesis credits. Of the 31 course credits, 16 must be in computer science courses and at least 6 from outside the major. The 16 major credits must include five 3-credit courses that fulfill the breadth requirement in three different areas: theory and algorithms; architecture, systems and software; and applications; plus 1 credit of colloquium (CSCI 8970).

The remaining 9 credits may be taken as additional graduate-level courses in the major or in any supporting field. Students are recommended to take CSCI 8001/2 Introduction to Research in Computer Science I and II and a directed research course (CSCI 8994).

Students are expected to complete all courses in their degree program with a GPA of at least 3.45. All courses must be taken for graduate credit and on the A-F grading basis.

All doctoral students must demonstrate background knowledge in computer science as explained in the program requirements at: https://www.cs.umn.edu/academics/graduate/phd/bg-req

Breadth Requirement Courses
Students must take a total of 5 courses (typically 15 credits): one from each of the three subject areas and the remaining two from any of the three subject areas.
Take 5 or more course(s) from the following:

**Theory and Algorithms**
Take 1 or more course(s) from the following:
- CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
- CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
- CSCI 5403 - Computational Complexity (3.0 cr)
- CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
- CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
- CSCI 5525 - Machine Learning (3.0 cr)

**Architecture, Systems and Software**
Take 1 or more course(s) from the following:
- CSCI 5103 - Operating Systems (3.0 cr)
- CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
- CSCI 5106 - Programming Languages (3.0 cr)
- CSCI 5161 - Introduction to Compilers (3.0 cr)
- CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
- CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
- CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
- CSCI 5451 - Introduction to Parallel Computing; Architectures, Algorithms, and Programming (3.0 cr)
- CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
- CSCI 5801 - Software Engineering I (3.0 cr)
• CSCI 5802 - Software Engineering II (3.0 cr)
• CSCI 5204 - Advanced Computer Architecture (3.0 cr)

Applications
Take 1 or more course(s) from the following:
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 5125 - Collaborative and Social Computing (3.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5471 - Modern Cryptography (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5512 - Artificial Intelligence II (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
• CSCI 5561 - Computer Vision (3.0 cr)
• CSCI 5607 - Fundamentals of Computer Graphics 1 (3.0 cr)
• CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 5611 - Animation & Planning in Games (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)

Supporting Program
Take 6 credits in courses outside of computer science. These credits may be used toward the requirements for a doctoral minor.

Colloquium Credits
Take 1 credit of CS colloquium.
CSCI 8970 - Computer Science Colloquium (1.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam.
CSCI 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Computer Science Courses
The remaining 9 credits of coursework may be taken in the major field or any supporting field. Students may choose courses from this list or consult with their advisor for additional options.
Take 0 or more credit(s) from the following:
• CSCI 5103 - Operating Systems (3.0 cr)
• CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
• CSCI 5106 - Programming Languages (3.0 cr)
• CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
• CSCI 5117 - Developing the Interactive Web (3.0 cr)
• CSCI 5125 - Collaborative and Social Computing (3.0 cr)
• CSCI 5161 - Introduction to Compilers (3.0 cr)
• CSCI 5204 - Advanced Computer Architecture (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
• CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
• CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
• CSCI 5403 - Computational Complexity (3.0 cr)
• CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
• CSCI 5471 - Modern Cryptography (3.0 cr)
• CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5512 - Artificial Intelligence II (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• CSCI 5551 - Introduction to Intelligent Robotic Systems (3.0 cr)
• CSCI 5561 - Computer Vision (3.0 cr)
• CSCI 5607 - Fundamentals of Computer Graphics 1 (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)
• CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)
• CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
• CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
• CSCI 5801 - Software Engineering I (3.0 cr)
• CSCI 5802 - Software Engineering II (3.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• CSCI 5991 - Independent Study (1.0 - 3.0 cr)
• CSCI 5994 - Directed Research (1.0 - 3.0 cr)
• CSCI 8001 - Introduction to Research in Computer Science I (1.0 cr)
• CSCI 8002 - Introduction to Research in Computer Science, II (2.0 cr)
• CSCI 8115 - Human-Computer Interaction and User Interface Technology (3.0 cr)
• CSCI 8205 - Parallel Computer Organization (3.0 cr)
• CSCI 8363 - Numerical Linear Algebra in Data Exploration (3.0 cr)
• CSCI 8442 - Computational Geometry and Applications (3.0 cr)
• CSCI 8551 - Intelligent Agents (3.0 cr)
• CSCI 8735 - Advanced Database Systems (3.0 cr)
• CSCI 8801 - Advanced Software Engineering (3.0 cr)
• CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
• CSCI 8991 - Independent Study (1.0 - 3.0 cr)
• CSCI 8994 - Directed Research in Computer Science (1.0 - 3.0 cr)
Twin Cities Campus
Cyber Security Minor
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Technological Leadership Institute, University of Minnesota, 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455
(612-624-5474; fax: 612-624-7510)
Email: damian@umn.edu
Website: http://tli.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 8
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The minor in the Cyber Security program is administered by the Technological Leadership Institute (TLI) in the College of Science and Engineering. The program integrates the fields of technology, security, and management, to provide students with the skills and insights to assume a leadership role in cyber security, or continue their field of study with a focus on cyber security and its role in organizations.

The curriculum applies fundamental concepts of business management, organizational leadership, and risk management techniques and strategies, each as applied in the context of cyber security, to empower engineering, technology, and business professionals to adapt and lead in the emerging field of cyber security. Each class will include exercises that inform students on those cyber security topics, and give them an opportunity to practice the fundamental skills of communications, teamwork, and project management.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Courses
These core courses are designed to be taken in sequence.
ST 8661 - Securing Cyberspace (Fundamentals) (3.0 cr)
ST 8662 - Securing Cyberspace - Advanced (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Elective Courses
- Take 2 or more credit(s) from the following:
  - ST 8113 - Information and Cyber Security (2.0 cr)
• ST 8513 - Cyber Threat Intelligence (2.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5471 - Modern Cryptography (3.0 cr)
• CSCI 8271 - Security and Privacy in Computing (3.0 cr)

Doctoral
Elective Courses
Take 6 or more credit(s) from the following:
• ST 8113 - Information and Cyber Security (2.0 cr)
• ST 8513 - Cyber Threat Intelligence (2.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5471 - Modern Cryptography (3.0 cr)
• CSCI 8271 - Security and Privacy in Computing (3.0 cr)
Twin Cities Campus
Data Science Certificate
Computer Science and Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Data Science Graduate Program, Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572).
Email: datascience@umn.edu
Website: http://datascience.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Data Science Certificate program provides a strong foundation in the science of Big Data and its analysis by gathering in a single program the knowledge, expertise, and educational assets in data collection and management, data analytics, scalable data-driven pattern discovery, and the fundamental concepts behind these methods.

Students who graduate from this 2-semester certificate program will learn the state-of-the-art methods for treating Big Data and be exposed to the cutting edge methods and theory forming the basis for the next generation of Big Data technology.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited college or university in computer science, math, statistics, engineering, natural sciences, or a related field.

Other requirements to be completed before admission:
The undergraduate degree must include statistics, calculus, multivariable calculus, linear algebra, and mathematical software environments such as Matlab or R or the equivalent, programming languages such as C++, C++, Java, programming experience including algorithms and data structures normally taught in beginning computer science courses either as part of the undergraduate degree or subsequent work experience.

Special Application Requirements:
Admission application deadlines: rolling. Applicants are considered for Fall or Spring admission and decisions are made after all applications are received following the close of the application cycle. Application instructions can be found here: https://datascience.umn.edu/admissions

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Writing Score: 23
  - Internet Based - Reading Score: 23
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Part 1 (Composition) score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

The Data Science certificate requires a minimum of 12 credits consisting of one course from each of the three emphasis areas, plus one course chosen from any of the three emphasis areas.

Statistics
Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- STAT 5101 - Theory of Statistics I (4.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5511 - Time Series Analysis (3.0 cr)
- STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)

Algorithmics
Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5523 - Introduction to Data Mining (3.0 cr)
- CSCI 5525 - Machine Learning (3.0 cr)
- EE 8591 - Predictive Learning from Data (3.0 cr)
- PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)

Infrastructure and Large Scale Computing
Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
- CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
- CSCI 5707 - Principles of Database Systems (3.0 cr)
- CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
- EE 5351 - Applied Parallel Programming (3.0 cr)
- EE 8367 - Parallel Computer Organization (3.0 cr)
**Twin Cities Campus**  
*Data Science M.S.*  
*Computer Science and Engineering*  
*College of Science and Engineering*

Link to a list of faculty for this program.

**Contact Information:**  
Data Science Graduate Program, Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572).  
Email: datascience@umn.edu  
Website: http://datascience.umn.edu

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 31  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The MS in data science program provides a strong foundation in the science of Big Data and its analysis by gathering in a single program the knowledge, expertise, and educational assets in data collection and management, data analytics, scalable data-driven pattern discovery, and the fundamental concepts behind these methods.

Students who graduate from this regular 2 year master's program will learn the state-of-the-art methods for treating Big Data, be exposed to the cutting edge methods and theory forming the basis for the next generation of Big Data technology, and will complete a project demonstrating that they can use the fundamental concepts to design innovative methods for new application areas arising from business, government, security, medicine, biology, physical sciences, and the environment.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited college or university in computer science, math, statistics, engineering, natural sciences, or a related field.

Other requirements to be completed before admission:  
The undergraduate degree must include statistics, calculus, multivariable calculus, linear algebra, and mathematical software environments such as Matlab or R or the equivalent, programming languages such as C, C++, Java, programming experience including algorithms and data structures normally taught in beginning computer science courses either as part of the undergraduate degree or subsequent work experience.

**Special Application Requirements:**  
Admission application deadlines: February 1st international applicants, March 1st domestic applicants. Applicants are only considered for fall admission and decisions are made after all applications are received following the close of the application cycle. Application instructions can be found here: https://datascience.umn.edu/admissions

Applicants must submit their test score(s) from the following:  
- GRE

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Writing Score: 23  
  - Internet Based - Reading Score: 23  
  - Paper Based - Total Score: 550  
- IELTS

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Information current as of August 31, 2018
Total Score: 6.5
- MELAB
  - Part 1 (Composition) score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 31 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: Students must complete 3 credit hours of capstone project coursework supervised by a faculty member.

The final examination for the Capstone Project may be oral, written, or both. The format of the final exam is decided between the student, the adviser, and the director of graduate studies, and is based on what is most appropriate for the students project. The final oral examination, if it is used, is a closed examination open only to the final oral examination committee and the student.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The program requires a total of 31 credits consisting of 6 credits each from the three emphasis areas: statistics, algorithms, and infrastructure and large scale computing; 9 credits in approved electives, 3 credits of which must be at the 8xxx level; 1 credit of research colloquium; and 3 credits for the capstone project.

Statistics

Short List
- Take one course from the short list and one additional statistics course from any in this emphasis for a total of 6 or more credits.
  - Take 2 or more course(s) totaling 6 or more credit(s) from the following:
    • STAT 5101 - Theory of Statistics I (4.0 cr)
    • STAT 5102 - Theory of Statistics II (4.0 cr)
    • STAT 5302 - Applied Regression Analysis (4.0 cr)
    • STAT 5401 - Applied Multivariate Methods (3.0 cr)
    • STAT 5511 - Time Series Analysis (3.0 cr)
    • STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
    • PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)

Additional Courses
- Take 0 or more course(s) totaling 0 or more credit(s) from the following:
  • PUBH 8401 - Linear Models (4.0 cr)
  • PUBH 8432 - Probability Models for Biostatistics (3.0 cr)
  • PUBH 7405 - Biostatistics: Regression (4.0 cr)
  • PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
  • PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
  • EE 5531 - Probability and Stochastic Processes (3.0 cr)
  • EE 8581 - Detection and Estimation Theory (3.0 cr)

Algorithmics

Short List
- Take one course from the short list and one additional course from any in this emphasis for a total of 6 or more credits.
  - Take 2 or more course(s) totaling 6 or more credit(s) from the following:
    • CSCI 5521 - Introduction to Machine Learning (3.0 cr)
    • CSCI 5523 - Introduction to Data Mining (3.0 cr)
    • CSCI 5525 - Machine Learning (3.0 cr)
    • EE 8591 - Predictive Learning from Data (3.0 cr)
    • PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)

Additional Courses
- Take 0 or more course(s) totaling 0 or more credit(s) from the following:
  • CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
  • CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
  • CSCI 5511 - Artificial Intelligence I (3.0 cr)
  • CSCI 5512 - Artificial Intelligence II (3.0 cr)
**Infrastructure and Large Scale Computing**

**Short List**
Take one course from the short list and one additional course from any in this emphasis for a total of 6 or more credits.

- Take 2 or more course(s) totaling 6 or more credit(s) from the following:
  - CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
  - CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
  - CSCI 5707 - Principles of Database Systems (3.0 cr)
  - CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
  - EE 5351 - Applied Parallel Programming (3.0 cr)
  - EE 8367 - Parallel Computer Organization (3.0 cr)
  - CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)

**Additional Courses**
Take 0 or more course(s) totaling 0 or more credit(s) from the following:

- CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
- CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
- CSCI 5271 - Introduction to Computer Security (3.0 cr)
- CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
- CSCI 8701 - Overview of Database Research (3.0 cr)
- CSCI 8715 - Spatial Data Science Research (3.0 cr)
- EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
- EE 5381 - Telecommunications Networks (3.0 cr)
- EE 5501 - Digital Communication (3.0 cr)

**Electives**
Take 3 elective courses for 9 graduate-credits. 3 credits must be at the 8xxx level. DSCI 8760 does not satisfy the elective requirement. Students may choose courses from this list or consult with their adviser for further options. Examples include 5xxx & 8xxx special topics classes in CSCI, EE, STAT, & PUBH (Biostat).

- Take 3 or more course(s) totaling 9 or more credit(s) from the following:
  - CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
  - CSCI 5561 - Computer Vision (3.0 cr)
  - CSCI 8271 - Security and Privacy in Computing (3.0 cr)
  - CSCI 8363 - Numerical Linear Algebra in Data Exploration (3.0 cr)
  - CSCI 8715 - Spatial Data Science Research (3.0 cr)
  - CSCI 8725 - Databases for Bioinformatics (3.0 cr)
  - PUBH 8445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
  - PUBH 8446 - Advanced Statistical Genetics and Genomics (3.0 cr)
  - PUBH 8472 - Spatial Biostatistics (3.0 cr)
  - MATH 5467 - Introduction to the Mathematics of Image and Data Analysis (4.0 cr)

**Research Colloquium**

- DSCI 8970 - Data Science M.S. Colloquium (1.0 cr)

**Capstone Course**

- DSCI 8760 - Data Science M.S. Plan B Project (3.0 cr)
Twin Cities Campus
Data Science Minor
Computer Science and Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Data Science Graduate Program, Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-4002; fax: 612-625-0572).
Email: datascience@umn.edu
Website: http://datascience.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 9
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Data Science Minor provides a strong foundation in the science of Big Data and its analysis by gathering together the knowledge, expertise, and educational assets in data collection and management, data analytics, scalable data-driven pattern discovery, and the fundamental concepts behind these methods. Students completing this program will learn the state-of-the-art methods for treating Big Data and be exposed to the cutting edge methods and theory forming the basis for the next generation of Big Data technology.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Currently enrolled in a University of Minnesota M.S. or Ph.D. program.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Courses must be taken at the University of Minnesota Twin Cities Campus and on the A/F grading scale. Transfer coursework will not be accepted. A 3.0 GPA must be maintained in the courses used for the Data Science minor.

All students must take one course from each of the three emphasis areas for a total of at least 9 credits. Doctoral students must take an additional electives course for at least 3 credits.

Algorithmics
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
- CSCI 5521 - Introduction to Machine Learning (3.0 cr)
- CSCI 5523 - Introduction to Data Mining (3.0 cr)
- CSCI 5525 - Machine Learning (3.0 cr)
- EE 8591 - Predictive Learning from Data (3.0 cr)
- PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)

Statistics
Take 1 or more course(s) totaling 3 or more credit(s) from the following:

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Information current as of August 31, 2018
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5511 - Time Series Analysis (3.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)

Infrastructure and Large Scale Computing
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
• CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)
• CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
• EE 5351 - Applied Parallel Programming (3.0 cr)

• Parallel Computer Organization
  Either CSCI 8205 or EE 8367. These courses are cross-listed.
  • CSCI 8205 - Parallel Computer Organization (3.0 cr)
  or EE 8367 - Parallel Computer Organization (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's
The master's minor requires one course from each of the three emphasis areas for a total of 9 credits.

Doctoral
In addition to one course from each of the three emphasis areas, doctoral students take one elective course from the following to complete the 12-credit minimum.

Biochemistry Electives (6 Credits)
Students cannot use a course from the department housing their degree program as an elective.
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
• STAT 5101 - Theory of Statistics I (4.0 cr)
• STAT 5102 - Theory of Statistics II (4.0 cr)
• STAT 5302 - Applied Regression Analysis (4.0 cr)
• STAT 5511 - Time Series Analysis (3.0 cr)
• STAT 5401 - Applied Multivariate Methods (3.0 cr)
• STAT 8051 - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
• PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
• PUBH 8401 - Linear Models (4.0 cr)
• PUBH 8432 - Probability Models for Biostatistics (3.0 cr)
• PUBH 7405 - Biostatistics: Regression (4.0 cr)
• PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
• PUBH 7460 - Advanced Statistical Computing (3.0 cr)
• PUBH 8442 - Bayesian Decision Theory and Data Analysis (3.0 cr)
• EE 5531 - Probability and Stochastic Processes (3.0 cr)
• EE 8581 - Detection and Estimation Theory (3.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
• CSCI 5523 - Introduction to Data Mining (3.0 cr)
• CSCI 5525 - Machine Learning (3.0 cr)
• EE 8591 - Predictive Learning from Data (3.0 cr)
• PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
• CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
• CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
• CSCI 5511 - Artificial Intelligence I (3.0 cr)
• CSCI 5512 - Artificial Intelligence II (3.0 cr)
• CSCI 5609 - Visualization (3.0 cr)
• CSCI 8314 - Sparse Matrix Computations (3.0 cr)
• EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
• EE 5251 - Optimal Filtering and Estimation (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EE 5551 - Multiscale and Multirate Signal Processing (3.0 cr)
• EE 5561 - Image Processing and Applications (3.0 cr)
• EE 5581 - Information Theory and Coding (3.0 cr)
• EE 5585 - Data Compression (3.0 cr)
• EE 8231 - Optimization Theory (3.0 cr)
• IE 5531 - Engineering Optimization I (4.0 cr)
• IE 8534 - Advanced Topics in Operations Research (4.0 cr)
• CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
• CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
• CSCI 5707 - Principles of Database Systems (3.0 cr)
• CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
• EE 5351 - Applied Parallel Programming (3.0 cr)
• CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
• CSCI 5231 - Wireless and Sensor Networks (3.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
• CSCI 5715 - From GPS and Virtual Globes to Spatial Computing (3.0 cr)
• CSCI 5980 - Special Topics in Computer Science (1.0 - 3.0 cr)
• CSCI 8701 - Overview of Database Research (3.0 cr)
• CSCI 8715 - Spatial Data Science Research (3.0 cr)
• CSCI 8725 - Databases for Bioinformatics (3.0 cr)
• EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
• EE 5381 - Telecommunications Networks (3.0 cr)
• EE 5501 - Digital Communication (3.0 cr)
• EE 8367 - Parallel Computer Organization (3.0 cr)
• CSCI 8205 - Parallel Computer Organization (3.0 cr)
Twin Cities Campus
Earth Sciences M.S.
Department of Earth Sciences
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Earth Sciences, University of Minnesota, John T. Tate Hall-Suite 150, 116 Church St. SE, Minneapolis, MN 55455 (612-624-1333; fax: 612-625-3819)
Email: esci@umn.edu
Website: http://www.esci.umn.edu/programs/graduate

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The modern earth sciences are a remarkable synthesis of the physical and biological sciences. They are at the forefront of inquiry into and solutions of most of the major issues involving the global environment: climate, oceans, freshwater in all its forms, natural resources, and natural disasters. Like no other field, they integrate all the systems, from surface to great depth, from physics to chemistry to biology, and over all of geologic time and all geographic scales. The program includes the fields of structural geology, tectonics, petrology, hydrogeology, geomorphology, sedimentology, surface processes, geochemistry, biogeochemistry, biogeology, chemical oceanography, mineralogy, mineral and rock magnetism, rock and mineral physics, geodynamics, seismology, geostatistics, planetary geology, and geophysics and applied geophysics.

Students may accommodate other areas of interest such as engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in geology, geophysics, earth and material sciences, chemistry, physics, biology, or environmental science.

Other requirements to be completed before admission:
At least one year each of study in calculus, chemistry, and physics is required. In general, an outstanding academic record is expected.

Special Application Requirements:
Materials required for a complete application file include the student's statement of purpose, three letters of recommendation, transcripts, official GRE scores, and the Application for Admission. Applications are considered at any time; however, to be considered for financial aid, all materials must be submitted by December 15. Studies may begin in any semester or summer session, although fall semester is preferable. IMPORTANT: Refer to the Graduate Programs section of the department website (http://www.esci.umn.edu/programs/gradprospective) for a listing of all required application materials and preferred method of submission.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
- Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

**IELTS**
- Total Score: 6.5

**MELAB**
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A**: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 14 to 22 major credits and 8 to 16 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project**: Students must demonstrate familiarity with the tools of research or scholarship in their track, the ability to work independently, and the ability to present the results of their investigation effectively, by completing one or more projects, which may take the form of a research paper, presentation of research results, or completion of a faculty-supervised research experience. The Plan B project(s) should involve a minimum combined total of approximately 120 hours (the equivalent of three full-time weeks) of work.

**Plan C**: Plan C requires 14 to 21 major credits and 9 to 16 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

At the onset of studies, a coursework "compact" will be developed with the student, his/her advisor, and the graduate studies committee. The compact will be reviewed annually to assure timely progress and revise as needed.

The masters degree is offered under Plan A (thesis), Plan B (project), or Plan C (coursework). Plan A and Plan B students must choose one of five tracks in the earth sciences program: geology, geophysics, biogeology, hydrogeology, or earth sciences. Plan C students may only choose the hydrogeology track. Tracks carry coursework requirements that are part of the student's course compact.

A maximum of 9 credits of 4xxx-level coursework may be used towards program requirements.

**Required Courses**

All students must complete ESCI 8001, preferably in the first year.

**ESCI 8001 - Introductory Graduate Seminar (2.0 cr)**

**Plan A**
Plan A requires 14 credits in the major (including the track requirements); 6 credits in a minor or in related fields outside ESCI, and 10 thesis credits.

**ESCI 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)**

**Plan B**
Plan B requires 14 credits in the major (including the track requirements) and 8 credits outside ESCI, which can include a minor. The remaining 8 credits can be taken in the major or in any supporting field. Up to 3 credits of ESCI 8994 may be used for the project requirement.

**ESCI 8994 - Research in Earth Sciences (1.0 - 4.0 cr)**

**Plan C**
Plan C requires 14 credits in the major (including the track requirements) and 9 credits outside ESCI, which can include a minor. The remaining 7 credits can be taken in the major or in any supporting field. Plan C students may only choose the Hydrogeology track.
Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Biogeology
This sub-plan is limited to students completing the program under Plan A or Plan B.

Biogeology represents a rapidly growing area at the intersection between Earth and the life sciences. It includes research in microbial evolution and biochemistry, microbe/mineral chemical interactions, the role of organisms in basic geological processes, the principles through which organisms or organic compounds can be used to reconstruct surface conditions, biogeochemical cycling, pollution control and remediation, the origin of life on Earth, and astrobiology. This is a broad field that is moving in new and exciting directions, and witnessing explosive growth in understanding the variety of ways biology mediates geology and vice versa. Many of the most basic earth surface processes are now seen as intimately biological with rates and pathways dictated by organic processes. Understanding the importance of these processes, quantifying them through time and place, and learning to utilize and/or control them will be major components of earth sciences research in the 21st century.

Required Courses
Take 6 or more credit(s) from the following:
- ESCI 8402 - Biogeochemical Cycles in the Ocean (3.0 cr)
- ESCI 8801 - Geomicrobiology (3.0 cr)

Earth Sciences
This sub-plan is limited to students completing the program under Plan A or Plan B.

This generalist track exists for students whose curriculum and/or thesis (paper or project for MS Plan B) do not fit any of the other four tracks. Because it is not specific to a discipline, there are no mandatory courses in the major apart from the introductory graduate seminar, a minimum of 6 additional graduate-level credits in the major program, 12 supporting program credits or completion of all requirements for a minor, and thesis credits. A curriculum specific to the student will be set through the compact process.

6-credit minimum; courses determined on an individual basis.

Geology
This sub-plan is limited to students completing the program under Plan A or Plan B.

Geology uses field observation, laboratory work, analog and computer modeling, chemical and biological probes and assays to understand Earth's coupled rock, water and biological systems, the underlying processes, and their history of interaction as evidenced in the rock record.

Required Courses
Take 6 or more credit(s) from the following:
- ESCI 5302 - Isotope Geology (3.0 cr)
- ESCI 5351 - Geochemical Modeling of Aqueous Systems (3.0 cr)
- ESCI 5353 - Electron Microprobe Theory and Practice (3.0 cr)
- ESCI 5502 - Advanced Structural Geology (3.0 cr)
- ESCI 5503 - Advanced Petrology (3.0 cr)
- ESCI 5601W - Advanced Sedimentology [WI] (4.0 cr)
- ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)

Geophysics
This sub-plan is limited to students completing the program under Plan A or Plan B.

Geophysics uses remote sensing probes (seismic waves, potential fields, etc.), laboratory simulation of deep earth conditions and computer modeling of fluid and continuum mechanical dynamics to investigate the structure, composition, history and dynamics of solid Earth and other planets.

Required Courses
ESCI 4211 - Solid Earth Geophysics I (3.0 cr)
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
- ESCI 4212 - Solid Earth Geophysics II (3.0 cr)
• ESCI 5201 - Time-Series Analysis of Geological Phenomena (3.0 cr)
• ESCI 5203 - Mineral and Rock Physics (3.0 cr)
• ESCI 5204 - Geostatistics and Inverse Theory (3.0 cr)
• ESCI 8203 - Environmental Geophysics (3.0 cr)
• ESCI 8204 - Geomagnetism and Paleomagnetism (3.0 cr)

Hydrogeology
Hydrogeology uses direct observation and remote sensing, computer modeling and laboratory simulation to constrain the interaction of water and rock in Earth's shallow subsurface. Freshwater is Earth's most precious and increasingly overexploited resource. Hydrogeology is a key discipline in the effective shepherding of this important reserve. This track establishes a baseline curriculum for hydrogeology at the graduate level. The compact process will identify additional coursework appropriate to the student's prior training and research directions.

Required Courses
ESCI 4702 - General Hydrogeology (4.0 cr)
Take 1 or more course(s) totaling 3 or more credit(s) from the following:
• ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
• ESCI 5971 - Field Hydrogeology (2.0 cr)
Twin Cities Campus
Earth Sciences Minor
Department of Earth Sciences
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Earth Sciences, University of Minnesota, John T. Tate Hall-Suite 150, 116 Church St. SE, Minneapolis, MN 55455 (612-624-1333; fax: 612-625-3819)
Email: esci@umn.edu
Website: http://www.esci.umn.edu/programs/graduate

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The modern earth sciences are a remarkable synthesis of the physical and biological sciences. They are at the forefront of inquiry into and solutions of most of the major issues involving the global environment: climate, oceans, freshwater in all its forms, natural resources, and natural disasters. Like no other field, they integrate all the systems, from surface to great depth, from physics to chemistry to biology, and over all of geologic time and all geographic scales. The program includes the fields of structural geology, tectonics, petrology, hydrogeology, geomorphology, sedimentology, surface processes, geochemistry, biogeochemistry, biogeology, chemical oceanography, mineralogy, mineral and rock magnetism, rock and mineral physics, geodynamics, seismology, geostatistics, planetary geology, and geophysics and applied geophysics.

Students may accommodate other areas of interest such as engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The minor is established individually with approval by the graduate studies committee.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
The master's minor requires a minimum of 6 credits in ESCI courses.

Doctoral
The doctoral minor requires a minimum of 12 credits in ESCI courses.
Twin Cities Campus
Earth Sciences Ph.D.
Department of Earth Sciences
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Earth Sciences, University of Minnesota, John T. Tate Hall-Suite 150, 116 Church St. SE, Minneapolis, MN 55455 (612-624-1333; fax: 612-625-3819)
Email: esci@umn.edu
Website: http://www.esci.umn.edu/programs/graduate

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The modern earth sciences are a remarkable synthesis of the physical and biological sciences. They are at the forefront of inquiry into and solutions of most of the major issues involving the global environment: climate, oceans, freshwater in all its forms, natural resources, and natural disasters. Like no other field, they integrate all the systems, from surface to great depth, from physics to chemistry to biology, and over all of geologic time and all geographic scales. The program includes the fields of structural geology, tectonics, petrology, hydrogeology, geomorphology, sedimentology, surface processes, geochemistry, biogeochemistry, biogeology, chemical oceanography, mineralogy, mineral and rock magnetism, rock and mineral physics, geodynamics, seismology, geostatistics, planetary geology, and geophysics and applied geophysics.

Students may accommodate other areas of interest such as engineering geology, environmental geology, materials science, soil science, and paleoecology by choosing a minor or supporting field from outside the program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Bachelor's degree in geology, geophysics, earth and material sciences, chemistry, physics, biology, or environmental science.

Other requirements to be completed before admission:
At least one year of study each in calculus, chemistry, and physics is required. In general, an outstanding academic record is expected.

Special Application Requirements:
Materials required for a complete application file include the student's statement of purpose, three letters of recommendation, transcripts, official GRE scores, and the Application for Admission. Applications are considered at any time; however, to be considered for financial aid, all materials must be submitted by December 15. Studies may begin in any semester or summer session, although fall semester is preferable. IMPORTANT: Refer to the Graduate Programs section of the department website (http://www.esci.umn.edu/programs/gradprospective) for a listing of all required application materials and preferred method of submission.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550

IELTS
- Total Score: 6.5

MELAB
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
12 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

At the onset of studies, a coursework "compact" will be developed with the student, his/her advisor, and the graduate studies committee. The compact will be reviewed annually to assure timely progress and revise as needed.

Students must choose one of five tracks in the earth sciences program: geology, geophysics, biogeology, hydrogeology, or earth sciences. Tracks carry coursework requirements that are part of the student's course compact.

The PhD requires a minimum 12 credits of coursework in earth sciences, including the track requirements, a minimum of 12 credits in a minor or supporting field, plus 24 thesis credits.

A maximum of 9 credits of 4xxx-level coursework may be used towards program requirements. Coursework taken A/F must be completed with an average grade of B or better.

Required Courses
All students must complete ESCI 8001, preferably in the first year.
ESCI 8001 - Introductory Graduate Seminar (2.0 cr)

Minor or Supporting Program Coursework
Take 12 credits in a minor or in supporting fields outside ESCI.

Thesis Credits
Take 24 credits after passing preliminary oral exam
ESCI 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Biogeology
Biogeology represents a rapidly growing area at the intersection between Earth and the life sciences. It includes research in microbial evolution and biochemistry, microbe/mineral chemical interactions, the role of organisms in basic geological processes, the principles through which organisms or organic compounds can be used to reconstruct surface conditions, biogeochemical cycling, pollution control and remediation, the origin of life on Earth, and astrobiology. This is a broad field that is moving in new and exciting directions, and witnessing explosive growth in understanding the variety of ways biology mediates geology and vice versa. Many of the most basic earth surface processes are now seen as intimately biological with rates and pathways dictated by organic processes. Understanding the importance of these processes, quantifying them through time and place, and learning to utilize and/or control them will be major components of earth sciences research in the 21st century.

Required Courses
Take 6 or more credit(s) from the following:

- ESCI 8402 - Biogeochemical Cycles in the Ocean (3.0 cr)
- ESCI 8801 - Geomicrobiology (3.0 cr)

**Earth Sciences**

This generalist track exists for students whose curriculum and/or thesis (paper or project for MS Plan B) do not fit any of the other four tracks. Because it is not specific to a discipline, there are no mandatory courses in the major apart from the introductory graduate seminar, a minimum of 6 additional graduate-level credits in the major program, 12 supporting program credits or completion of all requirements for a minor, and thesis credits. A curriculum specific to the student will be set through the compact process.

6-credit minimum; courses determined on an individual basis.

**Geology**

Geology uses field observation, laboratory work, analog and computer modeling, chemical and biological probes and assays to understand Earth’s coupled rock, water and biological systems, the underlying processes, and their history of interaction as evidenced in the rock record.

**Required Courses**

Take 6 or more credit(s) from the following:

- ESCI 5302 - Isotope Geology (3.0 cr)
- ESCI 5351 - Geochemical Modeling of Aqueous Systems (3.0 cr)
- ESCI 5353 - Electron Microprobe Theory and Practice (3.0 cr)
- ESCI 5502 - Advanced Structural Geology (3.0 cr)
- ESCI 5503 - Advanced Petrology (3.0 cr)
- ESCI 5601W - Advanced Sedimentology [WI] (4.0 cr)
- ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)

**Geophysics**

Geophysics uses remote sensing probes (seismic waves, potential fields, etc.), laboratory simulation of deep Earth conditions and computer modeling of fluid and continuum mechanical dynamics to investigate the structure, composition, history and dynamics of solid Earth and other planets.

**Required Courses**

- ESCI 4211 - Solid Earth Geophysics I (3.0 cr)

Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- ESCI 4212 - Solid Earth Geophysics II (3.0 cr)
- ESCI 5201 - Time-Series Analysis of Geological Phenomena (3.0 cr)
- ESCI 5203 - Mineral and Rock Physics (3.0 cr)
- ESCI 5204 - Geostatistics and Inverse Theory (3.0 cr)
- ESCI 8203 - Environmental Geophysics (3.0 cr)
- ESCI 8204 - Geomagnetism and Paleomagnetism (3.0 cr)

**Hydrogeology**

Hydrogeology uses direct observation and remote sensing, computer modeling and laboratory simulation to constrain the interaction of water and rock in Earth’s shallow subsurface. Freshwater is Earth’s most precious and increasingly overexploited resource. Hydrogeology is a key discipline in the effective shepherding of this important reserve. This track establishes a baseline curriculum for hydrogeology at the graduate level. The compact process will identify additional coursework appropriate to the student’s prior training and research directions.

**Required Courses**

- ESCI 4702 - General Hydrogeology (4.0 cr)

Take 1 or more course(s) totaling 3 or more credit(s) from the following:

- ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences (3.0 cr)
- ESCI 5971 - Field Hydrogeology (2.0 cr)
Twin Cities Campus
Electrical Engineering M.S.E.E.
Electrical and Computer Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Electrical and Computer Engineering, University of Minnesota, 3-166 Keller Hall, 200 Union Street SE, Minneapolis, MN 55455 (612-625-3564; fax: 612-626-1136).
Email: jager001@umn.edu
Website: http://www.ece.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Science in Electrical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Electrical and Computer Engineering offers diverse educational programs that encompass nearly all aspects of modern electrical and computer engineering, ranging from the very theoretical system and information theory to highly experimental work in novel device research and microelectronics. Emphases in the major are solid state and physical electronics, surface physics, thin films, sputtering, noise and fluctuation phenomena, quantum electronics, plasma physics, automation, power systems and power electronics theory, wave propagation, communication systems and theory, optics, lasers, fiber optics, magnetism, semiconductor properties and devices, VLSI and WSI engineering in theory and practice, network theory, signal and image processing, and computer and systems engineering. Interdisciplinary work is also available in bioelectrical sciences, control sciences, computer sciences, solar energy, applications of systems theory to urban transportation and economic planning, and biological modeling.

Students are considered for admission beginning fall semester only (except for part-time students living in Minnesota who work in industry and who may apply for other terms). The deadline for applying for fall semester is December 1.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)
• completely online (all program coursework can be completed online)
• primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)
• partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.40.

Other requirements to be completed before admission:
Consideration is given to students who have completed another curriculum in engineering, science, physics, or mathematics that includes sufficient preparation to pursue a graduate program in electrical engineering. In some instances, additional preparatory studies may be required after admission.

All documents must be submitted electronically. No documents should be mailed to the department or the Graduate Admissions Office.

Every applicant must submit the General Test of the GRE (except University of Minnesota bachelor of electrical engineering graduates who have a GPA of 3.40 or better). The GRE Subject Test is not required for admission.

Special Application Requirements:
Applications are accepted for fall admission only. The deadline is December 1. Additional application information is available at http://www.ece.umn.edu/ProspectiveStudentsGraduate/index.htm

Applicants must submit their test score(s) from the following:
• GRE
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550

- **IELTS**
  - Total Score: 6.5

- **MELAB**
  - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan C:** Plan C requires 18 to 24 major credits and 6 to 12 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MSEE requires a minimum of 30 credits. Plan A requires 14 credits in EE courses, 6 credits in a minor or in related fields outside of the department, and 10 thesis credits. Plan C requires at least 18 credits from EE courses 5xxx and above, at least 6 credits in a minor or in related fields outside of the department, and additional credits from the major or related fields to meet the 30-credit minimum.

Courses taken outside of the major field must be within the College of Science and Engineering.

Part-time students must choose Plan C; full-time students may choose either Plan A or Plan C. The department limits project, seminar, special investigation, directed study credits, and GRAD 999 registrations.

All courses must be taken A-F, with the exception of EE 5041, EE 8925, and graduate seminars, which are only offered S-N. Cross-listed courses must be taken under the EE designator to count towards degree requirements. Non-EE coursework that is cross-listed with Electrical Engineering does not count toward the non-EE coursework requirement.

A maximum of nine 4xxx-level course credits may be used to satisfy masters degree requirements; of these, only six credits may be in EE courses. Only the 4xxx-level courses included on the lists below will be accepted.

M.S.E.E. students who wish to pursue the PhD must pass the PhD preliminary written examination by the end of their second year in residence. Students have two chances to pass the examination. The PhD preliminary written examination is typically held in November and in April.

**Coursework**

**Major Coursework**

Courses from this list can be applied to both Plan A and Plan C major field credit requirements. Plan C students can also apply these courses toward MSEE's 30-credit minimum.

- **EE 5121** - Transistor Device Modeling for Circuit Simulation (3.0 cr)
- **EE 5141** - Introduction to Microsystem Technology (4.0 cr)
- **EE 5163** - Semiconductor Properties and Devices I (3.0 cr)
- **EE 5164** - Semiconductor Properties and Devices II (3.0 cr)
- **EE 5171** - Microelectronic Fabrication (4.0 cr)
- **EE 5173** - Basic Microelectronics Laboratory (1.0 cr)
- **EE 5181** - Micro and Nanotechnology by Self Assembly (3.0 cr)
- **EE 5231** - Linear Systems and Optimal Control (3.0 cr)
- **EE 5235** - Robust Control System Design (3.0 cr)
- **EE 5239** - Introduction to Nonlinear Optimization (3.0 cr)
- **EE 5251** - Optimal Filtering and Estimation (3.0 cr)
- **EE 5301** - VLSI Design Automation I (3.0 cr)

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Information current as of August 31, 2018
EE 5302 - VLSI Design Automation II (3.0 cr)
EE 5323 - VLSI Design I (3.0 cr)
EE 5324 - VLSI Design II (3.0 cr)
EE 5327 - VLSI Design Laboratory (3.0 cr)
EE 5329 - VLSI Digital Signal Processing Systems (3.0 cr)
EE 5333 - Analog Integrated Circuit Design (3.0 cr)
EE 5351 - Applied Parallel Programming (3.0 cr)
EE 5364 - Advanced Computer Architecture (3.0 cr)
EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
EE 5381 - Telecommunications Networks (3.0 cr)
EE 5391 - Computing With Neural Networks (3.0 cr)
EE 5393 - Circuits, Computation, and Biology (3.0 cr)
EE 5501 - Digital Communication (3.0 cr)
EE 5505 - Wireless Communication (3.0 cr)
EE 5531 - Probability and Stochastic Processes (3.0 cr)
EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
EE 5545 - Digital Signal Processing (3.0 cr)
EE 5549 - Digital Signal Processing Structures for VLSI (3.0 cr)
EE 5551 - Multiscale and Multirate Signal Processing (3.0 cr)
EE 5561 - Image Processing and Applications (3.0 cr)
EE 5581 - Information Theory and Coding (3.0 cr)
EE 5583 - Error Control Coding (3.0 cr)
EE 5585 - Data Compression (3.0 cr)
EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
EE 5602 - RF/Microwave Circuit Design (3.0 cr)
EE 5613 - RF/Microwave Circuit Design Laboratory (2.0 cr)
EE 5616 - Antenna Theory and Design (3.0 cr)
EE 5621 - Physical Optics (3.0 cr)
EE 5622 - Physical Optics Laboratory (1.0 cr)
EE 5624 - Optical Electronics (4.0 cr)
EE 5627 - Optical Fiber Communication (3.0 cr)
EE 5628 - Fiber Optics Laboratory (1.0 cr)
EE 5629 - Optical System Design (2.0 cr)
EE 5653 - Physical Principles of Magnetic Materials (3.0 cr)
EE 5655 - Magnetic Recording (3.0 cr)
EE 5657 - Physical Principles of Thin Film Technology (4.0 cr)
EE 5705 - Electric Drives in Sustainable Energy Systems (3.0 cr)
EE 5707 - Electric Drives in Sustainable Energy Systems Laboratory (1.0 cr)
EE 5721 - Power Generation Operation and Control (3.0 cr)
EE 5725 - Power Systems Engineering (3.0 cr)
EE 5741 - Advanced Power Electronics (3.0 cr)
EE 5745 - Wind Energy Essentials (2.0 cr)
EE 5940 - Special Topics in Electrical Engineering I (1.0 - 4.0 cr)
EE 5950 - Special Topics in Electrical Engineering II (1.0 - 4.0 cr)
EE 5960 - Special Topics in Electrical Engineering III (1.0 - 4.0 cr)
EE 5970 - Special Topics in Electrical Engineering IV (1.0 - 4.0 cr)
EE 8100 - Advanced Topics in Electronics (1.0 - 3.0 cr)
EE 8141 - Advanced Heterojunction Transistors (3.0 cr)
EE 8161 - Physics of Semiconductors (3.0 cr)
EE 8163 - Quantum Electronics (3.0 cr)
EE 8213 - Advanced System Theory (3.0 cr)
EE 8215 - Nonlinear Systems (3.0 cr)
EE 8231 - Optimization Theory (3.0 cr)
EE 8235 - Advanced Control Topics (3.0 cr)
EE 8300 - Advanced Topics in Computers (1.0 - 3.0 cr)
EE 8310 - Advanced Topics in VLSI (1.0 - 3.0 cr)
EE 8320 - Advanced Topics in Design Automation (1.0 - 3.0 cr)
EE 8331 - CMOS Data Converters: A/D and D/A (3.0 cr)
EE 8337 - Analog Circuits for Wire/Wireless Communications (3.0 cr)
EE 8367 - Parallel Computer Organization (3.0 cr)
EE 8510 - Advanced Topics in Communications (1.0 - 3.0 cr)
EE 8520 - Advanced Topics in Signal Processing (1.0 - 3.0 cr)
EE 8581 - Detection and Estimation Theory (3.0 cr)
EE 8591 - Predictive Learning from Data (3.0 cr)
EE 8601 - Advanced Electromagnetic Theory (3.0 cr)
EE 8611 - Plasma Physics (3.0 cr)
EE 8620 - Advanced Topics in Magnetics (1.0 - 3.0 cr)
EE 8630 - Advanced Topics in Electromagnetics (1.0 - 3.0 cr)
EE 8725 - Advanced Power System Analysis and Economics (3.0 cr)
EE 8741 - Power Electronics in Power Systems (3.0 cr)
EE 8850 - Advanced Topics in Electrical and Computer Engineering (1.0 - 3.0 cr)

**Outside Coursework**

Courses from this list can be applied to both the Plan A and Plan C outside (non-EE) credit requirements. Plan C students can also apply these courses toward MSEEs 30-credit minimum.

AEM 4203 - Aerospace Propulsion (4.0 cr)
AEM 4295 - Problems in Fluid Mechanics (1.0 - 3.0 cr)
AEM 4301 - Orbital Mechanics (3.0 cr)
AEM 4303W - Flight Dynamics and Control [WI] (3.0 cr)
AEM 4305 - Spacecraft Attitude Dynamics and Control (3.0 cr)
AEM 4331 - Aerospace Vehicle Design (4.0 cr)
AEM 4333 - Aerospace Design: Special Projects (3.0 cr)
AEM 4495 - Problems in Aerospace Systems (3.0 cr)
AEM 4501 - Aerospace Structures (3.0 cr)
AEM 4502 - Computational Structural Analysis (3.0 cr)
AEM 4511 - Mechanics of Composite Materials (3.0 cr)
AEM 4581 - Mechanics of Solids (3.0 cr)
AEM 4595 - Problems in Mechanics and Materials (1.0 - 3.0 cr)
AEM 4601 - Instrumentation Laboratory (3.0 cr)
AEM 4602W - Aeromechanics Laboratory [WI] (4.0 cr)
AEM 5247 - Hypersonic Aerodynamics (3.0 cr)
AEM 5253 - Computational Fluid Mechanics (3.0 cr)
AEM 5333 - Design-to-Flight: Small Uninhabited Aerial Vehicles (3.0 cr)
AEM 5401 - Intermediate Dynamics (3.0 cr)
AEM 5501 - Continuum Mechanics (3.0 cr)
AEM 5503 - Theory of Elasticity (3.0 cr)
AEM 5581 - Mechanics of Solids (3.0 cr)
AEM 5651 - Aeroelasticity (3.0 cr)
BBE 5023 - Process Control and Instrumentation (3.0 cr)
BBE 5333 - Off-road Vehicle Design (4.0 cr)
SSM 5413 - A Systems Approach to Residential Construction (4.0 cr)
SSM 5416 - Building Testing & Diagnostics (2.0 cr)
BBE 5733 - Renewable Energy Technologies (3.0 cr)
BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
BIOL 4003 - Genetics (3.0 cr)
BIOL 4004 - Cell Biology (3.0 cr)
PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
BIOL 4850 - Special Topics in Biology (1.0 - 5.0 cr)
BIOL 5272 - Applied Biostatistics (4.0 cr)
BMEN 5001 - Advanced Biomaterials (3.0 cr)
BMEN 5041 - Tissue Engineering (3.0 cr)
BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
BMEN 5111 - Biomedical Ultrasound (3.0 cr)
BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
BMEN 5201 - Advanced Biomechanics (3.0 cr)
BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
BMEN 5351 - Cell Engineering (3.0 cr)
BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
BMEN 5411 - Neural Engineering (3.0 cr)
BMEN 5412 - Neuromodulation (3.0 cr)
BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
BMEN 5701 - Cancer Bioengineering (3.0 cr)
CEGE 5211 - Traffic Engineering (3.0 cr)
CEGE 5411 - Applied Structural Mechanics (3.0 cr)
CHEM 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
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<td>Modern Instrumental Methods of Chemical Analysis</td>
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<td>CHEN 4704</td>
<td>Advanced Undergraduate Physical Rate Processes I: Transport</td>
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<td>CHEN 4707</td>
<td>Advanced Undergraduate Statistical Thermodynamics and Kinetics</td>
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<td>CHEN 4708</td>
<td>Advanced Undergraduate Chemical Rate Processes: Analysis of Chemical Reactors</td>
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<td>Biochemical Engineering</td>
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<td>CSCI 4511W</td>
<td>Introduction to Artificial Intelligence [WI]</td>
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<td>CSCI 4611</td>
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<td>CSCI 5105</td>
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<td>CSCI 5106</td>
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<td>CSCI 5115</td>
<td>User Interface Design, Implementation and Evaluation</td>
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<td>CSCI 5125</td>
<td>Collaborative and Social Computing</td>
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<td>CSCI 5143</td>
<td>Real-Time and Embedded Systems</td>
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<td>CSCI 5271</td>
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<td>Introduction to Stochastic Processes</td>
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<td>MATH 5654</td>
<td>Prediction and Filtering</td>
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<td>Materials in Design</td>
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<td>Introduction to Finite Element Modeling, Analysis, and Design</td>
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<td>ME 5247</td>
<td>Stress Analysis, Sensing, and Transducers</td>
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<td>ME 5281</td>
<td>Analog and Digital Control</td>
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<td>ME 5286</td>
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<td>Introduction to Solid-State Physics</td>
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<td>PHYS 4303</td>
<td>Electrodynamics and Waves</td>
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<td>Introduction to Nuclear and Particle Physics</td>
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<td>Introduction to Space Physics</td>
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<td>Thermal and Statistical Physics</td>
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<td>Solid-State Physics for Engineers and Scientists</td>
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<td>STAT 5021</td>
<td>Statistical Analysis</td>
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<td>STAT 5031</td>
<td>Statistical Methods for Quality Improvement</td>
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<td>STAT 5102</td>
<td>Theory of Statistics II</td>
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STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
STAT 5302 - Applied Regression Analysis (4.0 cr)
STAT 5303 - Designing Experiments (4.0 cr)
STAT 5401 - Applied Multivariate Methods (3.0 cr)
STAT 5421 - Analysis of Categorical Data (3.0 cr)
STAT 5511 - Time Series Analysis (3.0 cr)

Plan A
Plan A students have the option to apply the following courses to their major field credit requirement. A maximum of 2 credits from the following subset of this list can be used: EE 8190, EE 8210, EE 8230, EE 8360, EE 8370, EE 8500, EE 8610, EE 8660, EE 8920, EE 8925, EE 8940.

EE 4111 - Advanced Analog Electronics Design (4.0 cr)
EE 4161W - Energy Conversion and Storage [WI] (3.0 cr)
EE 4163 - Energy Conversion and Storage Laboratory (1.0 cr)
EE 4231 - Linear Control Systems: Designed by Input/Output Methods (3.0 cr)
EE 4233 - State Space Control System Design (3.0 cr)
EE 4235 - Linear Control Systems Laboratory (1.0 cr)
EE 4237 - State Space Control Laboratory (1.0 cr)
EE 4301 - Digital Design With Programmable Logic (4.0 cr)
EE 4303 - Introduction to Programmable Devices Laboratory (1.0 cr)
EE 4341 - Embedded System Design (4.0 cr)
EE 4363 - Computer Architecture and Machine Organization (4.0 cr)
EE 4389W - Introduction to Predictive Learning [WI] (3.0 cr)
EE 4501 - Communications Systems (3.0 cr)
EE 4505 - Communications Systems Laboratory (1.0 cr)
EE 4541 - Digital Signal Processing (3.0 cr)
EE 4607 - Wireless Hardware System Design (3.0 cr)
EE 4701 - Electric Drives (3.0 cr)
EE 4703 - Electric Drives Laboratory (1.0 cr)
EE 4721 - Introduction to Power System Analysis (3.0 cr)
EE 4722 - Power System Analysis Laboratory (1.0 cr)
EE 4741 - Power Electronics (3.0 cr)
EE 4743 - Switch-Mode Power Electronics Laboratory (1.0 cr)
EE 5041 - Industrial Assignment for Graduate Students (1.0 cr)
EE 8190 - Electronics Seminar (1.0 cr)
EE 8210 - System Theory Seminar (1.0 cr)
EE 8230 - Control Theory Seminar (1.0 cr)
EE 8360 - Computer Systems Seminar (1.0 cr)
EE 8370 - Computer Aided Design Seminar (1.0 cr)
EE 8500 - Seminar: Communications (1.0 cr)
EE 8610 - Seminar: Electronics, Fields, and Photonics (1.0 cr)
EE 8660 - Seminar: Magnetics (1.0 cr)
EE 8920 - Teaching Experience in Electrical and Computer Engineering (1.0 cr)
EE 8925 - Ethics in Electrical and Computer Engineering (1.0 cr)
EE 8940 - Special Investigations (1.0 - 3.0 cr)

Thesis Credits
All Plan A students must take at least 10 master's thesis credits.
EE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan C
Plan C students have the option to apply the following courses toward MSEEs 30-credit minimum. These courses do not satisfy the major or outside (non-EE) credit requirements.
A maximum of 2 credits of the following may be applied: EE 5041, EE 8190, EE 8210, EE 8230, EE 8360, EE 8370, EE 8500, EE 8610, EE 8660, EE 8920, EE 8925, and EE 8940.

EE 4111 - Advanced Analog Electronics Design (4.0 cr)
EE 4161W - Energy Conversion and Storage [WI] (3.0 cr)
EE 4163 - Energy Conversion and Storage Laboratory (1.0 cr)
EE 4231 - Linear Control Systems: Designed by Input/Output Methods (3.0 cr)
EE 4233 - State Space Control System Design (3.0 cr)
EE 4235 - Linear Control Systems Laboratory (1.0 cr)
EE 4237 - State Space Control Laboratory (1.0 cr)
EE 4301 - Digital Design With Programmable Logic (4.0 cr)
EE 4303 - Introduction to Programmable Devices Laboratory (1.0 cr)
EE 4341 - Embedded System Design (4.0 cr)
EE 4363 - Computer Architecture and Machine Organization (4.0 cr)
Plan C students must complete a paper and project. The following courses satisfy all or a portion of the requirement. Contact the EE department for additional information.

**Program Sub-plans**

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Rochester**

The University of Minnesota Rochester (UMR) offers the MS degree in electrical engineering. Students may complete all degree requirements in Rochester by combining courses taught by College of Science and Engineering faculty in person (face-to-face), or via streaming video using the UNITE (University-Industry Television for Education) instructional television system. UNITE enables students
to watch class live via the internet or pick up class on a special server at a later time.

**Integrated B.E.E./M.S.E.E.**

The Department of Electrical and Computer Engineering offers an integrated bachelor of electrical engineering (BEE) and master of science in electrical engineering (MSEE). The integrated BEE/MSEE program offers students the opportunity to earn both degrees in five years. The programs were established to allow high-achieving University undergraduates the opportunity to work toward a masters degree while simultaneously working toward their undergraduate degree. The combined program offers several advantages: flexibility in fulfilling required courses for both degrees during the senior year; eligibility for graduate assistantships and fellowships; and the ability to save money by completing up to 16 graduate credits at the undergraduate tuition rate.

Both the BEE and MSEE degrees must be completed in their entirety, with no courses shared between them. The graduate degree cannot be earned before the undergraduate requirements are satisfied.

**Eligibility requirements:**

Application to the integrated program is open to University students in the electrical engineering or computer engineering program who have completed a majority of the required upper division courses for their undergraduate degree and have a cumulative GPA of 3.4 or higher. Students with a GPA between 3.2 and 3.4 may also apply, but must submit a GRE score.

**Integrated B.Comp.E./M.S.E.E.**

The Department of Electrical and Computer Engineering offers an integrated bachelor of computer engineering (B.Comp.E.) and master of science in electrical engineering (MSEE). Benefits, eligibility requirements, and degree-completion requirements outlined for the BEEE/MSEE integrated program also apply to the B.Comp.E./MSEE.
Twin Cities Campus
Electrical Engineering Minor
Electrical and Computer Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Electrical and Computer Engineering, University of Minnesota, 3-166 Keller Hall, 200 Union Street SE, Minneapolis, MN 55455 (612-625-3564; fax: 612-626-1136)
Email: jager001@umn.edu
Website: http://www.ece.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Electrical and Computer Engineering offers diverse educational programs that encompass nearly all aspects of modern electrical and computer engineering, ranging from the very theoretical system and information theory, to highly experimental work in novel device research and microelectronics. Emphases in the major are solid state and physical electronics, surface physics, thin films, sputtering, noise and fluctuation phenomena, quantum electronics, plasma physics, automation, power systems and power electronics theory, wave propagation, communication systems and theory, optics, lasers, fiber optics, magnetism, semiconductor properties and devices, VLSI and WSI engineering in theory and practice, network theory, signal and image processing, and computer and systems engineering. Interdisciplinary work is also available in bioelectrical sciences, control sciences, solar energy, applications of systems theory to urban transportation and economic planning, and biological modeling.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.40.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Minor credits must be 5xxx or 8xxx level. Coursework must be from classroom and laboratory courses. No colloquia, seminar, or special investigation credits count toward meeting the minor requirements.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
The master's minor requires a minimum of 6 credits in EE courses. All courses must be taken A-F. Courses that are cross-listed must be taken under the EE designator to count towards degree requirements.
Doctoral

The doctoral minor requires a minimum of 12 credits in EE courses. All courses must be taken A-F. Courses that are cross-listed must be taken under the EE designator to count towards degree requirements.
Twin Cities Campus

Electrical Engineering Ph.D.
Electrical and Computer Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, Department of Electrical and Computer Engineering, University of Minnesota, 3-166 Keller Hall, 200 Union Street SE, Minneapolis, MN 55455 (612-625-3564; fax: 612-626-1136)
Email: jager001@umn.edu
Website: http://www.ece.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Department of Electrical and Computer Engineering offers diverse educational programs that encompass nearly all aspects of modern electrical and computer engineering, ranging from the very theoretical system and information theory to highly experimental work in novel device research and microelectronics. Emphases in the major are solid state and physical electronics, surface physics, thin films, sputtering, noise and fluctuation phenomena, quantum electronics, plasma physics, automation, power systems and power electronics theory, wave propagation, communication systems and theory, optics, lasers, fiber optics, magnetism, semiconductor properties and devices, VLSI and WSI engineering in theory and practice, network theory, signal and image processing, and computer and systems engineering. Interdisciplinary work is also available in bioelectrical sciences, control sciences, computer sciences, solar energy, applications of systems theory to urban transportation and economic planning, and biological modeling.

Students are considered for admission beginning fall semester only (except for part-time students living in Minnesota who work in industry who may apply for other terms). The deadline for applying for fall semester is December 1.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.40.

Other requirements to be completed before admission:
All documents must be submitted electronically. No documents should be mailed to the department or the Graduate Admissions Office.

Applicants to the doctoral program must submit a writing sample with their online application. The writing sample should consist of a minimum of one, to a maximum of three, class papers or publications.

Every applicant, except University of Minnesota bachelor of electrical engineering graduates who have a GPA of 3.40 or better, must submit the General Test of the GRE. The GRE Subject Test is not required for admission.

Special Application Requirements:
Applications are accepted for fall admission only. The deadline is December 1. Additional application information is available at http://www.ece.umn.edu/ProspectiveStudentsGraduate/index.htm

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
- Internet Based - Writing Score: 21
- Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
  • IELTS
    - Total Score: 6.5
  • MELAB
    - Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

14 to 28 credits are required in the major.
12 to 26 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.30 is required for students to remain in good standing.

The PhD degree requires a minimum of 40 course credits and 24 thesis credits. The program must include 14 credits in EE courses at the 5xxx-level and above, and 12 credits in a minor or supporting program outside of EE but within the College of Science and Engineering (CSE). The remaining 14 credits may be taken in the major field or in any supporting field within CSE.

All courses must be taken A-F, with the exception of EE 5041, EE 8925, and graduate seminars, which are only offered S-N. Courses that are cross-listed must be taken under the EE designator to count towards degree requirements, and non-EE coursework that is cross-listed with EE does not count toward the outside field requirement.

A minimum of 6 course credits at the 8xxx-level must be included. Courses can be from the major or outside field; but seminars, directed study, and special investigations may not be used to satisfy this requirement.

A maximum of nine 4xxx-level course credits may be used toward degree requirements. Only the 4xxx-level courses included on the lists below will be accepted.

PhD students who enter the department with a MS degree in electrical engineering must pass the PhD Preliminary Written Examination by the end of their third semester in residence. Students who enter with an MS in another field, or students who enter with a bachelor's degree, have until the end of their second year in residence to pass the exam. Students have two chances to pass the exam. The exam is typically held in November and in April.

**Required Courses**

**Major Field Coursework**

Major field coursework is accepted from the following list only.

Take 14 or more credit(s) from the following:

• EE 5121 - Transistor Device Modeling for Circuit Simulation (3.0 cr)
• EE 5141 - Introduction to Microsystem Technology (4.0 cr)
• EE 5163 - Semiconductor Properties and Devices I (3.0 cr)
• EE 5164 - Semiconductor Properties and Devices II (3.0 cr)
• EE 5171 - Microelectronic Fabrication (4.0 cr)
• EE 5173 - Basic Microelectronics Laboratory (1.0 cr)
• EE 5181 - Micro and Nanotechnology by Self Assembly (3.0 cr)
• EE 5231 - Linear Systems and Optimal Control (3.0 cr)
• EE 5235 - Robust Control System Design (3.0 cr)
• EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
• EE 5251 - Optimal Filtering and Estimation (3.0 cr)
• EE 5301 - VLSI Design Automation I (3.0 cr)
• EE 5302 - VLSI Design Automation II (3.0 cr)
• EE 5323 - VLSI Design I (3.0 cr)
• EE 5324 - VLSI Design II (3.0 cr)
• EE 5327 - VLSI Design Laboratory (3.0 cr)
• EE 5329 - VLSI Digital Signal Processing Systems (3.0 cr)
• EE 5333 - Analog Integrated Circuit Design (3.0 cr)
• EE 5351 - Applied Parallel Programming (3.0 cr)
• EE 5364 - Advanced Computer Architecture (3.0 cr)
• EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
• EE 5381 - Telecommunications Networks (3.0 cr)
• EE 5391 - Computing With Neural Networks (3.0 cr)
• EE 5393 - Circuits, Computation, and Biology (3.0 cr)
• EE 5501 - Digital Communication (3.0 cr)
• EE 5505 - Wireless Communication (3.0 cr)
• EE 5531 - Probability and Stochastic Processes (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EE 5545 - Digital Signal Processing Design (3.0 cr)
• EE 5549 - Digital Signal Processing Structures for VLSI (3.0 cr)
• EE 5551 - Multiscale and Multirate Signal Processing (3.0 cr)
• EE 5561 - Image Processing and Applications (3.0 cr)
• EE 5581 - Information Theory and Coding (3.0 cr)
• EE 5583 - Error Control Coding (3.0 cr)
• EE 5585 - Data Compression (3.0 cr)
• EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
• EE 5602 - RF/Microwave Circuit Design (3.0 cr)
• EE 5611 - Plasma-Aided Manufacturing (4.0 cr)
• EE 5613 - RF/Microwave Circuit Design Laboratory (2.0 cr)
• EE 5616 - Antenna Theory and Design (3.0 cr)
• EE 5621 - Physical Optics (3.0 cr)
• EE 5622 - Physical Optics Laboratory (1.0 cr)
• EE 5624 - Optical Electronics (4.0 cr)
• EE 5627 - Optical Fiber Communication (3.0 cr)
• EE 5628 - Fiber Optics Laboratory (1.0 cr)
• EE 5629 - Optical System Design (2.0 cr)
• EE 5653 - Physical Principles of Magnetic Materials (3.0 cr)
• EE 5655 - Magnetic Recording (3.0 cr)
• EE 5657 - Physical Principles of Thin Film Technology (4.0 cr)
• EE 5705 - Electric Drives in Sustainable Energy Systems (3.0 cr)
• EE 5707 - Electric Drives in Sustainable Energy Systems Laboratory (1.0 cr)
• EE 5721 - Power Generation Operation and Control (3.0 cr)
• EE 5725 - Power Systems Engineering (3.0 cr)
• EE 5741 - Advanced Power Electronics (3.0 cr)
• EE 5745 - Wind Energy Essentials (2.0 cr)
• EE 5940 - Special Topics in Electrical Engineering I (1.0 - 4.0 cr)
• EE 5950 - Special Topics in Electrical Engineering II (1.0 - 4.0 cr)
• EE 5960 - Special Topics in Electrical Engineering III (1.0 - 4.0 cr)
• EE 5970 - Special Topics in Electrical Engineering IV (1.0 - 4.0 cr)
• EE 8100 - Advanced Topics in Electronics (1.0 - 3.0 cr)
• EE 8141 - Advanced Heterojunction Transistors (3.0 cr)
• EE 8163 - Quantum Electronics (3.0 cr)
• EE 8213 - Advanced System Theory (3.0 cr)
• EE 8215 - Nonlinear Systems (3.0 cr)
• EE 8231 - Optimization Theory (3.0 cr)
• EE 8235 - Advanced Control Topics (3.0 cr)
• EE 8300 - Advanced Topics in Computers (1.0 - 3.0 cr)
• EE 8310 - Advanced Topics in VLSI (1.0 - 3.0 cr)
• EE 8320 - Advanced Topics in Design Automation (1.0 - 3.0 cr)
• EE 8331 - CMOS Data Converters: A/D and D/A (3.0 cr)
• EE 8337 - Analog Circuits for Wire/Wireless Communications (3.0 cr)
• EE 8367 - Parallel Computer Organization (3.0 cr)
• EE 8510 - Advanced Topics in Communications (1.0 - 3.0 cr)
• EE 8520 - Advanced Topics in Signal Processing (1.0 - 3.0 cr)
• EE 8581 - Detection and Estimation Theory (3.0 cr)
• EE 8591 - Predictive Learning from Data (3.0 cr)
• EE 8601 - Advanced Electromagnetic Theory (3.0 cr)
• EE 8611 - Plasma Physics (3.0 cr)
• EE 8620 - Advanced Topics in Magnetics (1.0 - 3.0 cr)
• EE 8630 - Advanced Topics in Electromagnetics (1.0 - 3.0 cr)
• EE 8725 - Advanced Power System Analysis and Economics (3.0 cr)
• EE 8741 - Power Electronics in Power Systems (3.0 cr)
• EE 8950 - Advanced Topics in Electrical and Computer Engineering (1.0 - 3.0 cr)

Outside Field Coursework
Outside field and the additional coursework credits may be chosen from this list. A maximum of 2 credits of the following may be applied: EE 5041, EE 8190, EE 8210, EE 8290, EE 8360, EE 8970, EE 8500, EE 8610, EE 8660, EE 8920, EE 8925, and EE 8940.

Take 12 or more credit(s) from the following:

• AEM 4203 - Aerospace Propulsion (4.0 cr)
• AEM 4295 - Problems in Fluid Mechanics (1.0 - 3.0 cr)
• AEM 4301 - Orbital Mechanics (3.0 cr)
• AEM 4303 - Flight Dynamics and Control [WI] (3.0 cr)
• AEM 4305 - Spacecraft Attitude Dynamics and Control (3.0 cr)
• AEM 4331 - Aerospace Vehicle Design (4.0 cr)
• AEM 4333 - Aerospace Design: Special Projects (3.0 cr)
• AEM 4495 - Problems in Aerospace Systems (3.0 cr)
• AEM 4501 - Aerospace Structures (3.0 cr)
• AEM 4502 - Computational Structural Analysis (3.0 cr)
• AEM 4511 - Mechanics of Composite Materials (3.0 cr)
• AEM 4561 - Mechanics of Solids (3.0 cr)
• AEM 4595 - Problems in Mechanics and Materials (1.0 - 3.0 cr)
• AEM 4601 - Instrumentation Laboratory (3.0 cr)
• AEM 4602W - Aeromechanics Laboratory [WI] (4.0 cr)
• AEM 5247 - Hypersonic Aerodynamics (3.0 cr)
• AEM 5253 - Computational Fluid Mechanics (3.0 cr)
• AEM 5333 - Design-to-Flight: Small Uninhabited Aerial Vehicles (3.0 cr)
• AEM 5401 - Intermediate Dynamics (3.0 cr)
• AEM 5501 - Continuum Mechanics (3.0 cr)
• AEM 5503 - Theory of Elasticity (3.0 cr)
• AEM 5581 - Mechanics of Solids (3.0 cr)
• AEM 5651 - Aeroelasticity (3.0 cr)
• AEM 8202 - Fluid Mechanics II (3.0 cr)
• AEM 8211 - Theory of Turbulence I (3.0 cr)
• AEM 8253 - Computational Methods in Fluid Mechanics (3.0 cr)
• AEM 8421 - Robust Multivariable Control Design (3.0 cr)
• AEM 8423 - Convex Optimization Methods in Control (3.0 cr)
• AEM 8495 - Advanced Topics in Aerospace Systems (1.0 - 4.0 cr)
• AEM 5023 - Process Control and Instrumentation (3.0 cr)
• BBE 5333 - Off-road Vehicle Design (4.0 cr)
• SSM 5413 - A Systems Approach to Residential Construction (4.0 cr)
• SSM 5416 - Building Testing & Diagnostics (2.0 cr)
• BBE 5733 - Renewable Energy Technologies (3.0 cr)
• BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• BIOC 5527 - Introduction to Modern Structural Biology (4.0 cr)
• BIOC 5528 - Spectroscopy and Kinetics (4.0 cr)
• BIOL 4003 - Genetics (3.0 cr)
• BIOL 4004 - Cell Biology (3.0 cr)
• PMB 4121 - Microbial Ecology and Applied Microbiology (3.0 cr)
• BIOL 4850 - Special Topics in Biology (1.0 - 5.0 cr)
• BIOL 5272 - Applied Biostatistics (4.0 cr)
• BMEN 5001 - Advanced Biomaterials (3.0 cr)
• BMEN 5041 - Tissue Engineering (3.0 cr)
• BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
• BMEN 5111 - Biomedical Ultrasound (3.0 cr)
• BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
• BMEN 5201 - Advanced Biomechanics (3.0 cr)
• BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
• BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
• BMEN 5351 - Cell Engineering (3.0 cr)
• BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
• BMEN 5411 - Neural Engineering (3.0 cr)
• BMEN 5412 - Neuromodulation (3.0 cr)
• BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
• BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
• BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
• BMEN 5701 - Cancer Bioengineering (3.0 cr)
• BMEN 8001 - Polymeric Biomaterials (3.0 cr)
• BMEN 8041 - Advanced Tissue Engineering Lab (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8201 - Advanced Tissue Mechanics (3.0 cr)
• BMEN 8381 - Bioheat and Mass Transfer (3.0 cr)
• BMEN 8401 - New Product Design and Business Development (4.0 cr)
• BMEN 8402 - New Product Design and Business Development (4.0 cr)
• BMEN 8421 - Biophotonics (3.0 cr)
• BMEN 8501 - Dynamical Systems in Biology (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
• BMEN 8900 - Special Topics in Biomedical Engineering (1.0 - 4.0 cr)
• CEGE 5211 - Traffic Engineering (3.0 cr)
• CEGE 5411 - Applied Structural Mechanics (3.0 cr)
• CHEM 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
• CHEM 4011 - Mechanisms of Chemical Reactions (3.0 cr)
• CHEM 4021 - Computational Chemistry (3.0 cr)
• CHEM 4066 - Chemistry of Industry (3.0 cr)
• CHEM 4101 - Modern Instrumental Methods of Chemical Analysis (3.0 cr)
• CHEM 4111W - Modern Instrumental Methods of Chemical Analysis Lab [WI] (2.0 cr)
• CHEM 4201 - Materials Chemistry (3.0 cr)
• CHEM 4214 - Polymers (3.0 cr)
• CHEM 4221 - Introduction to Polymer Chemistry (3.0 cr)
• CHEM 4223W - Polymer Laboratory [WI] (2.0 cr)
• CHEM 4301 - Applied Surface and Colloid Science (3.0 cr)
• CHEM 4311W - Advanced Organic Chemistry Lab [WI] (4.0 cr)
• CHEM 4321 - Organic Synthesis (3.0 cr)
• CHEM 4322 - Advanced Organic Chemistry (3.0 cr)
• CHEM 4352 - Physical Organic Chemistry (3.0 cr)
• CHEM 4411 - Introduction to Chemical Biology (3.0 cr)
• CHEM 4412 - Chemical Biology of Enzymes (3.0 cr)
• CHEM 4501 - Introduction to Thermodynamics, Kinetics, and Statistical Mechanics (3.0 cr)
• CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)
• CHEM 4511W - Advanced Physical Chemistry Lab [WI] (3.0 cr)
• CHEM 4601 - Green Chemistry [ENV] (3.0 cr)
• CHEM 4701 - Inorganic Chemistry (3.0 cr)
• CHEM 4711W - Advanced Inorganic Chemistry Lab [WI] (3.0 cr)
• CHEM 4715 - Physical Inorganic Chemistry (3.0 cr)
• CHEM 4725 - Organometallic Chemistry (3.0 cr)
• CHEM 4735 - Bioinorganic Chemistry (3.0 cr)
• CHEM 4745 - Advanced Inorganic Chemistry (3.0 cr)
• CHEM 5755 - X-Ray Crystallography (4.0 cr)
• CHEM 8152 - Analytical Spectroscopy (4.0 cr)
• CHEM 8201 - Materials Chemistry (4.0 cr)
• CHEM 8551 - Quantum Mechanics I (4.0 cr)
• CHEM 8552 - Quantum Mechanics II (4.0 cr)
• CHEN 4214 - Polymers (3.0 cr)
• CHEN 4401W - Senior Chemical Engineering Lab [WI] (3.0 cr)
• CHEN 4501W - Chemical Engineering Design I [WI] (3.0 cr)
• CHEN 4502W - Chemical Engineering Design II [WI] (2.0 cr)
• CHEN 4601 - Process Control (3.0 cr)
• CHEN 4701 - Applied Math (3.0 cr)
• CHEN 4702 - Advanced Undergraduate Rheology (2.0 cr)
• CHEN 4704 - Advanced Undergraduate Physical Rate Processes I: Transport (3.0 cr)
• CHEN 4707 - Advanced Undergraduate Statistical Thermodynamics and Kinetics (3.0 cr)
• CHEN 4708 - Advanced Undergraduate Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)
• CHEN 5751 - Biochemical Engineering (3.0 cr)
• CHEN 5753 - Advanced Biomedical Transport Processes (3.0 cr)
• CHEN 5771 - Colloids and Dispersions (3.0 cr)
• CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
• CHEN 8401 - Physical and Chemical Thermodynamics (3.0 cr)
• CMB 8754 - Systems Analysis of Biological Processes (3.0 cr)
• CMB 8500 - Statistical Genetics and Genomics (4.0 cr)
• CSCI 4011 - Formal Languages and Automata Theory (4.0 cr)
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<td>EE 4505</td>
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<td>MATH 5467</td>
<td>Introduction to the Mathematics of Image and Data Analysis (4.0 cr)</td>
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<tr>
<td>MATH 5485</td>
<td>Introduction to Numerical Methods I (4.0 cr)</td>
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<tr>
<td>MATH 5486</td>
<td>Introduction To Numerical Methods II (4.0 cr)</td>
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<tr>
<td>MATH 5525</td>
<td>Introduction to Ordinary Differential Equations (4.0 cr)</td>
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<td>MATH 5535</td>
<td>Dynamical Systems and Chaos (4.0 cr)</td>
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<tr>
<td>MATH 5583</td>
<td>Complex Analysis (4.0 cr)</td>
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• MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
• MATH 5588 - Elementary Partial Differential Equations II (4.0 cr)
• MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
• MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
• MATH 5654 - Prediction and Filtering (4.0 cr)
• MATH 5705 - Enumerative Combinatorics (4.0 cr)
• MATH 5707 - Graph Theory and Non-enumerative Combinatorics (4.0 cr)
• MATH 5711 - Linear Programming and Combinatorial Optimization (4.0 cr)
• MATH 8301 - Manifolds and Topology (3.0 cr)
• MATH 8302 - Manifolds and Topology (3.0 cr)
• MATH 8442 - Numerical Analysis and Scientific Computing (3.0 cr)
• MATH 8445 - Numerical Analysis of Differential Equations (3.0 cr)
• MATH 8450 - Topics in Numerical Analysis (1.0 - 3.0 cr)
• MATH 8600 - Topics in Advanced Applied Mathematics (1.0 - 3.0 cr)
• MATH 8601 - Real Analysis (3.0 cr)
• MATH 8602 - Real Analysis (3.0 cr)
• MATH 8651 - Theory of Probability Including Measure Theory (3.0 cr)
• MATH 8668 - Combinatorial Theory (3.0 cr)
• ME 5228 - Finite Elements in Multidisciplinary Flow/Thermal/Stress and Manufacturing Applications (4.0 cr)
• ME 5229 - Finite Element Methods for Computational Mechanics: Transient/Dynamic Problems (4.0 cr)
• ME 5230 - Topics in Design (4.0 cr)
• ME 5253 - Computational Nanomechanics (3.0 cr)
• ME 5254 - Fundamentals of Microelectromechanical Systems (MEMS) (4.0 cr)
• ME 5281 - Advanced Control System Design (4.0 cr)
• ME 5282 - Robotics (4.0 cr)
• ME 5286 - Robots (4.0 cr)
• ME 5343 - Radiation (3.0 cr)
• ME 5344 - Thermodynamics of Fluid Flow With Applications (4.0 cr)
• ME 5351 - Computational Heat Transfer (4.0 cr)
• ME 5461 - Internal Combustion Engines (4.0 cr)
• ME 5462 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• ME 5561 - Systems Neuroscience (4.0 cr)
• ME 5562 - Basic and Clinical Vision Science (3.0 cr)
• ME 5563 - Systems Neuroscience (4.0 cr)
• ME 5564 - Principles of Physiology for Biomedical Engineering (4.0 cr)
• ME 5565 - Human Physiology (5.0 cr)
• ME 5566 - Computational Neuroscience I: Membranes and Channels (3.0 cr)
• ME 5567 - Analytical Mechanics (4.0 cr)
• ME 5568 - Electricity and Magnetism (4.0 cr)
• ME 5569 - Computational Methods in the Physical Sciences (4.0 cr)
• ME 5570 - Methods of Experimental Physics I (5.0 cr)
• ME 5571 - Methods of Experimental Physics II [WI] (5.0 cr)
• ME 5572 - Quantum Mechanics (4.0 cr)
• ME 5573 - History of 20th-Century Physics [WI] (3.0 cr)
PHYS 4201 - Statistical and Thermal Physics (3.0 cr)
PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)
PHYS 4303 - Electrodynamics and Waves (3.0 cr)
PHYS 4511 - Introduction to Nuclear and Particle Physics (3.0 cr)
PHYS 4611 - Introduction to Space Physics (3.0 cr)
PHYS 4621 - Introduction to Plasma Physics (3.0 cr)
PHYS 4911 - Introduction to Biopolymer Physics (3.0 cr)
PHYS 5001 - Quantum Mechanics I (4.0 cr)
PHYS 5002 - Quantum Mechanics II (4.0 cr)
PHYS 5011 - Classical Physics I (4.0 cr)
PHYS 5012 - Classical Physics II (4.0 cr)
PHYS 5041 - Mathematical Methods for Physics (4.0 cr)
PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
PHYS 5201 - Thermal and Statistical Physics (3.0 cr)
PHYS 5402 - Radiological Physics (4.0 cr)
PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
PHYS 8001 - Advanced Quantum Mechanics (3.0 cr)
PHYS 8711 - Solid-State Physics I (3.0 cr)
PHYS 8712 - Solid-State Physics II (3.0 cr)
PSY 5036W - Computational Vision [WI] (3.0 cr)
PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
STAT 4101 - Theory of Statistics I (4.0 cr)
STAT 4102 - Theory of Statistics II (4.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)
STAT 5031 - Statistical Methods for Quality Improvement (4.0 cr)
STAT 5101 - Theory of Statistics I (4.0 cr)
STAT 5102 - Theory of Statistics II (4.0 cr)
STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
STAT 5302 - Applied Regression Analysis (4.0 cr)
STAT 5303 - Designing Experiments (4.0 cr)
STAT 5401 - Applied Multivariate Methods (3.0 cr)
STAT 5421 - Analysis of Categorical Data (3.0 cr)
STAT 5511 - Time Series Analysis (3.0 cr)
STAT 8053 - Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression (3.0 cr)
STAT 8054 - Statistical Methods 4: Advanced Statistical Computing (3.0 cr)
STAT 8101 - Theory of Statistics I (3.0 cr)
STAT 8111 - Mathematical Statistics I (3.0 cr)
STAT 8501 - Introduction to Stochastic Processes with Applications (3.0 cr)
STAT 8711 - Statistical Computing (3.0 cr)
STAT 8931 - Advanced Topics in Statistics (3.0 cr)
STAT 8932 - Advanced Topics in Statistics (3.0 cr)

**Thesis Credits**
Take 24 credits after passing preliminary oral exam.
EE 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Environmental Restoration Engineering and Science M.S.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Environmental Restoration Engineering and Science Graduate Program, 122 Civil Engineering, 500 Pillsbury Drive SE, Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: volle001@umn.edu
Website: http://www.cege.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

This program is not admitting students.

The goal of the master of science in environmental restoration engineering and science is to produce graduates who will understand how to combine engineering with physical, biological, and social sciences in order to contribute to the process of prioritizing, designing, implementing, evaluating, and setting policy for environmental restoration projects. In short, the program aims to generate future leaders who will both succeed in practice and set the national agenda for restoring, maintaining, and sustaining the Earth-surface environment.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A baccalaureate degree in a field related to ecology, civil engineering, or environmental and earth sciences. Other degrees will be accepted based on relevant experience at the discretion of the DGS.

Other requirements to be completed before admission:
This program is not admitting students.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 16
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan C: Plan C requires 30 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: Students complete the capstone project by undertaking a field research internship for 6 credits. Students will be required to document 100 hours of project-based work and will complement this work with a 10-minute oral presentation on the required Stream Restoration Practice course (CEGE 8602).

This program may not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The program requires a minimum of 30 credits consisting of 9 credits in required core classes and 15 credits in elective courses chosen in consultation with advisor. The remaining 6 credits are met by undertaking a field-based internship.

Required Courses

- CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
- CEGE 8602 - Stream Restoration Practice (2.0 cr)
- HORT 5071 - Ecological Restoration (4.0 cr)

Electives

Take at least 15 elective course credits, in consultation with the advisor.

Internship

Complete a 6-credit internship, in consultation with the advisor.
Twin Cities Campus
Environmental Restoration Engineering and Science Minor
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Environmental Restoration Science and Engineering Graduate Program, 122 Civil Engineering, 500 Pillsbury Dr SE, Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: volle001@umn.edu
Website: http://www.cege.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 8
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The environmental restoration engineering and science minor is not currently admitting students.

The goal of the Environmental Restoration Engineering and Science program is to produce graduates who will understand how to combine engineering with physical, biological, and social sciences in order to contribute to the process of prioritizing, designing, implementing, evaluating, and setting policy for environmental restoration projects. In short, the program aims to generate future leaders who will both succeed in practice and set the national agenda for restoring, maintaining, and sustaining the Earth-surface environment.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
The environmental restoration engineering and science minor is not currently admitting students.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The required courses, CEGE 8601 and CEGE 8602, are also offered as EEB/ESCI 8601 and EEB/ESCI 8602. Students obtaining a degree in earth sciences, civil engineering, or ecology, evolution and behavior should register for these courses under a designator other than their major field.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's
Required Courses

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Information current as of August 31, 2018
CEGE 8601 - Introduction to Stream Restoration (3.0 cr)
CEGE 8602 - Stream Restoration Practice (2.0 cr)

Recommended Elective
Take at least 3 credits. Consult with the ERES director of graduate studies for other course options.

HORT 5071 - Ecological Restoration (4.0 cr)
**Twin Cities Campus**  
**Financial Mathematics M.F.M.**  
**School of Mathematics**  
**College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**  
Program in Financial Mathematics, 127 Vincent Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)  
Email: mfmath@umn.edu  
Website: [http://www.math.umn.edu/finmath/](http://www.math.umn.edu/finmath/)

- Program Type: Master's  
- Requirements for this program are current for Fall 2018  
- Length of program in credits: 32  
- This program does not require summer semesters for timely completion.  
- Degree: Master of Financial Mathematics

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of financial mathematics degree program helps students understand the underlying mathematics of quantitative finance. The program offers a range of courses, from theoretical to practical, including a mathematical course on stochastic processes, a practitioner's course offering hands-on application of financial software tools, and a programming course focusing on C# and MATLAB.

Courses are offered in the evenings to accommodate working professionals. The program is designed with the possibility for full-time students to complete all requirements in one year.

**Program Delivery**  
This program is available:  
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**  
A bachelor's degree from an accredited US university or foreign equivalent. The minimum undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:  
Applicants should have completed college level courses in single variable and multivariable calculus and linear algebra. Background in probability and familiarity with programming language are highly recommended.

**Special Application Requirements:**  
Applications are accepted for fall semester only. The application deadline is February 1. Additional information is available at math.umn.edu/mcfam/financial-mathematics.

Applicants must submit their test score(s) from the following:  
- GRE

International applicants must submit score(s) from one of the following tests:  
- TOEFL  
  - Internet Based - Total Score: 79  
  - Internet Based - Writing Score: 21  
  - Internet Based - Reading Score: 19

Key to test abbreviations (GRE, TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

Plan C: Plan C requires 32 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

The MFM requires 32 credits, consisting of four year-long course sequences. These sequences may be taken either in parallel or sequentially, following their numerical order, with the exception of FM 5091/5092, which is recommended to be taken as early as possible. In addition to the 32 required credits, students who either do not have a strong mathematics background or who need a refresher may be asked to take FM 5001/5002 - Preparation for Financial Mathematics.

Students may take the optional FM 5990 topics course, which is offered periodically.

Required Courses
- FM 5011 - Mathematical Background for Finance I (4.0 cr)
- FM 5012 - Mathematical Background for Finance II (4.0 cr)
- FM 5021 - Mathematical Theory Applied to Finance I (4.0 cr)
- FM 5022 - Mathematical Theory Applied to Finance II (4.0 cr)
- FM 5031 - A Practitioner's Course in Finance I (4.0 cr)
- FM 5032 - A Practitioner's Course in Finance II (4.0 cr)
- FM 5091 - Computation, Algorithms, and Coding in Finance I (4.0 cr)
- FM 5092 - Computation, Algorithms, and Coding in Finance II (4.0 cr)

Elective Course
- FM 5990 - Topics in Financial Mathematics (1.0 - 2.0 cr)
Twin Cities Campus

Fundamentals of Quantitative Finance Postbaccalaureate Certificate

School of Mathematics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: mfmath@umn.edu
Website: http://www.math.umn.edu/finmath/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 14
- This program does not require summer semesters for timely completion.
- Degree: Fundamentals of Quantitative Finance PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postbaccalaureate certificate in fundamentals of quantitative finance (FQF) is a 14-credit certificate with four required courses. The certificate is good preparation for the master of financial mathematics (M.F.M.) degree program.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)
- completely online (all program coursework can be completed online)

Prerequisites for Admission
A bachelor's degree from an accredited US university or foreign equivalent. The minimum undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Applicants should have a good background in mathematics, but not necessarily at the level of a mathematics major. In particular, all applicants must have taken at least three semesters of college calculus, covering two semesters of single variable calculus and an additional semester of either multivariable calculus or linear algebra.

Special Application Requirements:
Applications are accepted for fall semester only. The application deadline is May 15. Additional information is available at math.umn.edu/mcfam/financial-mathematics/fqf.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.
Students must complete four courses in financial mathematics for 14 credits.

**Required Courses**
- **FM 5001** - Preparation for Financial Mathematics I (3.0 cr)
- **FM 5002** - Preparation for Financial Mathematics II (3.0 cr)
- **FM 5091** - Computation, Algorithms, and Coding in Finance I (4.0 cr)
- **FM 5092** - Computation, Algorithms, and Coding in Finance II (4.0 cr)
**Twin Cities Campus**

**Geoengineering M.GeoE.**
*CSENG Civil, Envrn & Geo-Eng (CEGE)*

**College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegesps@umn.edu
Website: [http://www.cege.umn.edu](http://www.cege.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Geoengineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Emphases are in fundamental aspects of geomechanics and its applications. Research focuses on the use and development of discrete and continuum theories such as elasticity, plasticity, fracture mechanics, and poroelasticity for solving engineering problems. Numerical methods are being developed for obtaining solutions; experimental methods and novel apparatus are being developed for gathering physical evidence. Applications include processes of comminution, flow of granular materials, hydraulic fracturing, and nondestructive testing.

The master of geoenigineering (M.GeoE.) degree is for the practicing engineer who would like to obtain an advanced degree enrolling part-time or full-time. Students who intend to proceed to the PhD program, or who think they may later wish to be admitted to the PhD program, should apply for the master of science program. Students are expected to follow a coherent program of coursework selected with the help of a faculty advisor and approved by the director of graduate studies. Students also must demonstrate professional competence by carrying out and defending a design project or by taking a coursework-related final oral exam (without a project).

The degree typically takes 2-3 semesters (12-18 months) to complete on a full-time basis or 6-8 semesters on a part-time basis. Students interested in pursuing doctoral studies should see the PhD program in civil engineering.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.00.

An ABET-accredited, four-year bachelor's degree in engineering is required for admission.

Other requirements to be completed before admission:
The application deadlines are December 3 for fall admission and August 31 for spring admission. All materials must be submitted to the online application. Additional information is available at [http://www.cege.umn.edu/prospective/graduate/how-to-apply.html](http://www.cege.umn.edu/prospective/graduate/how-to-apply.html)

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- IELTS
  - Total Score: 6.5
- MELAB

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Information current as of August 31, 2018
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan C: Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The M.GeoE. requires a minimum of 30 credits and is offered under two plans. Plan A requires preparation of a thesis/design project. The thesis/design project must be carried out by the student in consultation with a faculty advisor. Plan C is a coursework-only degree program.

Required Courses

Any courses at the 5xxx and 8xxx level from the following programs may be used: AEM, AST, BBE, BMEN, CEGE, CHEM, CHEN, CSCI, EE, ESCI, IE, MATH, MATS, ME, PHYS, STAT. Use of 4xxx level courses must be approved by the director of graduate studies and a maximum of 9 credits may be included. The following 4xxx courses may not be used: CEGE 4121, 4311, 4501, and 4522. Six credits in a minor may be included in the course credit total.

Seminar

Students may count one seminar credit in the course credit total.

CEGE 8300 - Seminar: Geomechanics (1.0 - 3.0 cr)

Plan A

Plan A requires a minimum of 20 course credits and 10 thesis credits for the design project.

CEGE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan C

Plan C requires 30 course credits and must include at least two courses at the 8xxx level. Students must also complete 100 hours of project work, give an oral presentation of no less than 10 minutes, and complete two hours of ethics training.
Twin Cities Campus

Geoengineering M.S.
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cgeesps@umn.edu
Website: http://www.cege.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Emphases are in fundamental aspects of geomechanics and its applications. Research focuses on the use and development of discrete and continuum theories such as elasticity, plasticity, fracture mechanics, and poroelasticity for solving engineering problems. Numerical methods are being developed for obtaining solutions; experimental methods and novel apparatus are being developed for gathering physical evidence. Applications include processes of communication, flow of granular materials, hydraulic fracturing, and nondestructive testing.

The master of science (MS) degree balances education in engineering fundamentals and design with research and development. It is designed for students wishing to pursue a career in industry or to continue toward a PhD.

Students interested in pursuing doctoral studies should see the PhD program in civil engineering.

Program Delivery
This program is available:
  • via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in engineering, basic science, or mathematics is preferred.

Other requirements to be completed before admission:
Admission depends primarily on the applicant's academic record and letters of recommendation. Applicants who lack geoengineering training are often required to complete at least one appropriate course from the undergraduate program. Graduate degree credit is not awarded for such preparatory work.

Special Application Requirements:
The application deadlines are December 3 for fall admission and August 31 for spring admission. All materials must be submitted to the online application. Additional information is available at http://www.cege.umn.edu/prospective/graduate/how-to-apply.html

Applicants must submit their test score(s) from the following:
  • GRE

International applicants must submit score(s) from one of the following tests:
  • TOEFL
    - Internet Based - Total Score: 79
    - Internet Based - Writing Score: 21
    - Internet Based - Reading Score: 19
IELTS
- Total Score: 6.5
MELAB
- Final score: 80

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral.

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MS requires at least 30 credits and is offered under three plans. Plan A emphasizes research and preparation of a thesis; Plan B emphasizes coursework and a project; Plan C is coursework only. The Plan A thesis is written on a research project carried out in consultation with a faculty advisor. Under Plan B, students complete one to three Plan B papers as determined by the faculty advisor. Plan B papers can include computer programs, annotated bibliographies, field investigations, and analysis/design of special engineering problems. A program typically takes 18 to 24 months to complete.

**Required Courses**

Any courses at the 5xxx and 8xxx level from the following programs may be used: AEM, AST, BBE, BMEN, CEGE, CHEM, CHEN, CSCI, EE, ESCI, IE, MATH, MATS, ME, PHYS, STAT. Use of 4xxx level courses must be approved by the director of graduate studies and a maximum of 9 credits may be included. The following 4xxx courses may not be used: CEGE 4121, 4311, 4501, and 4522. Six credits in a minor may be included in the course credit total.

**Seminar**

Students may include one seminar credit in the course credit total.

**CEGE 8300 - Seminar: Geomechanics (1.0 - 3.0 cr)**

**Plan A**

Plan A requires a minimum of 20 course credits and 10 thesis credits.

**CEGE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)**

**Plan B**

Plan B requires a minimum of 30 credits, which includes at least 27 course credits and a maximum of 3 credits of CEGE 8094 for the Plan B project.

**CEGE 8094 - Civil Engineering Research (1.0 - 4.0 cr)**

**Plan C**

Plan C requires 30 course credits and must include at least two courses at the 8xxx level. Students must also complete 100 hours of project work, give an oral presentation of no less than 10 minutes, and complete two hours of ethics training.

**Program Sub-plans**

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

**Integrated B.GeoE./M.S. - Geoengineering**

The department offers an integrated Bachelor of Geoengineering (B.GeoE.) and master of science (MS) in geoengineering. The integrated B.GeoE./MS program offers students the opportunity to earn the bachelors and masters degree in five years. These programs offer several benefits: streamlined admissions from the undergraduate to the graduate program (GRE not required); flexibility...
in fulfilling required courses for both degrees during the senior year (up to 16 credits can be transferred to the graduate program); and eligibility for teaching and research assistantships.

Both the B.GeoE. and MS degrees must be completed in their entirety, with no courses shared between them. The graduate degree cannot be earned before the undergraduate requirements are satisfied. Admitted students who decide not to complete the MS degree are permitted to count credits originally planned for the graduate program toward their B.GeoE. technical electives.

Eligibility Requirements

Application to the combined program is open to geoengineering undergraduates who:

- Are within 32 credits of completing the requirements for the bachelors degree;
- Have a faculty advisor selected prior to admission; and
- Hold a cumulative GPA of 3.3 or higher.

Integrated B.C.E./M.S. - Geoengineering

The department offers an integrated bachelor of civil engineering (B.C.E) and master of science (MS) in geoengineering. Benefits, eligibility requirements, and degree-completion requirements outlined for the B.GeoE./MS integrated program also apply to the B.C.E./MS.

Integrated B.Env.E./M.S. - Geoengineering

The department offers an integrated bachelor of environmental engineering (B.Env.E.) and master of science (MS) in geoengineering. Benefits, eligibility requirements, and degree-completion requirements outlined for the B.GeoE./MS integrated program also apply to the B.Env.E./MS.
Twin Cities Campus
Geoengineering Minor
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Civil, Environmental, and Geo-Engineering, University of Minnesota, 122 Civil Engineering Building, 500 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: cegesps@umn.edu
Website: http://www.cege.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Emphases are in fundamental aspects of geomechanics and its applications. Research focuses on the use and development of discrete and continuum theories such as elasticity, plasticity, fracture mechanics, and poroelasticity for solving engineering problems. Numerical methods are being developed for obtaining solutions; experimental methods and novel apparatus are being developed for gathering physical evidence. Applications include processes of comminution, flow of granular materials, hydraulic fracturing, and nondestructive testing.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
For a master's minor, two or more 5xxx or 8xxx level courses in geoengineering are required, for a total of 6 or more credits.

Geoengineering
CEGE 53xx
CEGE 83xx
Twin Cities Campus
Industrial and Systems Engineering M.S.I.S.Y.E.
Industrial and Systems Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Industrial and Systems Engineering Graduate Program, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax 612-624-2010)
Email: gradinfo@ie.umn.edu
Website: http://www.ie.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30 to 32
• This program does not require summer semesters for timely completion.
• Degree: Master of Science in Industrial & Systems Engr

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The industrial and systems engineering (ISyE) program offers coursework and research in industrial and systems engineering, operations research, and human factors. Special emphasis is on methodologies for design, planning, and management of service and manufacturing systems. Examples of research applications include logistics, transportation, healthcare delivery systems, revenue management, and supply chain management.

The Department of Industrial & Systems Engineering offers an MS degree with three tracks: the Industrial Engineering track, the Systems Engineering track, and the Analytics track. A PhD degree is also offered. MS degree applicants must indicate which track they are applying for on the application form. Note that the admission requirements for the three tracks are different. In addition, the ISyE program also offers a dual MS in ISyE and Civil Engineering (Transportation Engineering focus) and an integrated bachelor's/master's program.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A baccalaureate degree in engineering or a closely related field is required.

Other requirements to be completed before admission:
Applicants to the systems engineering track are required to have at least two years of professional work experience in a technical field. Promising candidates with less experience will be considered under exceptional circumstances. Applicants must submit three letters of recommendation and a personal statement. In addition to the academic record, the professional record of the applicant and the letters of recommendation carry weight in admission decisions. A GRE score is not required.

Special Application Requirements:
All application materials should be submitted electronically through the ApplyYourself application system.

Applicants to the industrial engineering and analytics tracks must submit a GRE score. Letters of recommendation are not required, but are highly recommended if you want to be considered for financial aid.

Applications for the analytics track are accepted for fall semester only.

The application deadlines are February 15 for fall semester and October 15 for spring semester. Additional information is available at www.isye.umn.edu/apply/
Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A**: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 16 to 24 major credits and 6 to 14 credits outside the major. The final exam is oral.

**Plan C**: Plan C requires 16 to 26 major credits and 6 to 16 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The Master of Science in Industrial and Systems Engineering (M.S.I.Sy.E.) is offered with three tracks.

The industrial engineering track has three options. Plan A (thesis) and Plan B (project) require 30 credits and Plan C (coursework) requires 32 credits. Plan A requires a minimum of 14 course credits in the major field, and Plan B or Plan C requires 16 course credits in the major field. All plans must include a minimum of 6 course credits in a minor or related field outside ISyE and 1 credit of graduate seminar. The remaining credits may be taken in the major field or any supporting field.

The systems engineering track is a coursework-only option (Plan C) requiring 30 credits. It requires a minimum of 14 course credits in the major field and 6 course credits in a minor or related field outside ISyE. The remaining 10 credits may be taken in the major or in any supporting field.

The analytics track is a coursework-only option (Plan C) requiring 30-32 credits. Students proceed through the program and advance as a cohort. The program requires 24 credits in core courses and a minimum of 6 credits in elective courses. In addition, non-native English speakers are required to take the 2-credit course ESL 5008.

Students may replace a required course with a qualifying replacement course if they have taken the equivalent of the required course elsewhere. A list of qualifying replacements is available on the ISyE program web page.

**Joint- or Dual-degree Coursework:** Dual M.S. in ISyE and Civil Engineering (Transportation Engineering Focus): Student may take a total of 15 credits in common among the academic programs.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Industrial Engineering**

**Plan A**

**Required Courses**
- IE 5531 - Engineering Optimization I (4.0 cr)
- IE 5532 - Stochastic Models (4.0 cr)
ME 8001 - Research Ethics and Professional Practice (0.0 cr)
Take 1 or more course(s) from the following:
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5551 - Production Planning and Inventory Control (4.0 cr)
Seminar
Take 1 seminar credit. The following may be used or consult with advisor for further options.
IE 8773 - Graduate Seminar (1.0 cr)
or IE 8774 - Graduate Seminar (1.0 cr)
Thesis Credits
Take 10 credits
IE 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B or Plan C
Required Courses
IE 5531 - Engineering Optimization I (4.0 cr)
IE 5532 - Stochastic Models (4.0 cr)
ME 8001 - Research Ethics and Professional Practice (0.0 cr)
Take 2 or more course(s) from the following:
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5551 - Production Planning and Inventory Control (4.0 cr)
Seminar
Take 1 seminar credit. The following may be used or consult with advisor for further options.
IE 8773 - Graduate Seminar (1.0 cr)
or IE 8774 - Graduate Seminar (1.0 cr)
Project Requirement
Plan B students must either take the Plan B courses IE 8951/8953 (3 credits), or complete one to three Plan B papers, determined in consultation with the advisor.
IE 8951 - Plan B Course (1.0 cr)
IE 8953 - Plan B (2.0 cr)

Systems Engineering
This sub-plan is limited to students completing the program under Plan C.

Required Courses
IE 5111 - Systems Engineering I (2.0 cr)
IE 5113 - Systems Engineering II (4.0 cr)
IE 5541 - Project Management (4.0 cr)
IE 5553 - Simulation (4.0 cr)
ME 8001 - Research Ethics and Professional Practice (0.0 cr)

Analytics
This sub-plan is limited to students completing the program under Plan C.

Required Courses
IE 5531 - Engineering Optimization I (4.0 cr)
IE 5532 - Stochastic Models (4.0 cr)
IE 5561 - Analytics and Data-Driven Decision Making (4.0 cr)
IE 5773 - Practice-focused Seminar (1.0 cr)
IE 5801 - Capstone Project (4.0 cr)
STAT 5302 - Applied Regression Analysis (4.0 cr)
CSCI 5521 - Introduction to Machine Learning (3.0 cr)
or CSCI 5523 - Introduction to Data Mining (3.0 cr)

Electives
Additional courses may be approved by the Director of Graduate Studies.
Take 6 or more credit(s) from the following:
• IE 5441 - Financial Decision Making (4.0 cr)
• IE 5522 - Quality Engineering and Reliability (4.0 cr)
• IE 5541 - Project Management (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5551 - Production Planning and Inventory Control (4.0 cr)
• IE 5553 - Simulation (4.0 cr)
• CSCI 5521 - Introduction to Machine Learning (3.0 cr)
**Integrated B.M.E./M.S.ISY.E.**
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

The Department of Industrial and Systems Engineering and the Department of Mechanical Engineering offer an integrated bachelor's/master's degree program. The program makes it possible for students to earn a bachelor's degree in Mechanical Engineering (B.M.E.) and a master's degree in Industrial & Systems Engineering (M.S.ISY.E.) in five years. The program has several benefits: a streamlined admissions process from the ME undergraduate program to the ISyE graduate program; graduate student status granted in the senior year; eligibility for teaching and research assistantships; and, flexibility in fulfilling required courses for both degrees simultaneously in the last two years of study. The integrated program is available only for the Industrial Engineering Track.

Both the BME and MSISYE degrees must be completed in their entirety, with no courses shared between them. The graduate degree cannot be earned before the undergraduate requirements are satisfied. Admitted students who decide not to complete the MSISYE degree are permitted to count credits originally planned for the graduate program toward their undergraduate technical electives.

**Eligibility Requirements:**
- Students must be enrolled in the Mechanical Engineering undergraduate program at the University of Minnesota, Twin Cities.
- Students who are within 32 semester credits completing the requirements for the BME degree are eligible to apply.
- Students with a GPA of 3.25 or greater are preferred. For students who have transferred from another institution, at least one semester must be completed at the University of Minnesota, Twin Cities before admission to the program will be granted.
**Twin Cities Campus**

**Industrial and Systems Engineering Minor**

*Industrial and Systems Engineering*

*College of Science and Engineering*

Link to a list of faculty for this program.

**Contact Information:**
Industrial and Systems Engineering Graduate Program, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax: 612-624-2010)
Email: gradinfo@ie.umn.edu
Website: [http://www.ie.umn.edu](http://www.ie.umn.edu)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The industrial and systems engineering (ISyE) program offers coursework and research in industrial and systems engineering, operations research, and human factors. Special emphasis is on methodologies for design, planning, and management of service and manufacturing systems. Examples of research applications include logistics, transportation, healthcare delivery systems, revenue management, and supply chain management.

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

**Program Requirements**

Use of 4xxx courses towards program requirements is not permitted.

A minimum of 6 credits are required for a master's minor and a minimum of 12 credits are required for a doctoral minor.

**Program Sub-plans**

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Master's**

The master's minor requires 6 credits in ISyE courses at the 5xxx-level or above. The following courses may not be used: IE 8773, IE 8774, and IE 8794.

**Doctoral**

The doctoral minor requires 12 credits in ISyE courses at the 5xxx-level or above. The following courses may not be used: IE 8773, IE 8774, and IE 8794.
Twin Cities Campus
Industrial and Systems Engineering Ph.D.
Industrial and Systems Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Industrial and Systems Engineering Graduate Program, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax: 612-624-2010)
Email: gradinfo@ie.umn.edu
Website: http://www.ie.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 68
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The industrial and systems engineering (ISyE) program offers coursework and research in industrial and systems engineering, operations research, and human factors. Special emphasis is on methodologies for design, planning, and management of service and manufacturing systems. Examples of research applications include logistics, transportation, healthcare delivery systems, revenue management, and supply chain management.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.
A baccalaureate degree in engineering or a closely related field is required.

Special Application Requirements:
All application materials should be submitted electronically through the ApplyYourself application system. Students whose native language is not English are required to submit scores from one of the following English proficiency examinations: TOEFL, MELAB, or IELTS. The GRE General Test is required for students applying to the PhD program.

The application deadlines are December 15 for fall semester and October 15 for spring semester. Additional information is available at www.isye.umn.edu/apply/

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
32 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The PhD degree requires a minimum of 68 credits consisting of 16 required major credits, 12 course credits in a minor or a supporting program outside ISyE, 2 credits of graduate seminar, and 24 thesis credits. The remaining 14 course credits may be taken in the major or any supporting field.

Required Courses
Students may replace a required course with a qualifying replacement course if they have taken the equivalent of the required course elsewhere. A list of qualifying replacements is available on the ISyE program web page.

IE 8521 - Optimization (4.0 cr)
IE 8532 - Stochastic Processes and Queuing Systems (4.0 cr)
ME 8001 - Research Ethics and Professional Practice (0.0 cr)

Take 2 or more course(s) from the following:
• IE 5511 - Human Factors and Work Analysis (4.0 cr)
• IE 5545 - Decision Analysis (4.0 cr)
• IE 5551 - Production Planning and Inventory Control (4.0 cr)

Minor or Supporting Program
Take 12 credits in a minor or supporting program outside ISyE. The following courses may be used or consult with advisor for further options.

CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
CSCI 5521 - Introduction to Machine Learning (3.0 cr)
CSCI 8980 - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)
ECON 8101 - Microeconomic Theory (2.0 cr)
ECON 8102 - Microeconomic Theory (2.0 cr)
ECON 8117 - Noncooperative Game Theory (2.0 cr)
ECON 8118 - Noncooperative Game Theory (2.0 cr)
ECON 8119 - Cooperative Game Theory (2.0 cr)
MATH 5615H - Honors: Introduction to Analysis I (4.0 cr)
MATH 5616H - Honors: Introduction to Analysis II (4.0 cr)
MATH 8601 - Real Analysis (3.0 cr)
MATH 8602 - Real Analysis (3.0 cr)
MATH 5485 - Introduction to Numerical Methods I (4.0 cr)
MATH 5486 - Introduction To Numerical Methods II (4.0 cr)
MATH 8651 - Theory of Probability Including Measure Theory (3.0 cr)
MATH 8652 - Theory of Probability Including Measure Theory (3.0 cr)
STAT 8501 - Introduction to Stochastic Processes with Applications (3.0 cr)

Seminar
Take 2 seminar credits. The following may be used or consult with advisor for further options.

IE 8773 - Graduate Seminar (1.0 cr)
IE 8774 - Graduate Seminar (1.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam

IE 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Industrial Engineering
Twin Cities Campus
Infrastructure Systems Management and Engineering M.S.I.S.M.E
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Technological Leadership Institute, University of Minnesota, 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455
(612-624-5474; fax: 612-624-7510)
Email: tli-info@umn.edu
Website: http://tli.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Infrastructure Sys Mgmt & Eng

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Students are no longer being accepted into this program. Program requirements below are for current students only.

The master of science in infrastructure systems management and engineering (MSISME) focuses on developing management and engineering tools that address issues in local, county, and state infrastructure. It is an interdisciplinary program offered through the College of Science and Engineering's Technological Leadership Institute. The two-year, professional-format program focuses on key knowledge areas of engineering, technology, and science; management of personnel, projects, and programs; communications; governance; and synthesis. Fields of application include transportation engineering/pavement management; water resources/environmental engineering; municipal engineering; construction and maintenance; computer applications/asset management; parks, recreation and open space. The degree is offered in a hybrid online format, with in-person residencies scheduled over the course of the program.

Program Delivery
This program is available:
- primarily online (at least 80% of the instruction for the program is online with short, intensive periods of face-to-face coursework)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Other requirements to be completed before admission:
Students are no longer being accepted into this program.

A BS degree in engineering, plus a minimum of one year of professional work experience in an infrastructure area, or a BS degree in a related science or technology field and a minimum of two years professional work experience in an infrastructure area are required.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements

Plan B: Plan B requires 30 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The capstone integrates knowledge from courses in the master's program with job experience. Students will prepare a proposal, conduct the project and report the results in written and oral form. The project will involve some aspect of the design, management, and operation of some feature of infrastructure. Students must register for the capstone course ISME 8105 (3 cr).

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

Required Courses
ISME 5101 - Project Management (3.0 cr)
ISME 5112 - Infrastructure Systems Engineering Management (2.0 cr)
ISME 5201 - Pavement Management Maintenance and Rehabilitation (2.0 cr)
ISME 5202 - Traffic Engineering Management (2.0 cr)
ISME 5301 - Bridge Management Maintenance and Rehabilitation (2.0 cr)
ISME 5302 - Critical Infrastructure Security and Protection (2.0 cr)
ISME 5402 - Storm Water Management (2.0 cr)
ISME 5500 - Public Interactions (1.0 cr)
ISME 5503 - Financial Management in Public Organizations (2.0 cr)
ISME 5504 - Construction Law and Ethics (2.0 cr)

Capstone
Take a total of 3 credits.
ISME 8105 - Capstone Project (1.0 - 2.0 cr)

Electives
Choose at least 7 elective credits in consultation with the director of graduate studies.
Management of Technology M.S.M.O.T.
Technological Leadership Institute
College of Science and Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science in the management of technology (MSMOT) program is administered by the College of Sciences and Engineering's Technological Leadership Institute (TLI). The two-year, executive-format program integrates the fields of technology and management and provides working engineers and scientists with management knowledge and skills needed to assume a technical leadership role within their organizations. The program focuses on management in technology-based environments in traditional and emerging industries. The curriculum includes technical and advanced management courses, such as pivotal technologies, technology forecasting, project management, management of innovation, intellectual property management, and strategic management of technology. The core management curriculum includes areas such as finance, marketing, accounting, strategic planning and decision making, and conflict management. Students proceed through the program and advance as a cohort, taking a prescribed sequence of courses together. Case studies, class discussions, and study-group interaction stimulate the learning process. Students also participate in off-campus residencies, including an international residency; complete individual and team projects; and develop final projects as part of a capstone course. Most students receive corporate financial support.

The program is offered in a format designed for full-time working professionals. Students take courses one day per week on alternating Fridays and Saturdays and complete the degree within two years.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in an engineering, science, or other technology-related field from an accredited program.

Other requirements to be completed before admission:
Applicants should have at least 5 years of professional experience in a technical field and have completed coursework (or show proficiency) in economics, mathematical modeling, statistics, and computer literacy.

In exceptional circumstances, promising candidates with less experience may be considered.

Special Application Requirements:
The program accepts applications on a rolling basis for fall semester of each year.

Applicants must submit three letters of recommendation, a resume, and a statement of purpose. Additional application information is available at mot.umn.edu

International applicants must submit score(s) from one of the following tests:
• TOEFL
Program Requirements

Plan B: Plan B requires 36 major credits and up to null credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The capstone project consists of an independent, original investigation requiring between 110 and 130 hours of effort. Students use concepts and methods learned in the MOT program to research and develop an industry-based product, project, process, or venture. The capstone project enables students to directly apply their MOT education at work.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

Students attend the program as a cohort and complete their studies in four semesters.

Required Courses (33.5 Credits)
Take the following courses for a total of 33.5 credits:
- MOT 8111 - Marketing Management for Technology-based Organizations (2.0 cr)
- MOT 8112 - Accounting for Decision Making (1.5 cr)
- MOT 8113 - Operations Management for Competitive Advantage (1.5 cr)
- MOT 8114 - Strategic Technology Analysis (1.5 cr)
- MOT 8121 - Managing Organizations in a Technological Environment (2.0 cr)
- MOT 8122 - Financial Management for Technology-based Organizations (2.0 cr)
- MOT 8133 - Managerial Communication for Technological Leaders: Persuasive Writing and Speaking (2.0 cr)
- MOT 8212 - Developing New Technology Products (2.0 cr)
- MOT 8213 - Macroenvironment of Technology (1.5 cr)
- MOT 8214 - Technology Foresight and Forecasting (2.0 cr)
- MOT 8221 - Project and Knowledge Management (1.5 cr)
- MOT 8224 - Pivotal Technologies (1.0 cr)
- MOT 8232 - Managing Technological Innovation (2.0 cr)
- MOT 8233 - Strategic Management of Technology (2.0 cr)
- MOT 8501 - Leading Individual & Team Performance (1.5 cr)
- MOT 8502 - Innovation Leadership and Organizational Effectiveness (1.0 cr)
- MOT 8800 - Conflict Management (0.5 cr)
- MOT 8820 - Science and Technology Policy (1.5 cr)
- MOT 8940 - Managing Intellectual Property (1.0 cr)
- MOT 8950 - International Management of Technology Project (2.0 cr)
- Take MOT 8960 twice for a total of two credits.
- MOT 8960 - Seminars in Management of Technology (MOT) and Innovation (1.0 cr)

Capstone Project (2.5 Credits)
Take MOT 8234 for a total of 2.5 credits to complete the 36-credit requirement.

MOT 8234 - Capstone Project (0.5 - 2.5 cr)
Twin Cities Campus
Management of Technology Minor
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Technological Leadership Institute, College of Science and Engineering, University of Minnesota, Suite 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455
Phone: 612-624-5747
Fax: 612-624-7510
Email: mot@umn.edu
Website: http://www.tli.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The management of technology minor program is administered by the Technological Leadership Institute (TLI) in the College of Science and Engineering. The program integrates the fields of technology and management, allowing students in science and engineering majors to develop understanding and expertise in business principles. The curriculum includes basic business knowledge, with an emphasis on technology-intensive organizations. Topics include strategy, finance, marketing, intellectual property, innovation, and technology planning. Each class will include exercises that inform students on those business topics, and give them an opportunity to practice the fundamental skills of communications, teamwork and project management.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in an engineering, science, or other technology-related field from an accredited program.

Special Application Requirements:
Applicants for the minor must be enrolled in a graduate-level degree program at the University of Minnesota and have director of graduate studies approval.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The MOT minor requires two core courses for a total of 4 credits. The remaining credits can be taken from the list of approved electives.

MOT minor courses cannot be counted towards the master of science in management of technology degree requirements.

Core Courses
MOT 5001 - Technological Business Fundamentals (2.0 cr)
MOT 5002 - Creating Technological Innovation (2.0 cr)
Program Sub-plans

Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters

Electives

Other courses may be chosen in consultation with the director of graduate studies.

Take 2 or more credit(s) from the following:

- MOT 5003 - Technological Business Planning Workshop (1.0 cr)
- ENTR 6020 - Business Formation (4.0 cr)
- ENTR 6036 - Managing the Growing Business (2.0 cr)
- HSCI 5401 - Ethics in Science and Technology (3.0 cr)
- HSCI 5421 - Engineering Ethics (3.0 cr)
- IDSC 6040 - Information Technology Management (2.0 cr)
- IDSC 6423 - Enterprise Systems (2.0 cr)
- IE 5111 - Systems Engineering I (2.0 cr)
- IE 5441 - Financial Decision Making (4.0 cr)
- IE 5541 - Project Management (4.0 cr)
- MBA 6110 - Leading Others (2.0 cr)
- MBA 6300 - Strategic Management (3.0 cr)
- ME 8221 - New Product Design and Business Development I (4.0 cr)
- ME 8222 - New Product Design and Business Development II (4.0 cr)
- MGMT 6004 - Negotiation Strategies (2.0 cr)
- MGMT 6040 - International Strategy and Organization (2.0 cr)
- MGMT 6084 - Management of Groups (2.0 cr)
- MGMT 6305 - The International Environment of Business (4.0 cr)
- MILI 5589 - Medical Technology Evaluation and Market Research (2.0 cr)
- OLPD 5607 - Organization Development (3.0 cr)
- PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
- PA 5741 - Risk, Resilience and Decision Making (1.5 cr)

Doctoral

Electives

Other courses may be chosen in consultation with the director of graduate studies.

Take 8 or more credit(s) from the following:

- MOT 5003 - Technological Business Planning Workshop (1.0 cr)
- ENTR 6020 - Business Formation (4.0 cr)
- ENTR 6036 - Managing the Growing Business (2.0 cr)
- HSCI 5401 - Ethics in Science and Technology (3.0 cr)
- HSCI 5421 - Engineering Ethics (3.0 cr)
- IDSC 6040 - Information Technology Management (2.0 cr)
- IDSC 6423 - Enterprise Systems (2.0 cr)
- IE 5111 - Systems Engineering I (2.0 cr)
- IE 5441 - Financial Decision Making (4.0 cr)
- IE 5541 - Project Management (4.0 cr)
- MBA 6110 - Leading Others (2.0 cr)
- MBA 6300 - Strategic Management (3.0 cr)
- ME 8221 - New Product Design and Business Development I (4.0 cr)
- ME 8222 - New Product Design and Business Development II (4.0 cr)
- MGMT 6004 - Negotiation Strategies (2.0 cr)
- MGMT 6040 - International Strategy and Organization (2.0 cr)
- MGMT 6084 - Management of Groups (2.0 cr)
- MGMT 6305 - The International Environment of Business (4.0 cr)
- MILI 5589 - Medical Technology Evaluation and Market Research (2.0 cr)
- OLPD 5607 - Organization Development (3.0 cr)
- PA 5711 - Science, Technology & Environmental Policy (3.0 cr)
- PA 5741 - Risk, Resilience and Decision Making (1.5 cr)
Twin Cities Campus
Materials Science and Engineering M.Mat.S.E.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Materials Science And Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate courses offered by the Chemical Engineering and Materials Science (CEMS) Department cover core areas of materials science and engineering (structure and symmetry of materials; thermodynamics and kinetics; electronic, optical, and magnetic properties of materials; and mechanical properties of materials). In addition, several specialized topics are offered, including rheology, coating process fundamentals, process control, finite element methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, solid state reaction kinetics, electronic structure of materials, organic semiconductors, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and the science of porous media.

The master of materials science and engineering (M.Mat.S.E.), also known as the professional master's, is designed for working professionals who are interested in obtaining a master's degree part time. This degree requires a design project. Part-time students may also choose the M.S.Mat.S.E. Plan C, which is coursework only.

The CEMS department focuses on the PhD and does not generally admit students directly to the M.S.Mat.S.E. Plan A degree, which is a thesis based master's and is intended for current graduate students who choose not to seek a PhD.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in materials science or other related field.

Other requirements to be completed before admission:
The professional master's in engineering degree is designed for employees of local industries who wish to pursue their studies part-time. No financial support is available. Applicants should contact the program before applying for admission.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Applications are accepted for fall semester only. December 15 is the application deadline; late applications are considered if space is available. More information is available at http://www.cems.umn.edu/graduate/admissions

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of August 31, 2018
Program Requirements

Plan A: Plan A requires 12 to 14 major credits, 6 to 8 credits outside the major, and 10 thesis credits. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

The M.Mat.S.E. requires 20 course credits and 10 thesis credits. The course credits must include 12 credits in MATS core courses, and a minimum of 6 credits outside the major. The remaining credits may be taken in the major or in any supporting field.

In addition to the coursework, M.Mat.S.E. students are required to complete a design project. The work-related M.Mat.S.E. design project consists of an in-depth study of an engineering design. It need not represent a publishable research project. While the amount of work should be the same as for a master's thesis, the project can contain elements that the thesis would not, such as economic considerations, design consultation, and social relevance. The written design report must be approved by a three-person faculty committee. The final exam consists of the written design report and an oral presentation to the faculty committee.

Core Courses

MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
MATS 8003 - Electronic Properties (3.0 cr)
MATS 8004 - Mechanical Properties (3.0 cr)

Thesis Credits

10 thesis credits are required for the design project.
MATS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Electives

The remaining credits may be chosen from the following list. Consult with advisor for further options.

AEM 4201 - Fluid Mechanics (4.0 cr)
AEM 4511 - Mechanics of Composite Materials (3.0 cr)
AEM 5501 - Continuum Mechanics (3.0 cr)
AEM 5503 - Theory of Elasticity (3.0 cr)
AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
AEM 8531 - Fracture Mechanics (3.0 cr)
BMEN 5001 - Advanced Biomaterials (3.0 cr)
BMEN 5041 - Tissue Engineering (3.0 cr)
BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
BMEN 5201 - Advanced Biomechanics (3.0 cr)
BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
CEGE 8022 - Numerical Methods for Free and Moving Boundary Problems (3.0 cr)
CEGE 8401 - Fundamentals of Finite Element Method (3.0 cr)
CEGE 8402 - Nonlinear Finite Element Analysis (3.0 cr)
CEGE 8501 - Environmental Fluid Mechanics I (4.0 cr)
CEGE 8502 - Environmental Fluid Mechanics II (4.0 cr)
CEGE 8504 - Theory of Unit Operations (4.0 cr)
CEGE 8505 - Biological Processes (3.0 cr)
CHEM 5210 - Materials Characterization (4.0 cr)
CHEM 5755 - X-Ray Crystallography (4.0 cr)
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<tr>
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<td>CHEM 8011</td>
<td>Mechanisms of Chemical Reactions</td>
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<tr>
<td>CHEM 8152</td>
<td>Analytical Spectroscopy</td>
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<td>CHEM 8201</td>
<td>Materials Chemistry</td>
<td>4.0 cr</td>
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<tr>
<td>CHEM 8221</td>
<td>Synthetic Polymer Chemistry</td>
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<td>CHEM 8321</td>
<td>Organic Synthesis</td>
<td>4.0 cr</td>
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<td>CHEM 8322</td>
<td>Advanced Organic Chemistry</td>
<td>4.0 cr</td>
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<tr>
<td>CHEM 8361</td>
<td>Interpretation of Organic Spectra</td>
<td>4.0 cr</td>
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<td>CHEM 8551</td>
<td>Quantum Mechanics I</td>
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<td>CHEM 8552</td>
<td>Quantum Mechanics II</td>
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<td>CHEM 8561</td>
<td>Thermodynamics, Statistical Mechanics, and Reaction Dynamics I</td>
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<td>CHEM 8562</td>
<td>Thermodynamics, Statistical Mechanics, and Reaction Dynamics II</td>
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<td>CHEN 5753</td>
<td>Advanced Biomedical Transport Processes</td>
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<td>CHEN 5771</td>
<td>Colloids and Dispersions</td>
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<td>CHEN 8101</td>
<td>Fluid Mechanics I: Change, Deformation, Equations of Flow</td>
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<td>CHEN 8102</td>
<td>Principles and Applications of Rheology</td>
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<td>CHEN 8104</td>
<td>Coating Process Fundamentals</td>
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<td>Physical Rate Processes I: Transport</td>
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<td>CHEN 8402</td>
<td>Statistical Thermodynamics and Kinetics</td>
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<td>CHEN 8501</td>
<td>Chemical Rate Processes: Analysis of Chemical Reactors</td>
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<td>Systems Analysis of Biological Processes</td>
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<td>Semiconductor Properties and Devices I</td>
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<td>EE 5164</td>
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<td>EE 5171</td>
<td>Microelectronic Fabrication</td>
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<td>EE 5173</td>
<td>Basic Microelectronics Laboratory</td>
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<td>EE 5181</td>
<td>Micro and Nanotechnology by Self Assembly</td>
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<td>EE 5621</td>
<td>Physical Optics</td>
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<td>EE 5622</td>
<td>Physical Optics Laboratory</td>
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<td>EE 5624</td>
<td>Optical Electronics</td>
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<td>EE 5653</td>
<td>Physical Principals of Magnetic Materials</td>
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<td>EE 5655</td>
<td>Magnetic Recording</td>
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<td>EE 5657</td>
<td>Physical Principles of Thin Film Technology</td>
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<td>GCD 5036</td>
<td>Molecular Cell Biology</td>
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<td>Mathematical Modeling</td>
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<td>Differential Equations with Applications</td>
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<td>Introduction to Numerical Methods I</td>
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<td>MATH 5486</td>
<td>Introduction To Numerical Methods II</td>
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<td>Introduction to Ordinary Differential Equations</td>
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<td>Dynamical Systems and Chaos</td>
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<td>Elementary Partial Differential Equations I</td>
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<td>MATH 5588</td>
<td>Elementary Partial Differential Equations II</td>
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<td>MATH 5651</td>
<td>Basic Theory of Probability and Statistics</td>
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<td>Introduction to Stochastic Processes</td>
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<td>MATH 8441</td>
<td>Numerical Analysis and Scientific Computing</td>
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<td>MATS 4212</td>
<td>Ceramics</td>
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<td>MATS 4214</td>
<td>Polymers</td>
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<td>MATS 5353</td>
<td>Electron Microprobe Theory and Practice</td>
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<td>MATS 5517</td>
<td>Electron Microscopy</td>
<td>3.0 cr</td>
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<td>MATS 5531</td>
<td>Electrochemical Engineering</td>
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<td>MATS 8201</td>
<td>Applied Math</td>
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<td>MATS 8211</td>
<td>Physical Chemistry of Polymers</td>
<td>4.0 cr</td>
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<td>MATS 8221</td>
<td>Synthetic Polymer Chemistry</td>
<td>4.0 cr</td>
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<td>MATS 8301</td>
<td>Physical Rate Processes I: Transport</td>
<td>3.0 cr</td>
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<tr>
<td>ME 5228</td>
<td>Introduction to Finite Element Modeling, Analysis, and Design</td>
<td>4.0 cr</td>
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<td>ME 5247</td>
<td>Stress Analysis, Sensing, and Transducers</td>
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<td>ME 5446</td>
<td>Introduction to Combustion</td>
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<td>ME 8390</td>
<td>Advanced Topics in the Thermal Sciences</td>
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<td>NSCI 5300</td>
<td>Biological Microscopy &amp; Digital Imaging</td>
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<td>PHYS 5001</td>
<td>Quantum Mechanics I</td>
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<td>PHYS 5081</td>
<td>Introduction to Biopolymer Physics</td>
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<td>PHYS 5201</td>
<td>Thermal and Statistical Physics</td>
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<td>PHYS 5701</td>
<td>Solid-State Physics for Engineers and Scientists</td>
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<td>PHYS 8001</td>
<td>Advanced Quantum Mechanics</td>
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</tbody>
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PHYS 8702 - Statistical Mechanics and Transport Theory (3.0 cr)
PHYS 8711 - Solid-State Physics I (3.0 cr)
PHYS 8712 - Solid-State Physics II (3.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

Special Topics Electives
The following electives are topics courses. Only the approved topic titles below may be used.
AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
CEGE 5180 Special Topics - Membrane Science and Technology
EE 5940 Special Topics - Thin Films and Nanostructures: Materials and Devices
EE 8950 Advanced Topics - Materials & Design for Future Nonvolatile Memory
GCD 8920 Special Topics - Quantitative Fluorescence Microscopy
Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
Twin Cities Campus
Materials Science and Engineering M.S.Mat.S.E.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science Materials Science And Engr

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The CEMS Department offers two types of master's degrees: the M.S.Mat.S.E. (Plan A or C) and the M.Mat.S.E. degree, also known as the professional master's. The M.S.Mat.S.E. Plan A degree is a thesis-based master's and is generally reserved only for current graduate students who choose not to seek a PhD. Working professionals who are interested in obtaining a master's degree part time should follow the requirements for the M.Mat.S.E. degree, which requires a design project, or the M.S.Mat.S.E. Plan C, which is coursework only.

Graduate courses offered by CEMS cover core areas of materials science and engineering (structure and symmetry of materials; thermodynamics and kinetics; electronic, optical, and magnetic properties of materials; and mechanical properties of materials). In addition, several specialized topics are offered, including rheology, coating process fundamentals, process control, finite element methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, solid state reaction kinetics, electronic structure of materials, organic semiconductors, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and the science of porous media.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in materials science or other related field.

Other requirements to be completed before admission:
With the exception of the professional master's degree (the M.Mat.S.E.) and the M.S.Mat.S.E. Plan C, the CEMS department focuses on the PhD and does not generally admit students directly to the M.S.Mat.S.E. Plan A degree.

Special Application Requirements:
Applicants must submit scores from the General Test of the GRE; three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of official transcripts; and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Applications are accepted for fall semester only. December 15 is the application deadline; late applications are considered if space is available. More information is available at http://www.cems.umn.edu/graduate/admissions

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of August 31, 2018
Program Requirements

Plan A: Plan A requires 12 to 14 major credits, 6 to 8 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan C: Plan C requires 12 to 18 major credits and 12 to 18 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 2.80 is required for students to remain in good standing.

Core Courses

- MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
- MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
- MATS 8003 - Electronic Properties (3.0 cr)
- MATS 8004 - Mechanical Properties (3.0 cr)

Plan A

The Plan A requires 12 credits in core MATS coursework, 6 credits outside the major, and 10 thesis credits. The remaining course credits may be taken in the major or in any supporting field.

MATS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan C

The Plan C requires 12 credits in core MATS coursework, and 12 credits outside the major. The remaining course credits may be taken in the major or in any supporting field.

Electives

The remaining credits may be chosen from the following list or consult with advisor for further options.

- AEM 4201 - Fluid Mechanics (4.0 cr)
- AEM 4511 - Mechanics of Composite Materials (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)
- AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
- AEM 8531 - Fracture Mechanics (3.0 cr)
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5041 - Tissue Engineering (3.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
- CEGE 8022 - Numerical Methods for Free and Moving Boundary Problems (3.0 cr)
- CEGE 8401 - Fundamentals of Finite Element Method (3.0 cr)
- CEGE 8402 - Nonlinear Finite Element Analysis (3.0 cr)
- CEGE 8501 - Environmental Fluid Mechanics I (4.0 cr)
- CEGE 8502 - Environmental Fluid Mechanics II (4.0 cr)
- CEGE 8504 - Theory of Unit Operations (4.0 cr)
- CEGE 8505 - Biological Processes (3.0 cr)
- CHEM 5210 - Materials Characterization (4.0 cr)
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<td>CHEM 5755</td>
<td>X-Ray Crystallography</td>
<td>4.0 cr</td>
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<td>CHEM 8011</td>
<td>Mechanisms of Chemical Reactions</td>
<td>4.0 cr</td>
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<tr>
<td>CHEM 8152</td>
<td>Analytical Spectroscopy</td>
<td>4.0 cr</td>
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<td>CHEM 8201</td>
<td>Materials Chemistry</td>
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<td>CHEM 8322</td>
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<td>CHEM 8361</td>
<td>Interpretation of Organic Spectra</td>
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<td>CHEM 8551</td>
<td>Quantum Mechanics I</td>
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<td>CHEM 8552</td>
<td>Quantum Mechanics II</td>
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<td>CHEN 5753</td>
<td>Advanced Biomedical Transport Processes</td>
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<td>Colloids and Dispersions</td>
<td>3.0 cr</td>
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<tr>
<td>CHEN 8101</td>
<td>Fluid Mechanics I: Change, Deformation, Equations of Flow</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8102</td>
<td>Principles and Applications of Rheology</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>CHEN 8104</td>
<td>Coating Process Fundamentals</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>CHEN 8201</td>
<td>Applied Math</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8301</td>
<td>Physical Rate Processes I: Transport</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8402</td>
<td>Statistical Thermodynamics and Kinetics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>CHEN 8501</td>
<td>Chemical Rate Processes: Analysis of Chemical Reactors</td>
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<tr>
<td>CHEN 8754</td>
<td>Systems Analysis of Biological Processes</td>
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<tr>
<td>EE 5163</td>
<td>Semiconductor Properties and Devices I</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EE 5164</td>
<td>Semiconductor Properties and Devices II</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EE 5171</td>
<td>Microelectronic Fabrication</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>EE 5173</td>
<td>Basic Microelectronics Laboratory</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>EE 5181</td>
<td>Micro and Nanotechnology by Self Assembly</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EE 5621</td>
<td>Physical Optics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EE 5622</td>
<td>Physical Optics Laboratory</td>
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</tr>
<tr>
<td>EE 5624</td>
<td>Optical Electronics</td>
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</tr>
<tr>
<td>EE 5653</td>
<td>Physical Principles of Magnetic Materials</td>
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</tr>
<tr>
<td>EE 5655</td>
<td>Magnetic Recording</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>EE 5657</td>
<td>Physical Principles of Thin Film Technology</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ESCI 5353</td>
<td>Electron Microprobe Theory and Practice</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>GCD 5036</td>
<td>Molecular Cell Biology</td>
<td>3.0 cr</td>
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<tr>
<td>MATH 4428</td>
<td>Mathematical Modeling</td>
<td>4.0 cr</td>
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<td>MATH 4512</td>
<td>Differential Equations with Applications</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATH 5485</td>
<td>Introduction to Numerical Methods I</td>
<td>4.0 cr</td>
</tr>
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<td>MATH 5486</td>
<td>Introduction To Numerical Methods II</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>MATH 5525</td>
<td>Introduction to Ordinary Differential Equations</td>
<td>4.0 cr</td>
</tr>
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<td>MATH 5535</td>
<td>Dynamical Systems and Chaos</td>
<td>4.0 cr</td>
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<td>Elementary Partial Differential Equations I</td>
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<td>MATH 5588</td>
<td>Elementary Partial Differential Equations II</td>
<td>4.0 cr</td>
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<tr>
<td>MATH 5651</td>
<td>Basic Theory of Probability and Statistics</td>
<td>4.0 cr</td>
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<td>MATH 5652</td>
<td>Introduction to Stochastic Processes</td>
<td>4.0 cr</td>
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<tr>
<td>MATH 8441</td>
<td>Numerical Analysis and Scientific Computing</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATH 8442</td>
<td>Numerical Analysis and Scientific Computing</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATS 4212</td>
<td>Ceramics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATS 4214</td>
<td>Polymers</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATS 5353</td>
<td>Electron Microprobe Theory and Practice</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATS 5517</td>
<td>Electron Microscopy</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATS 5531</td>
<td>Electrochemical Engineering</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATH 8201</td>
<td>Applied Math</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>MATH 8211</td>
<td>Physical Chemistry of Polymers</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>MATH 8221</td>
<td>Synthetic Polymer Chemistry</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>MATH 8301</td>
<td>Physical Rate Processes I: Transport</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ME 5226</td>
<td>Introduction to Finite Element Modeling, Analysis, and Design</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ME 5247</td>
<td>Stress Analysis, Sensing, and Transducers</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ME 5446</td>
<td>Introduction to Combustion</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ME 8390</td>
<td>Advanced Topics in the Thermal Sciences</td>
<td>1.0 - 3.0 cr</td>
</tr>
<tr>
<td>NSCI 5300</td>
<td>Biological Microscopy &amp; Digital Imaging</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHYS 5001</td>
<td>Quantum Mechanics I</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PHYS 5002</td>
<td>Quantum Mechanics II</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PHYS 5081</td>
<td>Introduction to Biopolymer Physics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PHYS 5201</td>
<td>Thermal and Statistical Physics</td>
<td>3.0 cr</td>
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</table>
PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
PHYS 8001 - Advanced Quantum Mechanics (3.0 cr)
PHYS 8702 - Statistical Mechanics and Transport Theory (3.0 cr)
PHYS 8711 - Solid-State Physics I (3.0 cr)
PHYS 8712 - Solid-State Physics II (3.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

Special Topics Electives
The following electives are topics courses. Only the approved topic titles below may be used.
AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
CEGE 5180 Special Topics - Membrane Science and Technology
EE 5940 Special Topics - Thin Films and Nanostructures: Materials and Devices
EE 8950 Advanced Topics - Materials & Design for Future Nonvolatile Memory
GCD 8920 Special Topics - Quantitative Fluorescence Microscopy
Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
Twin Cities Campus
Materials Science and Engineering Minor
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate courses offered by the Chemical Engineering and Materials Science (CEMS) Department cover core areas of materials science and engineering (structure and symmetry of materials; thermodynamics and kinetics; electronic, optical, and magnetic properties of materials; and mechanical properties of materials). In addition, several specialized topics are offered, including rheology, coating process fundamentals, process control, finite element methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, solid state reaction kinetics, electronic structure of materials, organic semiconductors, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and the science of porous media.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The minor must be approved by the director of graduate studies in materials science and engineering.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters
Core Courses
Take 2 or more course(s) totaling 6 or more credit(s) from the following:
- MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
- MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
- MATS 8003 - Electronic Properties (3.0 cr)
- MATS 8004 - Mechanical Properties (3.0 cr)
Doctoral

Core Courses
Take all 4 core courses for a total of 12 credits.

- MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
- MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
- MATS 8003 - Electronic Properties (3.0 cr)
- MATS 8004 - Mechanical Properties (3.0 cr)
Twin Cities Campus
Materials Science and Engineering Ph.D.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Department of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue SE, Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 57
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Graduate courses offered by the Chemical Engineering and Materials Science (CEMS) Department cover core areas of materials science and engineering (structure and symmetry of materials; thermodynamics and kinetics; electronic, optical, and magnetic properties of materials; and mechanical properties of materials). In addition, several specialized topics are offered, including rheology, coating process fundamentals, process control, finite element methods of computer-aided analysis, ceramics, polymers, materials design and performance, materials processing, corrosion, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electrochemical engineering, solid state reaction kinetics, electronic structure of materials, organic semiconductors, electronic ceramics, dislocations and interfaces, epitaxial thin film growth, and the science of porous media.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in materials science or other related field.

Other requirements to be completed before admission:
Applicants must submit scores from the general test of the GRE, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of official transcripts, and a clearly written statement of career interests, goals, and objectives. International students are required to provide TOEFL results.

Special Application Requirements:
Applications are accepted for fall semester only. Submission of all application materials by December 15 is strongly encouraged to ensure priority consideration for fellowships and assistantships; late applications are considered if space is available. More information is available at http://www.cems.umn.edu/graduate/admissions

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 560
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80
Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
21 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires 33 course credits and 24 thesis credits. The course credits must include 12 credits in four core MATS courses, and a minimum of 12 credits outside the major. The remaining 9 credits may be taken in the major or in any supporting field.

Students must attend, but not enroll in, the departmental seminar for six semesters. Informal attendance will be done within the department.

Core Courses
- MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
- MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
- MATS 8003 - Electronic Properties (3.0 cr)
- MATS 8004 - Mechanical Properties (3.0 cr)

Thesis Credits
Take 24 credits after passing preliminary oral exam
- MATS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Electives
The remaining credits may be chosen from the following list or consult with advisor for further options.
- AEM 4201 - Fluid Mechanics (4.0 cr)
- AEM 4511 - Mechanics of Composite Materials (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)
- AEM 8251 - Finite-Volume Methods in Computational Fluid Dynamics (3.0 cr)
- AEM 8531 - Fracture Mechanics (3.0 cr)
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5041 - Tissue Engineering (3.0 cr)
- BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 8511 - Systems and Synthetic Biology (3.0 cr)
- CEGE 8022 - Numerical Methods for Free and Moving Boundary Problems (3.0 cr)
- CEGE 8401 - Fundamentals of Finite Element Method (3.0 cr)
- CEGE 8402 - Nonlinear Finite Element Analysis (3.0 cr)
- CEGE 8501 - Environmental Fluid Mechanics I (4.0 cr)
- CEGE 8502 - Environmental Fluid Mechanics II (4.0 cr)
- CEGE 8504 - Theory of Unit Operations (4.0 cr)
- CEGE 8505 - Biological Processes (3.0 cr)
- CHEM 5210 - Materials Characterization (4.0 cr)
- CHEM 5755 - X-Ray Crystallography (4.0 cr)
- CHEM 8011 - Mechanisms of Chemical Reactions (4.0 cr)
- CHEM 8152 - Analytical Spectroscopy (4.0 cr)
- CHEM 8201 - Materials Chemistry (4.0 cr)
- CHEM 8221 - Synthetic Polymer Chemistry (4.0 cr)
- CHEM 8321 - Organic Synthesis (4.0 cr)
- CHEM 8322 - Advanced Organic Chemistry (4.0 cr)
- CHEM 8361 - Interpretation of Organic Spectra (4.0 cr)
- CHEM 8551 - Quantum Mechanics I (4.0 cr)

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Information current as of August 31, 2018
CHEM 8552 - Quantum Mechanics II (4.0 cr)
CHEM 8561 - Thermodynamics, Statistical Mechanics, and Reaction Dynamics I (4.0 cr)
CHEM 8562 - Thermodynamics, Statistical Mechanics, and Reaction Dynamics II (4.0 cr)
CHEN 5753 - Advanced Biomedical Transport Processes (3.0 cr)
CHEN 5771 - Colloids and Dispersions (3.0 cr)
CHEN 8101 - Fluid Mechanics I: Change, Deformation, Equations of Flow (3.0 cr)
CHEN 8102 - Principles and Applications of Rheology (2.0 cr)
CHEN 8104 - Coating Process Fundamentals (2.0 cr)
CHEN 8201 - Applied Math (3.0 cr)
CHEN 8301 - Physical Rate Processes I: Transport (3.0 cr)
CHEN 8402 - Statistical Thermodynamics and Kinetics (3.0 cr)
CHEN 8501 - Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)
CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
EE 5163 - Semiconductor Properties and Devices I (3.0 cr)
EE 5164 - Semiconductor Properties and Devices II (3.0 cr)
EE 5171 - Microelectronic Fabrication (4.0 cr)
EE 5173 - Basic Microelectronics Laboratory (1.0 cr)
EE 5181 - Micro and Nanotechnology by Self Assembly (3.0 cr)
EE 5521 - Physical Optics (3.0 cr)
EE 5522 - Physical Optics Laboratory (1.0 cr)
EE 5524 - Optical Electronics (4.0 cr)
EE 5553 - Physical Principles of Magnetic Materials (3.0 cr)
EE 5555 - Magnetic Recording (3.0 cr)
EE 5557 - Physical Principles of Thin Film Technology (4.0 cr)
ESCI 5353 - Electron Microprobe Theory and Practice (3.0 cr)
GCD 5036 - Molecular Cell Biology (3.0 cr)
MATH 4428 - Mathematical Modeling (4.0 cr)
MATH 4512 - Differential Equations with Applications (3.0 cr)
MATH 5485 - Introduction to Numerical Methods I (4.0 cr)
MATH 5486 - Introduction To Numerical Methods II (4.0 cr)
MATH 5525 - Introduction to Ordinary Differential Equations (4.0 cr)
MATH 5535 - Dynamical Systems and Chaos (4.0 cr)
MATH 5557 - Elementary Partial Differential Equations I (4.0 cr)
MATH 5558 - Elementary Partial Differential Equations II (4.0 cr)
MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
MATH 5641 - Numerical Analysis and Scientific Computing (3.0 cr)
MATH 5642 - Numerical Analysis and Scientific Computing (3.0 cr)
MATS 4212 - Ceramics (3.0 cr)
MATS 4214 - Polymers (3.0 cr)
MATS 5353 - Electron Microprobe Theory and Practice (3.0 cr)
MATS 5517 - Electron Microscopy (3.0 cr)
MATS 5531 - Electrochemical Engineering (3.0 cr)
MATS 8001 - Structure and Symmetry of Materials (3.0 cr)
MATS 8002 - Thermodynamics and Kinetics (3.0 cr)
MATS 8003 - Electronic Properties (3.0 cr)
MATS 8004 - Mechanical Properties (3.0 cr)
MATS 8201 - Applied Math (3.0 cr)
MATS 8211 - Physical Chemistry of Polymers (4.0 cr)
MATS 8221 - Synthetic Polymer Chemistry (4.0 cr)
MATS 8301 - Physical Rate Processes I: Transport (3.0 cr)
ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
ME 5247 - Stress Analysis, Sensing, and Transducers (4.0 cr)
ME 5446 - Introduction to Combustion (4.0 cr)
ME 8390 - Advanced Topics in the Thermal Sciences (1.0 - 3.0 cr)
NSCI 5300 - Biological Microscopy & Digital Imaging (3.0 cr)
PHYS 5001 - Quantum Mechanics I (4.0 cr)
PHYS 5002 - Quantum Mechanics II (4.0 cr)
PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
PHYS 5201 - Thermal and Statistical Physics (3.0 cr)
PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
PHYS 8001 - Advanced Quantum Mechanics (3.0 cr)
PHYS 8702 - Statistical Mechanics and Transport Theory (3.0 cr)
PHYS 8711 - Solid-State Physics I (3.0 cr)
PHYS 8712 - Solid-State Physics II (3.0 cr)
STAT 5021 - Statistical Analysis (4.0 cr)

**Special Topics Electives**
The following electives are topics courses. Only the approved topic titles below may be used.
- AEM 8511 Advanced Topics in Continuum Mechanics - Problems in Materials Science
- CEGE 5180 Special Topics - Membrane Science and Technology
- EE 5940 Special Topics - Thin Films and Nanostructures: Materials and Devices
- EE 8950 Advanced Topics - Materials & Design for Future Nonvolatile Memory
- GCD 8920 Special Topics - Quantitative Fluorescence Microscopy
- Math 8450 Topics in Numerical Analysis - Applications of Continuum Mechanics in Biology
Twin Cities Campus
Mathematics M.S.
School of Mathematics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu/grad/

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Mathematics offers a master of science (MS) in mathematics. Students may also earn the MS degree with emphasis in applied and industrial mathematics or with emphasis in mathematics education.

Special areas of research include ordinary and partial differential equations; probability; real, complex, harmonic, functional, and numerical analysis; differential and algebraic geometry; topology; number theory; commutative algebra; group theory; logic; combinatorics; mathematical physics; and applied and industrial mathematics, mathematical biology, and dynamical systems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Undergraduate degree in mathematics or equivalent.

Other requirements to be completed before admission:
Applicants should have the prerequisite material of linear algebra, advanced calculus and differential equations, and should be ready for higher level courses in analysis and algebra. The GRE Math subject test is strongly recommended. To receive full consideration for financial support, international applicants should have a TOEFL score of at least 100 with a speaking score of at least 23.

Special Application Requirements:
Applications are accepted for fall semester only. The application deadline is February 1. Additional information is available at math.umn.edu/graduate.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 18

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements

**Plan A**: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B**: Plan B requires 15 to 30 major credits and 0 to 15 credits outside the major. The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

**Plan A**
Plan A requires 14 credits in mathematics courses, 6 credits in a minor or related field, and 10 thesis credits. One sequence of two 8xxx-level mathematics courses in the student's concentration area must be included.

**Thesis Credits**
Take a minimum of 10 credits

- MATH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B**
Plan B allows more breadth; students complete a minimum of 30 course credits, half of which may be in a related area outside of Mathematics. Mathematics courses outside the student's major research area may be used toward the related field requirement.
Twin Cities Campus
Mathematics Minor
School of Mathematics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-624-6391, fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu/grad/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Mathematics offers a minor for both the master's and the PhD.

Special areas of research include ordinary and partial differential equations; probability; real, complex, harmonic, functional, and numerical analysis; differential and algebraic geometry; topology; number theory; commutative algebra; group theory; logic; combinatorics; mathematical physics; and applied and industrial mathematics, mathematical biology, and dynamical systems.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

The master's minor requires a minimum of 6 credits, consisting of two 5xxx- or 8xxx-level courses.

The PhD minor requires a minimum of 12 credits, consisting of four 5xxx- or 8xxx-level courses.

Courses must be completed with a grade of B or higher to satisfy the requirements. We recommend that you consult the director of graduate studies in Mathematics in advance for course approval.

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Masters Minor
Minor requires two 5xxx- or 8xxx-level mathematics courses. Minor programs must be approved by the director of graduate studies in the School of Mathematics.

Doctoral Minor
Minor requires four 5xxx- or 8xxx-level mathematics courses. Minor programs must be approved by the director of graduate studies in
the School of Mathematics.
Twin Cities Campus
Mathematics Ph.D.
School of Mathematics
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
127 Vincent Hall, 206 Church Street SE, Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu/grad/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 60
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The School of Mathematics offers a PhD in mathematics, and a PhD in mathematics with emphasis in applied mathematics.

Special areas of research include ordinary and partial differential equations; probability: real, complex, harmonic, functional, and numerical analysis; differential and algebraic geometry; topology; number theory; commutative algebra; group theory; logic; combinatorics; mathematical physics; and applied and industrial mathematics, mathematical biology, and dynamical systems.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Undergraduate degree in mathematics or equivalent.

Other requirements to be completed before admission:
Applicants should have the prerequisite material of abstract algebra, analysis, and topology. The GRE Math subject test is strongly recommended. To receive full consideration for financial support, international applicants should have a TOEFL score of at least 100 with a speaking score of at least 23.

Special Application Requirements:
Applications are accepted for fall semester only. The application deadline is December 15. Additional information is available at math.umn.edu/graduate.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 18

Key to test abbreviations (TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
12 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: French, German, Italian, or Russian

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires 24 credits in mathematics courses, 12 credits in a minor or in a supporting program, and 24 thesis credits. If a supporting program is chosen, it may consist partly or entirely of mathematics courses outside the student's major research area.

Students choose a program of coursework in consultation with their advisor and the director of graduate studies.

The PhD preliminary written examination, given twice each year, covers real analysis, complex analysis, algebra, and manifolds and topology. Students are expected to pass the written exam by the end of their second year; complete required coursework and pass the preliminary oral exam by the end of their fourth year; and pass the final oral exam and complete their dissertation by the end of the sixth year.

Reading proficiency is required in one of the following: French, German, Italian, or Russian

Thesis Credits
Take 24 credits after passing preliminary oral exam.
MATH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Mechanical Engineering M.S.M.E.
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Mechanical Engineering and Industrial Engineering Graduate Programs, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax: 612-624-2010)
Email: gardn032@umn.edu, hogan108@umn.edu
Website: http://www.me.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Mechanical Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Coursework and research for all graduate degrees are offered in bioengineering; biomechanics; combustion; computer-aided design; computer-aided manufacturing; computer graphics; control systems; design; energy conservation; environmental control; environmental engineering; fluid mechanics; heat and mass transfer; history of science and technology; human factors engineering; industrial engineering; innovative methodologies; integration of structural and environmental systems; lubrication; manufacturing engineering; particle technology; plasma chemistry; plasma heat transfer; power, propulsion, and applied thermodynamics; socioeconomic systems; solar energy; solar processing and thermochemistry; statistics; structures; systems dynamics; technology assessment; thermal energy storage; thermal environmental engineering; thermodynamics; transportation; tribology; vibration; and interdisciplinary finite element methodology. Additional instructional and research programs can be formulated.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year BS degree in engineering, science, or mathematics.

Special Application Requirements:
The department offers two options for applying to the masters degree program. The standard application requires a full set of application materials and allows admission to any of the MSME degree options (Plan A, B, or C). The streamlined application offers an abbreviated application process and admission is only for the coursework-only masters degree (Plan C).

The GRE test is not required for applicants to the streamlined application. Students admitted through the streamlined process are not eligible for financial support from the department.

Applications are accepted for fall semester only. The standard application deadline is December 15 and the streamlined application deadline is April 15. Additional information is available at www.me.umn.edu/education/graduate/prospective/

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
Program Requirements

Plan A: Plan A requires 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 14 major credits and 16 credits outside the major. The final exam is oral.

Plan C: Plan C requires 24 major credits and 6 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with advisor approval.

A minimum GPA of 2.8 is required for students to remain in good standing.

The MSME requires a minimum of 30 credits and is offered under Plan A (thesis), Plan B (project), and Plan C (coursework only). All three plans require completion of 1-2 graduate seminar credits and one research and professional ethics course. All courses, with the exception of seminars and the ethics course, must be taken on an A/F basis.

Major Course Credits

Any 5xxx or 8xxx level mechanical engineering course counts toward the major field credit requirement, with the exception of independent research courses. The following courses also meet the requirement for ME graduate course credits.

- AEM 5401 - Intermediate Dynamics (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)
- EE 5231 - Linear Systems and Optimal Control (3.0 cr)
- EE 8215 - Nonlinear Systems (3.0 cr)

Ethics Course

Take one research and professional ethics course. The following may be used or consult with advisor for further options.

- ME 8001 - Research Ethics and Professional Practice (0.0 cr)

Seminar

Take 1-2 seminar credits. The following may be used or consult with advisor for further options.

- ME 8773 - Graduate Seminar (1.0 cr)
- ME 8774 - Graduate Seminar (1.0 cr)

Supporting Program

The remaining course credits may be taken in the major or in any supporting field with significant scientific or engineering content, and may include 6 credits in a minor.

Use of 4xxx-level Courses

No more than six 4xxx-level course credits may be used for graduate-level credit. Only the following courses are acceptable.

- AEM 4511 - Mechanics of Composite Materials (3.0 cr)
- AEM 4581 - Mechanics of Solids (3.0 cr)
- CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)
- EE 4541 - Digital Signal Processing (3.0 cr)
- MATH 4512 - Differential Equations with Applications (3.0 cr)
- PHYS 4051 - Methods of Experimental Physics I (5.0 cr)
- PHYS 4101 - Quantum Mechanics (4.0 cr)
- PHYS 4201 - Statistical and Thermal Physics (3.0 cr)
- PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)

Plan A

Requires 14 credits in the major, 6 additional graduate level credits, and 10 thesis credits.

- ME 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Plan B
Requires 14 credits in the major, 16 additional graduate level credits, plus completion of a project or 1-3 Plan B papers, determined in consultation with the advisor. Up to 4 credits of ME 8794, taken S/N, may be used for the Plan B project.
ME 8794 - Mechanical Engineering Research (1.0 - 4.0 cr)

Plan C
Requires 24 credits in the major and 6 additional graduate level credits. Up to 4 credits of ME 8794, taken S/N, may be applied to the degree requirements.
ME 8794 - Mechanical Engineering Research (1.0 - 4.0 cr)

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Integrated B.M.E./M.S.M.E.
The Department of Mechanical Engineering offers an integrated bachelor's/master's degree program. The program makes it possible for students to earn a bachelor's degree (BME) and a master's degree (MSME) in Mechanical Engineering in five years. The program has several benefits: a streamlined admissions process from the undergraduate program to the graduate program; graduate student status granted in the senior year; eligibility for teaching and research assistantships; and flexibility in fulfilling required courses for both degrees simultaneously in the last two years of study.

Both the BME and MSME degrees must be completed in their entirety, with no courses shared between them. The graduate degree cannot be earned before the undergraduate requirements are satisfied. Admitted students who decide not to complete the MSME degree are permitted to count credits originally planned for the graduate program toward their undergraduate technical electives.

Eligibility Requirements:
- Students must be enrolled in the Mechanical Engineering undergraduate program at the University of Minnesota, Twin Cities.
- Students who are within 32 semester credits completing the requirements for the BME degree are eligible to apply.
- Students with a GPA of 3.25 or greater are preferred. For students who have transferred from another institution, at least one semester must be completed at the University of Minnesota, Twin Cities before admission to the program will be granted.
Twin Cities Campus
Mechanical Engineering Minor
Mechanical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Mechanical Engineering and Industrial Engineering Graduate Programs, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax: 612-624-2010)
Email: gardn032@umn.edu, hogan108@umn.edu
Website: http://www.me.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Coursework and research for all graduate degrees are offered in bioengineering; biomechanics; combustion; computer-aided design; computer-aided manufacturing; computer graphics; control systems; design; energy conservation; environmental control; environmental engineering; fluid mechanics; heat and mass transfer; history of science and technology; human factors engineering; industrial engineering; innovative methodologies; integration of structural and environmental systems; lubrication; manufacturing engineering; particle technology; plasma chemistry; plasma heat transfer; power, propulsion, and applied thermodynamics; socioeconomic systems; solar energy; solar processing and thermochemistry; statistics; structures; systems dynamics; technology assessment; thermal energy storage; thermal environmental engineering; thermodynamics; transportation; tribology; vibration; and interdisciplinary finite element methodology. Additional instructional and research programs can be formulated.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Mechanical engineering courses at the 5xxx or 8xxx level may be used for the minor, with the following exceptions: ME 8773, ME 8774, and ME 8794.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Master's Minor
At least 6 credits in mechanical engineering are required for a master's minor.

Doctoral Minor
At least 12 credits in mechanical engineering are required for a doctoral minor.
Twin Cities Campus
Mechanical Engineering Ph.D.
Mechanical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Mechanical Engineering and Industrial Engineering Graduate Programs, University of Minnesota, 1120 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-2009; fax: 612-624-2010)
Email: gardn032@umn.edu, hogan108@umn.edu
Website: http://www.me.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 62
- This program does not require summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Coursework and research for all graduate degrees are offered in bioengineering; biomechanics; combustion; computer-aided design; computer-aided manufacturing; computer graphics; control systems; design; energy conservation; environmental control; environmental engineering; fluid mechanics; heat and mass transfer; history of science and technology; human factors engineering; industrial engineering; innovative methodologies; integration of structural and environmental systems; lubrication; manufacturing engineering; particle technology; plasma chemistry; plasma heat transfer; power, propulsion, and applied thermodynamics; socioeconomic systems; solar energy; solar processing and thermochemistry; statistics; structures; systems dynamics; technology assessment; thermal energy storage; thermal environmental engineering; thermodynamics; transportation; tribology; vibration; and interdisciplinary finite element methodology. Additional instructional and research programs can be formulated.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A four-year BS degree in engineering, science, or mathematics.

Special Application Requirements:
Applications are accepted for fall semester only. The application deadline is December 15. Additional information is available at www.me.umn.edu/education/graduate/prospective/

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
- Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5

Key to test abbreviations (GRE, TOEFL, IELTS).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

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Information current as of August 31, 2018
Program Requirements
18 credits are required in the major.
20 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.0 is required for students to remain in good standing.

The PhD requires a minimum of 38 course credits, consisting of 18 credits in the major and 20 additional graduate level credits. Courses must be taken on an A/F basis, with the exception of seminars and the ethics course. A minimum of 12 course credits at the 8000-level are required (seminars and ethics courses may not be included). Students must complete 2-3 graduate seminar credits, and one research and professional ethics course. 24 thesis credits are also required.

Major Course Credits
Take 18 credits in any 5xxx or 8xxx level mechanical engineering courses. Independent research courses do not count toward the credit requirement. The following courses also meet the requirement for ME graduate course credits.

- AEM 5401 - Intermediate Dynamics (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 8201 - Fluid Mechanics I (3.0 cr)
- AEM 8202 - Fluid Mechanics II (3.0 cr)
- EE 5231 - Linear Systems and Optimal Control (3.0 cr)
- EE 8215 - Nonlinear Systems (3.0 cr)

Ethics Course
Take one research and professional ethics course. The following may be used or consult with advisor for further options.

- ME 8001 - Research Ethics and Professional Practice (0.0 cr)

Seminar
Take 2-3 seminar credits. The following may be used or consult with advisor for further options

- ME 8773 - Graduate Seminar (1.0 cr)
- ME 8774 - Graduate Seminar (1.0 cr)

Supporting Program
The remaining course credits may be taken in the major or in any supporting field with significant scientific or engineering content, and may include 12 credits in a minor.

Thesis Credits
Take 24 thesis credits after passing the preliminary oral exam

- ME 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Use of 4xxx-level Courses
No more than six 4xxx-level course credits may be used for graduate-level credit. Only the following courses are acceptable.

- AEM 4511 - Mechanics of Composite Materials (3.0 cr)
- AEM 4581 - Mechanics of Solids (3.0 cr)
- CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)
- EE 4541 - Digital Signal Processing (3.0 cr)
- MATH 4512 - Differential Equations with Applications (3.0 cr)
- PHYS 4051 - Methods of Experimental Physics I (5.0 cr)
- PHYS 4101 - Quantum Mechanics (4.0 cr)
- PHYS 4201 - Statistical and Thermal Physics (3.0 cr)
- PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)
Twin Cities Campus
Medical Device Innovation M.S.
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Technological Leadership Institute, College of Science and Engineering, University of Minnesota, Suite 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455
Phone: 612-624-5747
Fax: 612-624-7510
Email: mdi@umn.edu
Website: http://www.tli.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 34
• This program does not require summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science in medical device innovation (MDI) program is an interdisciplinary program administered by the College of Science and Engineering's Technological Leadership Institute (TLI). The program is comprised of courses in the core areas of technology innovation management and medical industry dynamics. Students experiences are enhanced through therapeutic area-based group activities and hands-on experiences in innovative biodesign through practicums at the Medical Devices Center. Students have the opportunity to specialize in an area of interest by taking 9 credits of electives in medical, technical, or business courses. The 14-month program draws upon the fields of technology innovation, product development, project and business management, intellectual property, regulatory affairs, clinical needs, entrepreneurship, emerging trends, globalization, reimbursement, and public policy. This program provides students with a full understanding of medical device innovation from start to finish. In doing so, it goes well beyond the traditional technology focus of most master's programs.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in a related field, such as biological or physical sciences, engineering, computer science, mathematics, or statistics.

Other requirements to be completed before admission:
Strong background in science, engineering, and math, with at least two to five years of work experience.

Special Application Requirements:
Applications are accepted on a rolling basis for the program's start in the summer of each year. The deadline for international students is March 15. Additional information is available at mdi.umn.edu.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 28 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The capstone project is independent, original, and applied research on a relevant subject, problem, or issue in areas of medical device technologies, policy, business, or innovation. The capstone project is rooted in real-world topics in the industry, and is usually framed in cooperation with the students organization or employer. The capstone is the students opportunity to demonstrate mastery of the concepts and methods (quantitative as well as qualitative) that have been learned in the MDI program, and to apply them to an industry-based medical device technology, venture, process, or organizational challenge.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

Core Courses (26 Credits)

Take the following courses for a total of 26 credits. Take MDI for 1 credit.

- MDI 5001 - Technical Writing Essentials (0.0 - 1.0 cr)
- MDI 5002 - Technology Foresight and Forecasting (3.0 cr)
- MDI 5004 - Clinical Foundations of Medical Device Innovation (3.0 cr)
- MDI 5006 - Finance, Valuation, and Entrepreneurship (3.0 cr)
- MDI 5008 - Quality, Regulatory and Manufacturing Management (2.0 cr)
- MDI 5010 - Product Innovation & Development Management (3.0 cr)
- MDI 5012 - Medical Industry Macro Environment (3.0 cr)
- MDI 5013 - Medical Device Center Practicum I (2.0 cr)
- MDI 5014 - Medical Device Center Practicum II (2.0 cr)
- MDI 5015 - Medical Device Center Practicum III (2.0 cr)
- MDI 5050 - Interpersonal & Team Effectiveness (1.0 cr)
- MDI 5051 - Leading Innovation & Change (1.0 cr)

Electives (6 Credits)

Take six credits of electives from the following list. Other courses may be selected in consultation with the director of graduate studies.

- ABUS 4043 - Project Management in Practice (3.0 cr)
- ABUS 4509 - New Product Development (3.0 cr)
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5041 - Tissue Engineering (3.0 cr)
- BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
- BMEN 5151 - Introduction to BioMEMS and Medical Microdevices (2.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
- BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
- BMEN 5351 - Cell Engineering (3.0 cr)
- BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
- BMEN 5411 - Neural Engineering (3.0 cr)
- BMEN 5412 - Neuromodulation (3.0 cr)
- BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
- BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 5701 - Cancer Bioengineering (3.0 cr)
- BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
- BTHX 5100 - Introduction to Clinical Ethics (3.0 cr)
ME 5223 - Materials in Design (4.0 cr)
ME 5341 - Case Studies in Thermal Engineering and Design (4.0 cr)
ME 8262 - Topics in Modeling and Analysis of Manufacturing Processes (4.0 cr)
ME 8381 - Bioheat and Mass Transfer (3.0 cr)
ME 8775 - Technical Communication (1.0 cr)
MGMT 5050 - Management of Innovation and Change (2.0 cr)
MGMT 6100 - Topics in Management (1.0 - 4.0 cr)
MILI 6235 - Pharmaceutical Industry: Business and Policy (2.0 cr)
MILI 6562 - Information Technology in Health Care (2.0 cr)
MILI 6589 - Medical Technology Evaluation and Market Research (2.0 cr)
MILI 6726 - Medical Device Industry: Business and Public Policy (2.0 cr)
MILI 6990 - The Health Care Marketplace (2.0 cr)
MILI 6991 - Anatomy and Physiology for Managers (2.0 cr)
MILI 6992 - Healthcare Delivery Innovations: Optimizing Cost and Quality (2.0 cr)
MILI 6995 - Medical Industry Valuation Laboratory (2.0 cr)
MGMT 5088 - Strategic Marketing (2.0 cr)
NEUR 5230 - Cerebrovascular Hemodynamics and Diseases I (4.0 cr)
NEUR 5240 - Cerebrovascular Hemodynamics and Diseases II (4.0 cr)
PDES 5701 - Creativity, Idea Generation, and Innovation (3.0 cr)
PDES 5702 - Concept Sketching and Rendering (3.0 cr)
PDES 5704 - Computer-Aided Design Methods (3.0 cr)
PHSL 5061 - Principles of Physiology for Biomedical Engineering (4.0 cr)
PHSL 5510 - Advanced Cardiac Physiology and Anatomy (2.0 - 3.0 cr)
PHSL 5525 - Anatomy and Physiology of the Pelvis and Urinary System (1.0 - 2.0 cr)
PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6752 - Economics of the Health Care System (3.0 cr)
PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
RSC 5101 - Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences (1.0 cr)
RSC 5106 - Introduction to Rehabilitation Science (1.0 cr)
RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
RSC 5200 - Introduction to Neuromodulation (1.0 - 3.0 cr)
RSC 5231 - Clinical Biomechanics (2.0 - 5.0 cr)
RSC 5281 - Scientific Foundations: Exercise Theory (3.0 cr)
SCB 8181 - Stem Cell Biology (3.0 cr)
ST 8109 - Cybersecurity Foundations - Technology, Risk & Communication (2.0 cr)
ST 8110 - Security Science and Technology Foundations (3.0 cr)
ST 8111 - Methods, Theory, and Applications (2.5 cr)
ST 8113 - Information and Cyber Security (2.0 cr)
ST 8220 - Vulnerability, Risk and Threat Assessment and Management (3.0 cr)
ST 8330 - Critical Infrastructure Protections (3.0 cr)
ST 8331 - Dynamic Systems Modeling and Simulation Tools (2.0 cr)
ST 8513 - Cyber Threat Intelligence (2.0 cr)
ST 8661 - Securing Cyberspace (Fundamentals) (3.0 cr)
ST 8662 - Securing Cyberspace - Advanced (3.0 cr)
Students may choose a minor in human factors and ergonomics, but must have courses pre-approved by the director of graduate studies.

Capstone Project (2 Credits)
Take 2 credits of MDI 5020.
MDI 5020 - Medical Device Innovation Capstone (1.0 - 2.0 cr)
Twin Cities Campus

Neuroengineering Minor
Department of Biomedical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Graduate Minor in Neuroengineering, 7-105 Nils Hasselmo Hall, 312 Church Street S.E., Minneapolis, MN 55455 (612-624-8396; fax 612-626-6583)
Email: bmengps@umn.edu
Website: http://neuroengineering.umn.edu/

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The graduate minor in neuroengineering (NE) is motivated by the notion that future breakthroughs in this rapidly-growing area of research will be made by engineers who understand the fundamental issues and principles of neuroscience that occur during neural interventions, and by neuroscientists who are truly competent in engineering concepts and tools. The minor trains doctoral students to develop the skills to revolutionize technologies for interfacing with the brain and to advance our understanding of the neuroscience processes that arise when we interface with and modulate the brain.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Enrollment in the neuroengineering minor is open to all currently enrolled PhD students in biomedical engineering, electrical engineering, mechanical engineering, and neuroscience. PhD students majoring in other programs may obtain approval from the neuroengineering director of graduate studies to participate in the minor program if they have the necessary science background to complete the coursework and are in good standing in their major program.

Students must officially declare the minor before taking the Oral Preliminary Examination (OPE).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Coursework must be approved by the neuroengineering director of graduate studies (DGS) - see http://neuroengineering.umn.edu/faculty.html.

For any course listed in multiple categories, students must choose which requirement that course will fulfill. A single course cannot be counted simultaneously toward multiple categories. The only exception is BMEn 8411 Neuroengineering Seminar, which must be taken once for the Seminar requirement and can be taken a second time to count as an Elective.

Students may not use any of their minor courses to satisfy the core course requirements for their major program (i.e., a Neuroscience student cannot count NSC 5561 as both a Neuroengineering Minor course and a core Neuroscience course).

Neuroengineering Seminar
BMEN 8411 - Neuroengineering Seminar (2.0 cr)
Engineering Core
It is strongly recommended that students take BMEn 5411 Neural Engineering, unless they have previously completed a neural engineering course. The Engineering Core course must be completed for a letter grade (A-F), and a minimum grade of B- is required for the course to count toward the minor.
Take 1 or more course(s) from the following:
• BMEN 5411 - Neural Engineering (3.0 cr)
• BMEN 5412 - Neuromodulation (3.0 cr)

Neuroscience Core
The Neuroscience Core course must be completed for a letter grade (A-F), and a minimum grade of B- is required for the course to count toward the minor.
Take 1 or more course(s) from the following:
• NSCI 5101 - Neurobiology I: Molecules, Cells, and Systems (3.0 cr)
• NSC 5561 - Systems Neuroscience (4.0 cr)

Electives
Additional coursework in engineering or neuroscience discipline is required - students must take enough elective credits to reach a total of 12 minimum for the minor. Additional courses may be approved as electives by the neuroengineering DGS. Elective Courses must be completed for a letter grade (A-F), and a minimum grade of B- is required for the course(s) to count toward the minor.
Take 1 or more course(s) from the following:
• BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
• BMEN 5411 - Neural Engineering (3.0 cr)
• BMEN 5412 - Neuromodulation (3.0 cr)
• BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
• BMEN 8101 - Biomedical Digital Signal Processing (3.0 cr)
• BMEN 8151 - Biomedical Electronics and Implantable Microsystems (3.0 cr)
• BMEN 8502 - Physiological Control Systems (3.0 cr)
• EE 5231 - Linear Systems and Optimal Control (3.0 cr)
• EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
• EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
• EM 5281 - Analog and Digital Control (4.0 cr)
• EM 5286 - Robotics (4.0 cr)
• MPHY 5178 - Physical Principles of Magnetic Resonance Imaging (3.0 cr)
• MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
• NSC 8111 - Quantitative Neuroscience (3.0 cr)
• NSC 8217 - Systems and Computational Neuroscience (2.0 cr)
• PSY 5036W - Computational Vision [WI] (3.0 cr)
• PSY 5038W - Introduction to Neural Networks [WI] (3.0 cr)
• PSY 5063 - Introduction to Functional MRI (3.0 cr)
• PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)

Program Sub-plans
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

Doctoral
Twin Cities Campus
Physics M.S.
School of Physics & Astronomy
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies in Physics, School of Physics and Astronomy, University of Minnesota, 116 Church St. SE, Minneapolis, MN 55455 (612-626-5982; fax: 612-624-4578)
Email: grad@physics.umn.edu
Website: http://www.physics.umn.edu/grad

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program does not require summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Note: Students applying for a terminal MS degree are not admitted, unless they arrange for their own financial support. Students admitted to the PhD program are automatically eligible for the MS program.

Physics is the study of the fundamental structure and interactions of matter. Research areas in the program include experimental and theoretical studies in astrophysics and cosmology, biological physics, condensed matter physics, elementary particle physics, nuclear physics, space and planetary physics, and physics education research. Interdisciplinary study is also available with the programs in astrophysics, biological sciences, chemistry, chemical engineering and materials science, electrical and computer engineering, mechanical engineering, and the history of science and technology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.30.

Other requirements to be completed before admission:
Upper division courses in the core areas of classical mechanics, electricity and magnetism, quantum mechanics, and statistical and thermal physics are required. It is advisable to have taken an upper division course in experimental methods in physics.

Special Application Requirements:
Students admitted to the Ph.D. program are automatically eligible for the M.S. program. Students applying for a terminal M.S. degree are not admitted unless they arrange for their own financial support.

Applications are accepted for fall admission only. Application by December 15 is strongly encouraged. Additional application information is available at http://www.physics.umn.edu/grad/physics/application.html

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80
Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan A:** Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 major credits and 0 credits outside the major. The final exam is oral. A capstone project is required.

**Capstone Project:** The Plan B project is a self-contained research problem performed in conjunction with the student's advisor. Students register for 4 credits of Physics 8500: Plan B project, which count toward the program requirement of 30 credits. The project is described in a written paper. Examples of Plan B projects include carrying out a specific calculation, writing and documenting a computer program, analyzing a set of experimental data, designing and/or constructing experimental instrumentation, and designing and/or constructing an undergraduate laboratory experiment. The alternative to the Plan B project is writing 1-3 Plan B papers. The Plan B papers are related to three courses that the student has taken and do not require original research. It's expected that completion of either the project or the Plan B papers require a nominal three weeks of full-time effort.

**Plan C:** Plan C requires 30 major credits and 0 credits outside the major. There is no final exam.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Physics 4001, 4002, 4101, 4201, and 4303 cannot be used to satisfy degree requirements.

To remain in good academic standing students must maintain a minimum GPA of 3.30.

Students completing the Plan C option must also pass the physics graduate written exam.

**Required Courses**

Plan A and Plan B students must complete either the quantum mechanics sequence or the classical physics sequence. Plan C students must complete both sequences.

**Quantum Mechanics Sequence**

- PHYS 5001 - Quantum Mechanics I (4.0 cr)
- PHYS 5002 - Quantum Mechanics II (4.0 cr)

**Classical Physics Sequence**

- PHYS 5011 - Classical Physics I (4.0 cr)
- PHYS 5012 - Classical Physics II (4.0 cr)

**Plan A**

Plan A requires 8 credits in a required sequence and an additional 12 course credits taken in the major or in a related field, including in a minor. Ten thesis credits are also required.

- PHYS 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

**Plan B**

Plan B requires 8 credits in a required sequence and an additional 22 course credits taken in the major or in a related field, including in a minor. Up to 4 credits of PHYS 8500 may be used for the Plan B project.

- PHYS 8500 - Plan B Project (4.0 cr)

**Plan C**

Plan C requires the two course sequences listed above (16 credits) and PHYS 5201 (3 credits). The remaining 11 credits may be taken in the major field or in a related field, including in a minor.

- PHYS 5201 - Thermal and Statistical Physics (3.0 cr)

**Electives**

Students may choose courses from this list or consult with their advisor for additional options.

**Atomic Physics and Optics**

- PHYS 8161 - Atomic and Molecular Structure (3.0 cr)

**Biophysics and Medical Physics**

- PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
- PHYS 5401 - Physiological Physics (4.0 cr)

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Information current as of August 31, 2018
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHYS 5402</td>
<td>Radiological Physics (4.0 cr)</td>
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<tr>
<td>PHYS 8311</td>
<td>Biological Physics of Single Molecules (3.0 cr)</td>
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<td>PHYS 8312</td>
<td>Biological Physics of Macroscopic Systems (3.0 cr)</td>
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<td>PHYS 8300</td>
<td>Seminar: Biological and Medical Physics. (1.0 cr)</td>
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<td>PHYS 5701</td>
<td>Solid-State Physics for Engineers and Scientists (4.0 cr)</td>
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<td>PHYS 8702</td>
<td>Statistical Mechanics and Transport Theory (3.0 cr)</td>
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<td>PHYS 8711</td>
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<td>PHYS 8750</td>
<td>Advanced Topics in Condensed Matter Physics (3.0 cr)</td>
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<td>Seminar: Condensed Matter Physics (1.0 cr)</td>
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<td>Seminar: Nuclear Physics (1.0 cr)</td>
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<td>Advanced Topics in Nuclear Physics (3.0 cr)</td>
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<tr>
<td>PHYS 4611</td>
<td>Introduction to Space Physics (3.0 cr)</td>
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<td>Cosmic Rays and Plasma Astrophysics (3.0 cr)</td>
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<td>Advanced Topics in Space and Plasma Physics (3.0 cr)</td>
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<td>PHYS 8600</td>
<td>Seminar: Space Physics (1.0 cr)</td>
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<td>PHYS 5022</td>
<td>Relativity, Cosmology, and the Universe (4.0 cr)</td>
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<td>PHYS 8501</td>
<td>General Relativity and Cosmology I (3.0 cr)</td>
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<td>PHYS 8502</td>
<td>General Relativity and Cosmology II (3.0 cr)</td>
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<tr>
<td>PHYS 8200</td>
<td>Seminar: Cosmology and High Energy Astrophysics (1.0 cr)</td>
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<tr>
<td>PHYS 5072</td>
<td>Best Practices in College Physics Teaching (1.0 - 3.0 cr)</td>
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<tr>
<td>PHYS 8100</td>
<td>Seminar: Problems of Physics Teaching and Higher Education (1.0 cr)</td>
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Twin Cities Campus
Physics Minor
School of Physics & Astronomy
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies in Physics, School of Physics and Astronomy, University of Minnesota, 116 Church St. SE, Minneapolis, MN 55455 (612-626-5982; fax: 612-624-4578)
Email: grad@physics.umn.edu
Website: http://www.physics.umn.edu/grad

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Physics is the study of the fundamental structure and interactions of matter. Research areas in the program include experimental and theoretical studies in astrophysics and cosmology, biological physics, condensed matter physics, elementary particle physics, nuclear physics, space and planetary physics, and physics education research. Interdisciplinary study is also available with the programs in astrophysics, biological sciences, chemistry, chemical engineering and materials science, electrical and computer engineering, mechanical engineering, and the history of science and technology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
A physics minor requires a background in differential and integral calculus and one year of calculus-level college physics.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The master's minor requires a minimum of 6 credits in PHYS courses (including 5001 or 5012).
The doctoral minor requires a minimum of 12 credits in PHYS courses (including 5001 and 5002-or-5011 and 5012).

The following courses cannot be used to satisfy the requirements: Physics 4001, 4002, 4101, 4201, and 4303.

Elective Course Options
PHYS subject requirements can be met through a combination of any of the classes listed below (minimum 2 credits for MS minor after required course and minimum 4 credits for PhD minor after required courses)
Take 2 or more credit(s) from the following:
Atomic Physics and Optics
• PHYS 8161 - Atomic and Molecular Structure (3.0 cr)

Biophysics and Medical Physics
• PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
or PHYS 5401 - Physiological Physics (4.0 cr)
or PHYS 5402 - Radiological Physics (4.0 cr)
or PHYS 8311 - Biological Physics of Single Molecules (3.0 cr)
or PHYS 8312 - Biological Physics of Macroscopic Systems (3.0 cr)
or PHYS 8300 - Seminar: Biological and Medical Physics (1.0 cr)

**Condensed Matter Physics**
- PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)
or PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
or PHYS 8702 - Statistical Mechanics and Transport Theory (3.0 cr)
or PHYS 8711 - Solid-State Physics I (3.0 cr)
or PHYS 8712 - Solid-State Physics II (3.0 cr)
or PHYS 8750 - Advanced Topics in Condensed Matter Physics (3.0 cr)
or PHYS 8700 - Seminar: Condensed Matter Physics (1.0 cr)

**Elementary Particle Physics**
- PHYS 4511 - Introduction to Nuclear and Particle Physics (3.0 cr)
or PHYS 8011 - Quantum Field Theory I (3.0 cr)
or PHYS 8012 - Quantum Field Theory II (3.0 cr)
or PHYS 8013 - Special Topics in Quantum Field Theory (3.0 cr)
or PHYS 8891 - Elementary Particle Physics I (3.0 cr)
or PHYS 8892 - Elementary Particle Physics II (3.0 cr)
or PHYS 8911 - Introduction to Supersymmetry (3.0 cr)
or PHYS 8890 - Seminar: Elementary Particle Physics (1.0 cr)

**Mathematical, Advanced Quantum, and Computational Physics**
- PHYS 5041 - Mathematical Methods for Physics (4.0 cr)
or PHYS 8001 - Advanced Quantum Mechanics (3.0 cr)
or PHYS 8301 - Symmetry and Its Application to Physical Problems (3.0 cr)

**Nuclear Physics**
- PHYS 8800 - Seminar: Nuclear Physics (1.0 cr)
or PHYS 8801 - Nuclear Physics I (3.0 cr)
or PHYS 8802 - Nuclear Physics II (3.0 cr)
or PHYS 8850 - Advanced Topics in Nuclear Physics (3.0 cr)

**Plasma and Space Physics**
- PHYS 4611 - Introduction to Space Physics (3.0 cr)
or PHYS 4621 - Introduction to Plasma Physics (3.0 cr)
or PHYS 8601 - Plasma Physics I (3.0 cr)
or PHYS 8602 - Plasma Physics II (3.0 cr)
or PHYS 8611 - Cosmic Rays and Plasma Astrophysics (3.0 cr)
or PHYS 8650 - Advanced Topics in Space and Plasma Physics (3.0 cr)
or PHYS 8600 - Seminar: Space Physics (1.0 cr)

**Relativity and Cosmology**
- PHYS 5011 - Relativity, Cosmology, and the Universe (4.0 cr)
or PHYS 8501 - General Relativity and Cosmology I (3.0 cr)
or PHYS 8502 - General Relativity and Cosmology II (3.0 cr)
or PHYS 8200 - Seminar: Cosmology and High Energy Astrophysics (1.0 cr)

**Physics Education**
- PHYS 5072 - Best Practices in College Physics Teaching (1.0 - 3.0 cr)
or PHYS 8100 - Seminar: Problems of Physics Teaching and Higher Education (1.0 cr)

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**Program Sub-plans**
Students are required to complete one of the following sub-plans. Students may not complete the program with more than one sub-plan.

**Masters**
Students must complete a minimum of 6 credits in physics including either Physics 5001 or 5011.

**Required Courses**
- PHYS 5001 - Quantum Mechanics I (4.0 cr)
or PHYS 5011 - Classical Physics I (4.0 cr)

**Doctoral Minor**
Students must complete a minimum of 12 credits in physics, including either the classical physics sequence or the quantum mechanics
Required Courses

Quantum Mechanics Sequence
PHYS 5001 - Quantum Mechanics I (4.0 cr)
PHYS 5002 - Quantum Mechanics II (4.0 cr)

or Classical Physics Sequence
PHYS 5011 - Classical Physics I (4.0 cr)
PHYS 5012 - Classical Physics II (4.0 cr)
Twin Cities Campus
Physics Ph.D.
School of Physics & Astronomy
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Director of Graduate Studies in Physics, School of Physics and Astronomy, University of Minnesota, 116 Church St. SE, Minneapolis, MN 55455 (612-626-5982; fax: 612-624-4578)
Email: grad@physics.umn.edu
Website: http://www.physics.umn.edu/grad

• Program Type: Doctorate
• Requirements for this program are current for Fall 2018
• Length of program in credits: 64
• This program does not require summer semesters for timely completion.
• Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

Physics is the study of the fundamental structure and interactions of matter. Research areas in the program include experimental and theoretical studies in astrophysics and cosmology, biological physics, condensed matter physics, elementary particle physics, nuclear physics, space and planetary physics, and physics education research. Interdisciplinary study is also available with the programs in astrophysics, biological sciences, chemistry, chemical engineering and materials science, electrical and computer engineering, mechanical engineering, and the history of science and technology.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.50.

Other requirements to be completed before admission:
Teaching assistantships and a few fellowships are available upon admittance to the School of Physics and Astronomy.

Applicants are required to submit three letters of recommendation from persons familiar with their scholarship and research potential; a complete set of transcripts; and a clearly written statement of career interests, goals, and objectives. Submission of GRE scores is strongly recommended. Fall semester entry is strongly recommended for all students. Application by December 15 is strongly encouraged to ensure priority consideration for fellowships awarded for the next academic year. Additional application information is available at http://www.physics.umn.edu/grad/physics/application.html

Special Application Requirements:
Courses at the upper division level in the core areas of classical mechanics, electricity and magnetism, quantum mechanics, and statistical and thermal physics are required. It is advisable to have taken an upper division course in experimental methods in physics.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 55
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

40 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.30 is required for students to remain in good standing.

Physics 4001, 4002, 4101, 4201, and 4303 cannot be used to satisfy the requirements.

Students whose financial support comes from TA assignments are also required to complete 3 credits of PHYS 5072 over two semesters. These credits count towards elective requirements.

Required orientation: Before the beginning of fall semester, new graduate students are expected to participate in the department orientation program. This includes TA orientation sessions, which are required if a student's financial support comes from TA assignments.

Requirement for international students: International students who want to teach as TAs must take CSE TALK, a workshop on American teaching culture and language skills, prior to the department orientation described above and achieve an ELP (English Language Proficiency) rating of 1. This includes passing an English test, which is given in late July and August. Students who do not achieve an ELP of 1 must take an English training course geared to their level of skills, such as GRAD 5105, GRAD 5102, or Foundations. These courses are given during the academic year and are required until the student achieves an ELP of 1.

**Required Courses**

- PHYS 5001 - Quantum Mechanics I (4.0 cr)
- PHYS 5002 - Quantum Mechanics II (4.0 cr)
- PHYS 5011 - Classical Physics I (4.0 cr)
- PHYS 5012 - Classical Physics II (4.0 cr)
- PHYS 5201 - Thermal and Statistical Physics (3.0 cr)

**Seminars**

Take 2 or more course(s) totaling 2 or more credit(s) from the following:
- PHYS 8100 - Seminar: Problems of Physics Teaching and Higher Education (1.0 cr)
- PHYS 8200 - Seminar: Cosmology and High Energy Astrophysics (1.0 cr)
- PHYS 8300 - Seminar: Biological and Medical Physics. (1.0 cr)
- PHYS 8600 - Seminar: Space Physics (1.0 cr)
- PHYS 8700 - Seminar: Condensed Matter Physics (1.0 cr)
- PHYS 8800 - Seminar: Nuclear Physics (1.0 cr)
- PHYS 8900 - Seminar: Elementary Particle Physics (1.0 cr)

**Electives**

Students may choose courses from this list or consult with their advisor for additional options.

Take 19 or more credit(s) from the following:

**Atomic Physics and Optics**
- PHYS 8161 - Atomic and Molecular Structure (3.0 cr)

**Biophysics and Medical Physics**
- PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
- PHYS 5401 - Physiological Physics (4.0 cr)
- PHYS 5402 - Radiological Physics (4.0 cr)
- PHYS 8311 - Biological Physics of Single Molecules (3.0 cr)
- PHYS 8312 - Biological Physics of Macroscopic Systems (3.0 cr)
- PHYS 8300 - Seminar: Biological and Medical Physics. (1.0 cr)

**Condensed Matter Physics**
- PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)
- PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
- PHYS 8702 - Statistical Mechanics and Transport Theory (3.0 cr)
- PHYS 8711 - Solid-State Physics I (3.0 cr)
PHYS 8712 - Solid-State Physics II (3.0 cr)
PHYS 8750 - Advanced Topics in Condensed Matter Physics (3.0 cr)
PHYS 8700 - Seminar: Condensed Matter Physics (1.0 cr)

• **Elementary Particle Physics**
  • PHYS 4511 - Introduction to Nuclear and Particle Physics (3.0 cr)
  • PHYS 8011 - Quantum Field Theory I (3.0 cr)
  • PHYS 8012 - Quantum Field Theory II (3.0 cr)
  • PHYS 8013 - Special Topics in Quantum Field Theory (3.0 cr)
  • PHYS 8901 - Elementary Particle Physics I (3.0 cr)
  • PHYS 8902 - Elementary Particle Physics II (3.0 cr)
  • PHYS 8911 - Introduction to Supersymmetry (3.0 cr)
  • PHYS 8950 - Advanced Topics in Elementary Particle Physics (3.0 cr)
  • PHYS 8900 - Seminar: Elementary Particle Physics (1.0 cr)

• **Mathematical, Advanced Quantum, and Computational Physics**
  • PHYS 5041 - Mathematical Methods for Physics (4.0 cr)
  • PHYS 8001 - Advanced Quantum Mechanics (3.0 cr)
  • PHYS 8301 - Symmetry and Its Application to Physical Problems (3.0 cr)

• **Nuclear Physics**
  • PHYS 8801 - Nuclear Physics I (3.0 cr)
  • PHYS 8802 - Nuclear Physics II (3.0 cr)
  • PHYS 8850 - Advanced Topics in Nuclear Physics (3.0 cr)
  • PHYS 8800 - Seminar: Nuclear Physics (1.0 cr)

• **Plasma and Space Physics**
  • PHYS 4611 - Introduction to Space Physics (3.0 cr)
  • PHYS 4621 - Introduction to Plasma Physics (3.0 cr)
  • PHYS 8601 - Plasma Physics I (3.0 cr)
  • PHYS 8602 - Plasma Physics II (3.0 cr)
  • PHYS 8611 - Cosmic Rays and Plasma Astrophysics (3.0 cr)
  • PHYS 8650 - Advanced Topics in Space and Plasma Physics (3.0 cr)
  • PHYS 8600 - Seminar: Space Physics (1.0 cr)

• **Relativity and Cosmology**
  • PHYS 5022 - Relativity, Cosmology, and the Universe (4.0 cr)
  • PHYS 8501 - General Relativity and Cosmology I (3.0 cr)
  • PHYS 8502 - General Relativity and Cosmology II (3.0 cr)
  • PHYS 8200 - Seminar: Cosmology and High Energy Astrophysics (1.0 cr)

• **Physics Education**
  • PHYS 5072 - Best Practices in College Physics Teaching (1.0 - 3.0 cr)
  • PHYS 8100 - Seminar: Problems of Physics Teaching and Higher Education (1.0 cr)

**Thesis Credits**
Take 24 credits (maximum 14 credits per term) after passing preliminary oral exam.
PHYS 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Quaternary Paleoecology Minor
Department of Earth Sciences
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Quaternary Paleoecology Graduate Program, University of Minnesota, John T. Tate Hall-Suite 150, 116 Church St. SE, Minneapolis, MN 55455 (612-624-7881; fax: 612-625-3819)
Email: qpminor@umn.edu
Website: http://lrc.geo.umn.edu/qpminor/index.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2018
- Length of program in credits (Masters): 6
- Length of program in credits (Doctorate): 12
- This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The faculty of the graduate minor in quaternary paleoecology (QP) hold appointments in several departments. Students in this unique program benefit from the broad range of expertise and experience available at a large research university. From their coursework in the minor, graduate students learn techniques and approaches from other areas that can be applied to their own research.

The minor is available to master's (MA and MS) and doctoral students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Students must be enrolled in a graduate program (master's or doctoral) at the University of Minnesota.

Special Application Requirements:
Students apply by sending a letter of application to the director of graduate studies (qpminor@umn.edu) as well as a letter of endorsement from their major adviser. Application may be made at any time.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The Quaternary Paleoecology minor curriculum is developed in consultation with the major advisor and the Quaternary Paleoecology director of graduate studies. Courses must be from relevant disciplines outside the major field.

Minor Courses
Masters students select at least 6 credits, and doctoral students select at least 12 credits from the following list. Alternative coursework can be applied to the minor with approval from the major advisor and Quaternary Paleoecology director of graduate studies.

- ANTH 4077 - Neanderthals: Biology and Culture of Humanity's Nearest Relative (3.0 cr)
- ANTH 4329 - Primate Ecology and Social Behavior (3.0 cr)
- ANTH 5009 - Human Behavioral Biology (3.0 cr)
- ANTH 5015W - Analysis of Stone Tool Technology (4.0 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>ANTH 5401</td>
<td>The Human Fossil Record</td>
<td>3.0 cr</td>
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<tr>
<td>ANTH 5402</td>
<td>Zooarchaeology Laboratory</td>
<td>3.0 cr</td>
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<tr>
<td>ANTH 5403</td>
<td>Quantitative Methods in Biological Anthropology</td>
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<tr>
<td>ANTH 5405</td>
<td>Human Skeletal Analysis</td>
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<tr>
<td>ANTH 5442</td>
<td>Archaeology of the British Isles</td>
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<tr>
<td>CEGE 5541</td>
<td>Environmental Water Chemistry</td>
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<tr>
<td>CEGE 5551</td>
<td>Environmental Microbiology</td>
<td>3.0 cr</td>
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<tr>
<td>CEGE 8508</td>
<td>Ecological Fluid Mechanics</td>
<td>4.0 cr</td>
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<td>CEGE 8511</td>
<td>Mechanics of Sediment Transport</td>
<td>3.0 cr</td>
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<tr>
<td>CEGE 8551</td>
<td>Environmental Microbiology: Molecular Theory and Methods</td>
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<tr>
<td>CEGE 8552</td>
<td>Groundwater Microbiology: Laboratory</td>
<td>4.0 cr</td>
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<tr>
<td>CEGE 8553</td>
<td>Biofilms</td>
<td>3.0 cr</td>
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<tr>
<td>CEGE 8561</td>
<td>Analysis and Modeling of Aquatic Environments I</td>
<td>3.0 cr</td>
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<tr>
<td>CEGE 8562</td>
<td>Analysis and Modeling of Aquatic Environments II</td>
<td>3.0 cr</td>
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<tr>
<td>CEGE 8581</td>
<td>Research and Professional Ethics in Water Resources and Environmental Science</td>
<td>0.5 cr</td>
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<tr>
<td>CEGE 8601</td>
<td>Introduction to Stream Restoration</td>
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<tr>
<td>CEGE 8602</td>
<td>Stream Restoration Practice</td>
<td>2.0 cr</td>
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<tr>
<td>EEB 4329</td>
<td>Primate Ecology and Social Behavior</td>
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<tr>
<td>EEB 4611</td>
<td>Biogeochemical Processes</td>
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<td>EEB 5221</td>
<td>Molecular Evolution</td>
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<td>EEB 5371</td>
<td>Principles of Systematics</td>
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<td>EEB 5601</td>
<td>Limnology</td>
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<td>EEB 5605</td>
<td>Limnology Laboratory</td>
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<tr>
<td>EEB 5609</td>
<td>Ecosystem Ecology</td>
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<tr>
<td>ESCI 4102W</td>
<td>Vertebrate Paleontology: Evolutionary History and Fossil Records of Vertebrates [WI]</td>
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<td>ESCI 4103W</td>
<td>Fossil Record of Mammals [WI]</td>
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<td>ESCI 4401</td>
<td>Aquifer Environmental Geochemistry</td>
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<tr>
<td>ESCI 4402</td>
<td>Biogeochemical Cycles in the Ocean</td>
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<tr>
<td>ESCI 4602</td>
<td>Sedimentology and Stratigraphy</td>
<td>3.0 cr</td>
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<tr>
<td>ESCI 4703</td>
<td>Glacial Geology</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ESCI 5102</td>
<td>Climate Change and Human History</td>
<td>3.0 cr</td>
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<tr>
<td>ESCI 5201</td>
<td>Time-Series Analysis of Geological Phenomena</td>
<td>3.0 cr</td>
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<tr>
<td>ESCI 5204</td>
<td>Geostatistics and Inverse Theory</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ESCI 5302</td>
<td>Isotope Geology</td>
<td>3.0 cr</td>
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<tr>
<td>ESCI 5601W</td>
<td>Advanced Sedimentology [WI]</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ESCI 5705</td>
<td>Limnogeology and Paleoenvironment</td>
<td>3.0 cr</td>
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<tr>
<td>ESCI 8243</td>
<td>Principles of Rock Magnetism (1.0 - 3.0 cr)</td>
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<tr>
<td>ESCI 8511</td>
<td>Mechanics of Sediment Transport</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ESPM 5402</td>
<td>Biometeorology</td>
<td>3.0 cr</td>
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<tr>
<td>FNRM 5131</td>
<td>Geographical Information Systems (GIS) for Natural Resources</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>FNRM 5153</td>
<td>Forest Hydrology &amp; Watershed Biogeochemistry</td>
<td>3.0 cr</td>
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<tr>
<td>FNRM 5203</td>
<td>Forest Fire and Disturbance Ecology</td>
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<tr>
<td>FNRM 5204</td>
<td>Landscape Ecology and Management</td>
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</tr>
<tr>
<td>FNRM 5205</td>
<td>Productivity and Ecology of Forest Soils</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>FNRM 5218</td>
<td>Measuring and Modeling Forests</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>FNRM 5262</td>
<td>Remote Sensing and Geospatial Analysis of Natural Resources and Environment</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>FNRM 5412</td>
<td>Advanced Remote Sensing and Geospatial Analysis</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>GEOG 5401</td>
<td>Geography of Environmental Systems and Global Change</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>GEOG 5426</td>
<td>Climatic Variations</td>
<td>3.0 cr</td>
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<tr>
<td>GEOG 5431</td>
<td>Plant and Animal Geography</td>
<td>3.0 cr</td>
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<tr>
<td>GEOG 5531</td>
<td>Numerical Spatial Analysis</td>
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<tr>
<td>GEOG 5561</td>
<td>Principles of Geographic Information Science</td>
<td>4.0 cr</td>
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<tr>
<td>GEOG 5839</td>
<td>Introduction to Dendrochronology</td>
<td>3.0 cr</td>
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<tr>
<td>LAAS 5050</td>
<td>Integrated Topics in Land &amp; Atmospheric Science</td>
<td>3.0 cr</td>
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<tr>
<td>LAAS 5425</td>
<td>Atmospheric Processes: Thermodynamics and Dynamics of the Atmosphere</td>
<td>3.0 cr</td>
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<tr>
<td>LAAS 5426</td>
<td>Atmospheric Processes: Radiation, Composition, and Climate</td>
<td>3.0 cr</td>
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<tr>
<td>SOIL 4511</td>
<td>Field Study of Soils</td>
<td>2.0 cr</td>
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<tr>
<td>SOIL 5555</td>
<td>Wetland Soils</td>
<td>3.0 cr</td>
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<tr>
<td>SOIL 8510</td>
<td>Advanced Topics in Pedology</td>
<td>2.0 - 4.0 cr</td>
</tr>
<tr>
<td>SOIL 8541</td>
<td>Aquatic and Soil Chemistry</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

**Program Sub-plans**

Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters

Doctoral
Twin Cities Campus
Security Technologies M.S.S.T.
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Security Technologies Graduate Program, Technological Leadership Institute, University of Minnesota, 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455 (612-624-5474; fax: 612-624-7510)
Email: tliss@umn.edu
Website: http://tli.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 32
- This program requires summer semesters for timely completion.
- Degree: Master of Science in Security Technologies

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The master of science in security technologies (MSST) shapes tomorrow's analytical and risk management policy makers and innovators through a multi-disciplinary graduate program developed in response to growing demand in many levels of industry and government. During the 14-month program and through a multidisciplinary systems approach, the program synthesizes core learning in four areas: security methods and foundations; application expertise (including cyber, bio, food, infrastructure, global supply chains); systems science (interdependency among critical networks, components, human capital, organizational dimensions); and social and policy dimensions. Through elective courses, students also choose a learning track in either security systems technologies or security risk management. Students can further specialize through a range of elective courses. This program bridges disciplines to address local, regional, national, and global areas of need, seeding innovative capabilities while enabling interdisciplinary connections through direct links to industry, business, and government partners.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor’s degree in a related field, e.g. in biological or physical sciences, engineering, computer science, mathematics, statistics, social sciences, or public policy.

Other requirements to be completed before admission:
Applicants should have one year of calculus, probability/statistics, or two science or engineering courses.

Special Application Requirements:
Applications are accepted on a rolling basis for the program's start in the summer of each year. Additional information is available at msst.umn.edu.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
- MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).
For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan B: Plan B requires 26 major credits and 6 credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: The Plan B project is an independent applied investigation on a relevant issue in security technologies or homeland security.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

The MSST program requires 32 credits in the fields of systems risk analysis, engineering (hardware and software), emerging technologies, economics, human factors, law, food and bio safety, and public policy to teach and investigate security technologies and address pertinent issues. The 32 credits consist of 24 credits in MSST core courses, 2 credits for the capstone course, and 6 credits in electives outside the major.

Core Courses

Take 0.5 credits of ST 8440
ST 8109 - Cybersecurity Foundations - Technology, Risk & Communication (2.0 cr)
ST 8110 - Security Science and Technology Foundations (3.0 cr)
ST 8111 - Methods, Theory, and Applications (2.5 cr)
ST 8113 - Information and Cyber Security (2.0 cr)
ST 8220 - Vulnerability, Risk and Threat Assessment and Management (3.0 cr)
ST 8221 - Communications of Risk and Security (1.0 cr)
ST 8330 - Critical Infrastructure Protections (3.0 cr)
ST 8331 - Dynamic Systems Modeling and Simulation Tools (2.0 cr)
ST 8440 - Security Practicum (0.5 - 2.0 cr)
ST 8510 - Psychology/Behavior Intelligence for Homeland Security (2.0 cr)
ST 8511 - Public Policy (1.0 cr)
ST 8512 - Partnership in Conflict Management: Security/Privacy Law, Social Responsibility and Ethics (2.0 cr)

Capstone Project

Take a total of 2 credits
ST 8620 - Capstone (0.5 - 2.0 cr)

Electives

Other courses may be selected in consultation with the director of graduate studies.

Take 6 or more credit(s) from the following:

• CI 5301 - Foundations of Computer Applications for Business and Education (3.0 cr)
• CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
• CSCI 5271 - Introduction to Computer Security (3.0 cr)
• CSCI 5471 - Modern Cryptography (3.0 cr)
• CSCI 8715 - Spatial Data Science Research (3.0 cr)
• ESPM 5604 - Environmental Management Systems and Strategy (3.0 cr)
• FNRM 5131 - Geographical Information Systems (GIS) for Natural Resources (4.0 cr)
• GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
• GEOG 5563 - Advanced Geographic Information Science (3.0 cr)
• GEOG 5564 - Urban Geographic Information Science and Analysis (3.0 cr)
• GIS 5574 - Web GIS and Services (3.0 cr)
• GIS 5577 - Spatial Database Design and Administration (3.0 cr)
• IDSC 6040 - Information Technology Management (2.0 cr)
• IDSC 6050 - Information Technologies and Solutions (2.0 cr)
• IDSC 6423 - Enterprise Systems (2.0 cr)
• IDSC 6444 - Business Analytics for Managers I (2.0 cr)
• IDSC 6481 - Managerial Decision Making (2.0 cr)
• IDSC 8003 - Accounting and Information Systems (4.0 cr)
• LAW 6022 - LL.M. Legal Writing and Legal Skills II (3.0 cr)
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>LAW 6103</td>
<td>Data Privacy Law</td>
<td>3.0 cr</td>
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<tr>
<td>LAW 6705</td>
<td>Information Governance</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>LAW 6832</td>
<td>Cybercrime and Cybersecurity</td>
<td>2.0 cr</td>
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<tr>
<td>MATH 5248</td>
<td>Cryptology and Number Theory</td>
<td>4.0 cr</td>
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<tr>
<td>MATH 5251</td>
<td>Error-Correcting Codes, Finite Fields, Algebraic Curves</td>
<td>4.0 cr</td>
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<td>MGMT 6094</td>
<td>Negotiation Strategies</td>
<td>2.0 cr</td>
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<tr>
<td>MGMT 6034</td>
<td>Strategic Leadership</td>
<td>2.0 cr</td>
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<tr>
<td>MGMT 6084</td>
<td>Management of Groups</td>
<td>2.0 cr</td>
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<tr>
<td>MGMT 6402</td>
<td>Integrative Leadership: From Theory to Practice</td>
<td>3.0 cr</td>
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<tr>
<td>OLPD 5611</td>
<td>Facilitation and Meeting Skills</td>
<td>1.0 cr</td>
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<tr>
<td>OLPD 5619</td>
<td>Planning and Decision-Making Skills</td>
<td>1.0 cr</td>
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<td>OLPD 6402</td>
<td>Integrative Leadership Seminar</td>
<td>3.0 cr</td>
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<tr>
<td>PA 5011</td>
<td>Management of Organizations</td>
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<td>PA 5105</td>
<td>Integrative Leadership Seminar</td>
<td>3.0 cr</td>
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<tr>
<td>PA 5405</td>
<td>Public Policy Implementation</td>
<td>3.0 cr</td>
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<tr>
<td>PA 5701</td>
<td>Science and State</td>
<td>3.0 cr</td>
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<tr>
<td>PA 5711</td>
<td>Science, Technology &amp; Environmental Policy</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>PA 5741</td>
<td>Risk, Resilience and Decision Making</td>
<td>1.5 cr</td>
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<tr>
<td>PA 5822</td>
<td>International Security</td>
<td>3.0 cr</td>
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<tr>
<td>PA 8201</td>
<td>Environment and Infrastructure Planning</td>
<td>4.0 cr</td>
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<tr>
<td>PA 8821</td>
<td>National Security Policy</td>
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<td>POL 5885</td>
<td>International Conflict and Security</td>
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<td>POL 8402</td>
<td>International Security</td>
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<tr>
<td>PUBH 5231</td>
<td>Emergency Preparedness: A Public Health Perspective</td>
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<td>PUBH 6112</td>
<td>Environmental Health Risk Assessment: Application</td>
<td>2.0 cr</td>
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<tr>
<td>PUBH 6123</td>
<td>Violence Prevention and Control: Theory, Research,</td>
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<tr>
<td>PUBH 6182</td>
<td>Emerging Infectious Disease: Current Issues, Policies,</td>
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<td>PUBH 6571</td>
<td>Leading Performance Improvement in Health Care</td>
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<td>PUBH 6702</td>
<td>Integrative Leadership Seminar</td>
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<td>PUBH 7214</td>
<td>Principles of Risk Communication</td>
<td>1.0 cr</td>
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<tr>
<td>PUBH 7221</td>
<td>Planning for Urgent Threats</td>
<td>1.0 cr</td>
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<tr>
<td>PUBH 7223</td>
<td>Concepts of Disaster Behavioral Health</td>
<td>1.0 cr</td>
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<tr>
<td>PUBH 7225</td>
<td>Communication and Information Technology Tools</td>
<td>1.0 cr</td>
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<tr>
<td>PUBH 7227</td>
<td>Incident Management Systems: The Public Health Role</td>
<td>1.0 cr</td>
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<tr>
<td>PUBH 7230</td>
<td>Topics in Infectious Disease</td>
<td>0.5 - 4.0 cr</td>
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<tr>
<td>PUBH 7233</td>
<td>Food System Defense: Vulnerabilities in the Food</td>
<td>1.5 cr</td>
</tr>
<tr>
<td>PUBH 7242</td>
<td>War and Public Health</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>SCO 6059</td>
<td>Quality Management and Lean Six Sigma</td>
<td>4.0 cr</td>
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<tr>
<td>SCO 8892</td>
<td>Readings in Operations and Management Science</td>
<td>1.0 - 8.0 cr</td>
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<tr>
<td>SOC 8412</td>
<td>Social Network Analysis: Theory and Methods</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>ST 8200</td>
<td>Special Topics in Security Technologies</td>
<td>0.5 cr</td>
</tr>
<tr>
<td>ST 8441</td>
<td>Internship (optional)</td>
<td>0.5 cr</td>
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<tr>
<td>VMED 5920</td>
<td>Food Defense: Prepare, Respond, Recover</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>WRIT 5001</td>
<td>Introduction to Graduate Studies in Scientific and</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>WRIT 5112</td>
<td>Information Design: Theory and Practice</td>
<td>3.0 cr</td>
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<tr>
<td>WRIT 5561</td>
<td>Editing and Style for Technical Communicators</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

**Special Topics Electives**

The following electives are topics courses. Only the approved topic titles below may be used.

- CSCI 5980 - Computation Geo-Informatics (3 credits)
- HIST 5900 - European Nationalism and National Identity (3 credits)
- IDSC 6490 - Information-Based Goods in the Network Economy (2 credits)
- PA 5190 - Managing Conflict: Negotiation (3 credits)
- PA 5890 - International Crisis Simulation (1 credit)
- PA 5920 - Action-Oriented Strategy Mapping (1 credit)
- PA 5920 - Assessing Leadership Capability (1 credit)
- PA 5920 - Stakeholder/SWOT Analysis and Casual Mapping (0.5 credits)
- PA 5790 - Risk Analysis for Science and Technology Policy (3 credits)
- PUBH 7200 - Best Practices in Emergency Response (1 credit)
- PUBH 7200 - Data Driven Decision-Making (1 credit)
- PUBH 7200 - Design for Disaster (1 credit)
- PUBH 7200 - Disaster 101 (1 credit)
- PUBH 7200 - Epidemiology of Foodborne Pathogens (1 credit)
- PUBH 7200 - Farm to Table Study Program (2 credits)
- PUBH 7200 - Food Defense: Vulnerabilities in Food System and How to Close Them (1 credit)
- PUBH 7200 - Food Facility Bio-Security: Cleaning and Sanitation for Food Facilities (1 credit)

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Information current as of August 31, 2018
PUBH 7200 - Food Systems Biosecurity Action Planning (1.5 credits)
PUBH 7200 - Using Risk Analysis Tools: Estimating Food Safety Risks on the Farm to Table Continuum (1 credit)
Twin Cities Campus
Security Technologies Minor
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Security Technologies Graduate Program, Technological Leadership Institute, University of Minnesota, 290 McNamara Alumni Center, 200 Oak Street SE, Minneapolis MN 55455 (612-624-5474; fax: 612-624-7510)
Email: tliss@umn.edu
Website: http://tli.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2018
• Length of program in credits (Masters): 7
• Length of program in credits (Doctorate): 12
• This program does not require summer semesters for timely completion.

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The security technologies graduate program shapes tomorrow's analytical and risk management policy makers and innovators through a multi-disciplinary graduate program developed in response to growing demand in many levels of industry and government. Through a multidisciplinary systems approach, the program synthesizes core learning in four areas: security methods and foundations; application expertise (including cyber, bio, food, infrastructure, global supply chains); systems science (interdependency among critical networks, components, human capital, organizational dimensions); and social and policy dimensions. Through elective courses, students choose a learning track in either security systems technologies or security risk management. Students can further specialize through a range of elective courses. This program bridges disciplines to address local, regional, national, and global areas of need, seeding innovative capabilities while enabling interdisciplinary connections through direct links to industry, business, and government partners.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Special Application Requirements:
Applicants for the minor must be enrolled in a degree program at the University of Minnesota and must be interviewed for admission (in person or by telephone) by the DGS or designate, except in rare circumstances where this requirement may be waived.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Program Sub-plans
Students are required to complete one of the following sub-plans.
Students may not complete the program with more than one sub-plan.

Masters
Minor Courses
Take 7 or more credit(s) from the following:
• ST 8109 - Cybersecurity Foundations - Technology, Risk & Communication (2.0 cr)
• ST 8110 - Security Science and Technology Foundations (3.0 cr)
• ST 8111 - Methods, Theory, and Applications (2.5 cr)
• ST 8113 - Information and Cyber Security (2.0 cr)
• ST 8200 - Special Topics in Security Technologies (0.5 cr)
• ST 8220 - Vulnerability, Risk and Threat Assessment and Management (3.0 cr)
• ST 8221 - Communications of Risk and Security (1.0 cr)
• ST 8330 - Critical Infrastructure Protections (3.0 cr)
• ST 8331 - Dynamic Systems Modeling and Simulation Tools (2.0 cr)
• ST 8440 - Security Practicum (0.5 - 2.0 cr)
• ST 8510 - Psychology/Behavior Intelligence for Homeland Security (2.0 cr)
• ST 8511 - Public Policy (1.0 cr)
• ST 8512 - Partnership in Conflict Management: Security/Privacy Law, Social Responsibility and Ethics (2.0 cr)
• ST 8661 - Securing Cyberspace (Fundamentals) (3.0 cr)

Doctoral

Minor Courses
Take 12 or more credit(s) from the following:
• ST 8109 - Cybersecurity Foundations - Technology, Risk & Communication (2.0 cr)
• ST 8110 - Security Science and Technology Foundations (3.0 cr)
• ST 8111 - Methods, Theory, and Applications (2.5 cr)
• ST 8113 - Information and Cyber Security (2.0 cr)
• ST 8200 - Special Topics in Security Technologies (0.5 cr)
• ST 8220 - Vulnerability, Risk and Threat Assessment and Management (3.0 cr)
• ST 8221 - Communications of Risk and Security (1.0 cr)
• ST 8330 - Critical Infrastructure Protections (3.0 cr)
• ST 8331 - Dynamic Systems Modeling and Simulation Tools (2.0 cr)
• ST 8440 - Security Practicum (0.5 - 2.0 cr)
• ST 8510 - Psychology/Behavior Intelligence for Homeland Security (2.0 cr)
• ST 8511 - Public Policy (1.0 cr)
• ST 8512 - Partnership in Conflict Management: Security/Privacy Law, Social Responsibility and Ethics (2.0 cr)
• ST 8661 - Securing Cyberspace (Fundamentals) (3.0 cr)
Twin Cities Campus
Software Engineering M.S.S.E.
Computer Science and Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
MSSE Program, Department of Computer Science and Engineering, College of Science and Engineering, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612-625-1381; msse@umn.edu)
Email: mssee@cs.umn.edu
Website: http://www.msse.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Software Engineering

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Master of Science in Software Engineering (MSSE) program provides a thorough understanding of the fundamental issues related to software development and the software development process. The MSSE curriculum provides a solid grounding in theoretical methods, principles, and tools, and an examination of fundamental software development issues and processes. These concepts are explored using realistic and relevant case examples and projects to ensure that the theory works in practice. The MSSE program is an interdisciplinary program administered by the College of Science and Engineering's Department of Computer Science and Engineering.

The program is offered in a format designed for full-time working professionals. Students take courses one day per week (alternating Fridays and Saturdays) and move through the curriculum as a cohort, taking all classes together for four semesters.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

Prospective students should have an undergraduate degree in computer science or a closely related field.

Other requirements to be completed before admission:
Students with degrees in other fields may be considered for admission based on relevant work experience.

Prospective applicants must have a minimum of one year of professional experience working in the software industry.

Because the MSSE program is designed for full-time working professionals, international applicants typically hold an H-1B visa.

Special Application Requirements:
The early application deadline is March 31. The final deadline is July 1. Applications are accepted for fall semester only. Additional information is available at http://www.msse.umn.edu/how-to-apply

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS

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Information current as of August 31, 2018
- Total Score: 6.5
- MELAB
- Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

**Program Requirements**

**Plan C:** Plan C requires 30 major credits and up to null credits outside the major. There is no final exam.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The MSSE requires 30 credits. The curriculum is fixed for the first three semesters. The fourth semester offers electives, including an optional independent project. Students take eight core courses, two industrial seminar courses, and 2 elective courses. The project requirement can be met by a combination of class projects or by an independent project elective.

**Core Courses**

- **SENG 5115** - Graphical User Interface Design, Evaluation, and Implementation (2.0 cr)
- **SENG 5707** - The Principles of Database Systems (3.0 cr)
- **SENG 5801** - Software Engineering I: Overview, Requirements, and Modeling (3.0 cr)
- **SENG 5802** - Software Engineering II: Software Design (3.0 cr)
- **SENG 5811** - Software Testing and Verification (2.0 cr)
- **SENG 5851** - Software Project Management (3.0 cr)
- **SENG 5852** - Quality Assurance and Process Improvement (3.0 cr)
- **SENG 5861** - Introduction to Software Architecture (3.0 cr)

**Industrial Seminar**

- Take twice for a total of 2 credits
- **SENG 5899** - Software Engineering Seminar (1.0 cr)

**Electives**

- Choose a minimum of 6 credits in SENG electives in consultation with adviser

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Information current as of August 31, 2018
Twin Cities Campus
Stream Restoration Science and Engineering Postbaccalaureate Certificate
CSENG Civil, Envrn & Geo-Eng (CEGE)
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Stream Restoration Graduate Certificate Program, National Center for Earth-surface Dynamics, Saint Anthony Falls Laboratory, 2 Third Avenue SE, Minneapolis, MN 55414 (612-624-4363)
Email: volle001@umn.edu
Website: http://www.nced.umn.edu/apply-certificate-program-stream-restoration

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2018
- Length of program in credits: 16
- This program does not require summer semesters for timely completion.
- Degree: Stream Rest. Science & Engineering PBacc Cert

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The postbaccalaureate certificate in stream restoration science and engineering is a three-semester program producing graduates who understand how to blend engineering, physical, biological, and social sciences in prioritizing, designing, implementing, and evaluating stream restoration projects. Two courses, including an introduction to stream restoration and a restoration design experience are required. The remaining courses are chosen from a specified list of relevant courses taught across a number of University departments.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree in a field related to ecology, civil engineering, or environmental and earth sciences from an accredited US institution or its foreign equivalent.

Other requirements to be completed before admission:
In addition to the University's online application form, students must submit a program application and one letter of reference. The SRSE program application form and directions for submission can be found at nced.umn.edu/apply-certificate-program-stream-restoration.

Applications are accepted throughout the year.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
• MELAB
  - Final score: 80

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.
Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

Required Coursework
Foundation Course
The foundation course is also offered as EEB/ESCI 8601. Students pursuing a degree in earth sciences, civil engineering, or ecology, evolution and behavior should register for the foundation course under a designator other than that of their major.

CEGE 8601 - Introduction to Stream Restoration (3.0 cr)

Elective Coursework
Take 11 or more credit(s) from the following:

River and Floodplain Science and Engineering
Take 1 or more course(s) from the following:
• BBE 5513 - Watershed Engineering (3.0 cr)
• BBE 8513 - Hydrologic Modeling of Small Watersheds (3.0 cr)
• CEGE 4511 - Hydraulic Structures (3.0 cr)
• CEGE 4512 - Open Channel Hydraulics (4.0 cr)
• CEGE 4501 - Hydrologic Design (4.0 cr)
• CEGE 8511 - Mechanics of Sediment Transport (3.0 cr)
• FNRM 5114 - Hydrology and Watershed Management (3.0 cr)
• FNRM 5153 - Forest Hydrology & Watershed Biogeochemistry (3.0 cr)
• ESCI 4701 - Geomorphology (4.0 cr)

River and Floodplain Ecology
• CEGE 8508 - Ecological Fluid Mechanics (4.0 cr)
• EEB 5601 - Limnology (3.0 cr)
• FW 8465 - Fish Habitats and Restoration (3.0 cr)
• FW 8459 - Stream and River Ecology (3.0 cr)
• HORT 5071 - Ecological Restoration (4.0 cr)

Water Quality
• CEGE 5541 - Environmental Water Chemistry (3.0 cr)
• CEGE 8541 - Aquatic Chemistry (3.0 cr)
• CEGE 8561 - Analysis and Modeling of Aquatic Environments I (3.0 cr)
• CEGE 8562 - Analysis and Modeling of Aquatic Environments II (3.0 cr)
• ESCI 4702 - General Hydrogeology (4.0 cr)
• ESPM 5111 - Hydrology and Water Quality Field Methods (3.0 cr)

Water Policy and Management
Take at most 4 credit(s) from the following:
• ESPM 4295W - GIS in Environmental Science and Management [WI] (4.0 cr)
• ESPM 5061 - Water Quality and Natural Resources (3.0 cr)
• ESPM 5202 - Environmental Conflict Management, Leadership, and Planning (3.0 cr)
• ESPM 5703 - Agroforestry in Watershed Management (3.0 cr)
• WRS 5101 - Water Policy (3.0 cr)

Capstone Course
The capstone course is also offered as EEB/ESCI 8602. Students pursuing a degree in earth sciences, civil engineering, or ecology, evolution and behavior should register for the capstone course under a designator other than that of their major.

CEGE 8602 - Stream Restoration Practice (2.0 cr)
Twin Cities Campus
Comparative and Molecular Biosciences M.S.
College of Veterinary Medicine - Adm
College of Veterinary Medicine

Link to a list of faculty for this program.

Contact Information:
College of Veterinary Medicine, 1365 Gortner Avenue, Room 443 VMC, Saint Paul, MN 55108 (612-625-3770; fax: 612-626-2825)
Email: cvmmsphd@umn.edu
Website: http://www.cvm.umn.edu/cmb

• Program Type: Master's
• Requirements for this program are current for Fall 2018
• Length of program in credits: 30
• This program requires summer semesters for timely completion.
• Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The mission of the Comparative and Molecular Biosciences (CMB) program is to train outstanding scientists in the basic mechanisms of animal and human health and disease. The CMB program embraces a One Health approach and investigates a wide range of species, including humans, laboratory animals, companion animals, and livestock species.

The CMB program is transdisciplinary, bringing together basic, applied, and clinical scientists from a number of departments to provide students with individualized, cutting-edge biomedical research training. Areas of emphasis include genetic and infectious diseases, and comparative aspects of biology and pathology across animal species and humans. Students receive scientific training that prepares them for careers as independent investigators and educators in academia, industry, and government.

The purpose of the master's degree is to provide technical training and scientific competence in the basic mechanisms of animal and human health and disease.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.25.

A bachelor's degree in a biological or basic science is required. Previous laboratory experience is strongly preferred.

Other requirements to be completed before admission:
Applicants must submit a C.V. or résumé; three letters of recommendation from persons familiar with their scholarship and research potential; and a statement of any research experience, as well as career interests, goals, and objectives.

Special Application Requirements:
Submission of all application materials by December 1 is required to ensure consideration for fall semester admission.

Applicants must submit their test score(s) from the following:
• GRE

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
• IELTS
  - Total Score: 6.5
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The M.S. requires a minimum of 20 course credits and 10 thesis credits. The 20 course credits include 11 credits from CMB courses. A statistics course is required. A minimum of 5 additional course credits from the biological sciences are also required. A minimum GPA of at least 3.0 is required to maintain satisfactory progress and to graduate.

CMB Program Courses

A minimum of 11 course credits are required. CMB 8550 must be taken twice.
- **CMB 8134** - Ethical Conduct of Animal Research (3.0 cr)
- **CMB 8202** - Mechanisms of Animal Health and Disease II (3.0 cr)
- **CMB 8303** - Comparative Models of Disease (2.0 cr)
- **CMB 8550** - Comparative and Molecular Biosciences Seminar (1.0 cr)
- **CMB 8560** - Research and Literature Reports (1.0 cr)

Statistics

One of the following statistics courses is required.
- **CMB 5200** - Statistical Genetics and Genomics (4.0 cr)
- **or CMB 8910** - Statistical Principles of Research Design (3.0 cr)
- **or PUBH 6450** - Biostatistics I (4.0 cr)
- **or PUBH 6451** - Biostatistics II (4.0 cr)
- **or STAT 5021** - Statistical Analysis (4.0 cr)
- **or STAT 5031** - Statistical Methods for Quality Improvement (4.0 cr)
- **or STAT 5302** - Applied Regression Analysis (4.0 cr)
- **or STAT 5303** - Designing Experiments (4.0 cr)
- **or STAT 5421** - Analysis of Categorical Data (3.0 cr)

Additional courses

A minimum of 5 course credits required, primarily from the biological sciences. These courses can be selected from the following list or in consultation with the advisor.
- **MICA 8002** - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- **or MICA 8003** - Immunity and Immunopathology (4.0 cr)
- **or MICA 8004** - Cellular and Cancer Biology (4.0 cr)
- **or MICA 8009** - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
- **or MICA 8010** - Microbial Pathogenesis (3.0 cr)
- **or BIOC 5361** - Microbial Genomics and Bioinformatics (3.0 cr)
- **or BIOC 6021** - Biochemistry (3.0 cr)
- **or BIOC 8002** - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- **or BIOC 8216** - Signal Transduction and Gene Expression (3.0 cr)
- **or GCD 5036** - Molecular Cell Biology (3.0 cr)
- **or GCD 8008** - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- **or GCD 8073** - Genetics & Genomics in Human Health (3.0 cr)
- **or GCD 8131** - Advanced Molecular Genetics and Genomics (3.0 cr)
- **or GCD 8151** - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- **or GCD 8161** - Advanced Cell Biology and Development (3.0 cr)
or CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
or CMB 5571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or CMB 5594 - Directed Research in Comparative and Molecular Biosciences (1.0 - 4.0 cr)
or CMB 5910 - Grantwriting: What Makes a Winning Proposal? (2.0 cr)
or CMB 8208 - Neuropsychopharmacology (3.0 cr)
or CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
or CMB 8361 - Neuro-Immune Interactions (3.0 cr)
or CMB 8371 - Mucosal Immunobiology (3.0 cr)
or CMB 8481 - Advanced Neuropharmaceutics (4.0 cr)
or CMB 8571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
Twin Cities Campus
Comparative and Molecular Biosciences Ph.D.
College of Veterinary Medicine - Adm
College of Veterinary Medicine

Link to a list of faculty for this program.

Contact Information:
College of Veterinary Medicine, 1365 Gortner Avenue, Room 443 VMC, Saint Paul, MN 55108 (612-625-3770; fax: 612-626-2825)
Email: cvmmsphd@umn.edu
Website: http://www.cvm.umn.edu/cmb

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The mission of the Comparative and Molecular Biosciences (CMB) program is to train outstanding scientists in the basic mechanisms of animal and human health and disease. The CMB program embraces a One Health approach and investigates a wide range of species, including humans, laboratory animals, companion animals, and livestock species. The CMB program is transdisciplinary, bringing together basic, applied, and clinical scientists from a number of departments to provide students with individualized, cutting-edge biomedical research training. Areas of emphasis include genetic and infectious diseases, and comparative aspects of biology and pathology across animal species and humans. Students receive scientific training that prepares them for careers as independent investigators and educators in academia, industry, and government.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.25.

A bachelor's degree in a biological or basic science is required. Previous research experience is expected but not required.

Other requirements to be completed before admission:
Applicants must submit a C.V. or résumé; three letters of recommendation from persons familiar with their scholarship and research potential; and a statement of any research experience, as well as career interests, goals, and objectives.

Special Application Requirements:
Submission of all application materials by December 1 is required to ensure consideration for admission, fellowships, and research assistantships awarded for the next academic year. https://www.vetmed.umn.edu/education-training/ms-phd-programs/ms-phd-comparative-and-molecular-biosciences

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB

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Information current as of August 31, 2018
The preferred English language test is Test of English as Foreign Language (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

The PhD requires a minimum of 24 course credits and 24 thesis credits. The 24 course credits include 15 credits of CMB program courses. A statistics course is required. A minimum of 6 additional course credits from the biological sciences are also required. In addition, all students are required to complete a teaching experience. A minimum GPA of at least 3.00 is required to maintain satisfactory progress and to graduate.

CMB program courses
A minimum of 15 course credits are required. CMB 8100 must be taken twice and CMB 8550 must be taken twice.

- CMB 5910 - Grantwriting: What Makes a Winning Proposal? (2.0 cr)
- CMB 8100 - Research Rotation in Comparative and Molecular Biosciences (1.0 cr)
- CMB 8134 - Ethical Conduct of Animal Research (3.0 cr)
- CMB 8202 - Mechanisms of Animal Health and Disease II (3.0 cr)
- CMB 8303 - Comparative Models of Disease (2.0 cr)
- CMB 8550 - Comparative and Molecular Biosciences Seminar (1.0 cr)
- CMB 8560 - Research and Literature Reports (1.0 cr)

Statistics
One of the following statistics courses is required.

- CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
- CMB 8910 - Statistical Principles of Research Design (3.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5031 - Statistical Methods for Quality Improvement (4.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)

Additional courses
A minimum of 6 course credits are required, selected from the following list or in consultation with the advisor. Students may take GRAD 8101 OR GRAD 8200 but not both.

- MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
- MICA 8003 - Immunity and Immunopathology (4.0 cr)
- MICA 8004 - Cellular and Cancer Biology (4.0 cr)
- MICA 8009 - Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death (2.0 cr)
- MICA 8010 - Microbial Pathogenesis (3.0 cr)
- BIOC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
- BIOC 6021 - Biochemistry (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
- GCD 5036 - Molecular Cell Biology (3.0 cr)
- GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
or GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
or CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
or CMB 5571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or CMB 8208 - Neuropsychopharmacology (3.0 cr)
or CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
or CMB 8361 - Neuro-Immune Interactions (3.0 cr)
or CMB 8371 - Mucosal Immunobiology (3.0 cr)
or CMB 8394 - Research in Comparative Biomedical Sciences (1.0 - 6.0 cr)
or CMB 8481 - Advanced Neuropharmaceutics (4.0 cr)
or CMB 8571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or GRAD 8101 - Teaching in Higher Education (3.0 cr)
or GRAD 8200 - Teaching and Learning Topics in Higher Education (1.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits
CMB 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
Twin Cities Campus
Veterinary Medicine M.S.
College of Veterinary Medicine - Adm
College of Veterinary Medicine

Link to a list of faculty for this program.

Contact Information:
College of Veterinary Medicine, 1365 Gortner Avenue, Room 443 VMC, Saint Paul, MN 55108 (612-625-3770; fax: 612-626-2825)
Email: cvmmsphd@umn.edu
Website: http://www.vetmed.umn.edu/education-training/ms-phd-programs

- Program Type: Master's
- Requirements for this program are current for Fall 2018
- Length of program in credits: 30
- This program requires summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The veterinary medicine graduate program focuses on the scientific study of the mechanisms of transmission and progression of diseases of importance to domestic animals, wildlife and humans with applications to diagnosis, prevention, and treatment. Includes training in infectious and noninfectious disease, epidemiology, environmental biology, ethology, anatomical, clinical and molecular pathobiology.

Accreditation
This program is accredited by NA

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.25.

DVM or equivalent; students with a BA or BS in biological sciences may be considered. Previous laboratory experience is preferred.

Other requirements to be completed before admission:
Applicants must submit a CV or résumé, three letters of recommendation from persons familiar with their scholarship and research potential, and a statement of any research experience, as well as career interests, goals, and objectives.

Special Application Requirements:
Submission of all application materials by December 1 is required to ensure consideration for admission, fellowships, and research assistantships awarded for the next academic year.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5
- MELAB
  - Final score: 80
The preferred English language test is Test of English as Foreign Language.

Key to test abbreviations (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements

Plan A: Plan A requires 20 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is written and oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

VMED Program Courses

Take the following courses for 9 credits. VMED 8550 must be taken twice.

VMED 5190 - Seminar and Presentation Development (2.0 cr)
VMED 5910 - Grant Writing: What Makes a Winning Proposal? (2.0 cr)
VMED 8134 - Ethical Conduct of Animal Research (3.0 cr)
VMED 8550 - Veterinary Medicine Seminar (1.0 cr)

Statistics

Take at least one statistics course. Two courses are recommended.

VMED 8910 - Statistical Principles of Research Design (3.0 cr)
or PUBH 6414 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or STAT 5031 - Statistical Methods for Quality Improvement (4.0 cr)
or STAT 5302 - Applied Regression Analysis (4.0 cr)
or STAT 5303 - Designing Experiments (4.0 cr)
or STAT 5421 - Analysis of Categorical Data (3.0 cr)

8000-level courses

Take at least one additional 8000-level course in the biological sciences, in consultation with the advisor. CMB 8202 is recommended.

BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
or BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
or GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
or GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
or GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
or CMB 8202 - Mechanisms of Animal Health and Disease II (3.0 cr)
or CMB 8303 - Comparative Models of Disease (2.0 cr)
or CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
or CMB 8571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or VMED 8192 - Dairy Health Management: Critical Thinking (3.0 cr)
or VMED 8193 - Welfare of Farmed Animals (1.0 cr)
or VMED 8394 - Research in Veterinary Medicine (1.0 - 3.0 cr)
or VMED 8492 - Seminar: Infectious Diseases and Swine Medicine (1.0 cr)
or VMED 8592 - Infectious Disease Journals: Critical Thinking (1.0 cr)

Additional biological sciences coursework

Take at least 7 additional course credits, in consultation with the advisor.

VPM 4131 - Immunology (3.0 cr)
or VMED 5165 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)
or VMED 5180 - Ecology of Infectious Disease (3.0 cr)
or VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)
or VMED 5182 - Molecular biology for the Public Health Professional (2.0 cr)
or VMED 5190 - Seminar and Presentation Development (2.0 cr)

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or VMED 5442 - Quantitative Methods for Population Health (3.0 cr)
or VMED 5594 - Research in Veterinary Medicine (1.0 - 4.0 cr)
or VMED 5910 - Grant Writing: What Makes a Winning Proposal? (2.0 cr)
or VMED 5920 - Food Defense: Prepare, Respond, Recover (3.0 cr)
or VMED 5921 - Seminar in Food Protection and Defense (1.0 cr)
or CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
or CMB 5571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
or PUBH 6342 - Epidemiologic Methods II (3.0 cr)
or PUBH 6343 - Epidemiologic Methods III (4.0 cr)
or PUBH 6350 - Epidemiologic Methods III: Lab (1.0 cr)
or PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)
or BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
or BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
or GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
or GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
or GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
or GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
or GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
or CMB 8202 - Mechanisms of Animal Health and Disease II (3.0 cr)
or CMB 8303 - Comparative Models of Disease (2.0 cr)
or CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
or CMB 8571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
or VMED 8192 - Dairy Health Management: Critical Thinking (1.0 cr)
or VMED 8193 - Welfare of Farmed Animals (1.0 cr)
or VMED 8394 - Research in Veterinary Medicine (1.0 - 3.0 cr)
or VMED 8492 - Seminar: Infectious Diseases and Swine Medicine (1.0 cr)
or VMED 8592 - Infectious Disease Journals: Critical Thinking (1.0 cr)
or VMED 5440 - Using Risk Analysis Tools: Estimating Food Safety Risks on the Farm to Table Continuum (2.0 cr)
**Twin Cities Campus**

**Veterinary Medicine Ph.D.**

*College of Veterinary Medicine - Adm*

**College of Veterinary Medicine**

Link to a list of faculty for this program.

**Contact Information:**
College of Veterinary Medicine, 1365 Gortner Avenue, Room 443 VMC, Saint Paul, MN 55108 (612-625-3770; fax: 612-626-2825)
Email: cvmmspdh@umn.edu
Website: [http://www.vetmed.umn.edu/education-training/ms-phd-programs](http://www.vetmed.umn.edu/education-training/ms-phd-programs)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2018
- Length of program in credits: 48
- This program requires summer semesters for timely completion.
- NO
- Degree: Doctor of Philosophy

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The veterinary medicine graduate program focuses on the scientific study of the mechanisms of transmission and progression of diseases of importance to domestic animals, wildlife and humans with applications to diagnosis, prevention, and treatment. Includes training in infectious and noninfectious disease, epidemiology, environmental biology, ethology, anatomical, clinical and molecular pathobiology.

**Accreditation**

This program is accredited by NA

**Program Delivery**

This program is available:
- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

The preferred undergraduate GPA for admittance to the program is 3.25.

DVM or equivalent; students with a BA or BS in biological sciences may be considered. Previous laboratory experience is preferred.

Other requirements to be completed before admission:
Applicants must submit a CV or résumé; three letters of recommendation from persons familiar with their scholarship and research potential; and a statement of any research experience, as well as career interests, goals, and objectives.

**Special Application Requirements:**
Submission of all application materials by December 1 is required to ensure consideration for fellowships and research assistantships awarded for the next academic year.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Paper Based - Total Score: 550
- IELTS
  - Total Score: 6.5
  - Reading Score: 6.5
  - Writing Score: 6.5

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• MELAB
  - Final score: 80

The preferred English language test is Test of English as Foreign Language

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
24 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

VMED Program Courses
Take the following courses for 9 credits. VMED 8550 must be taken twice.
- VMED 5190 - Seminar and Presentation Development (2.0 cr)
- VMED 5910 - Grant Writing: What Makes a Winning Proposal? (2.0 cr)
- VMED 8134 - Ethical Conduct of Animal Research (3.0 cr)
- VMED 8550 - Veterinary Medicine Seminar (1.0 cr)

Statistics Requirement
Take at least one statistics course, in consultation with the advisor. Two statistics courses are preferred.
- VMED 8910 - Statistical Principles of Research Design (3.0 cr)
  or PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)
  or PUBH 6451 - Biostatistics II (4.0 cr)
  or STAT 5021 - Statistical Analysis (4.0 cr)
  or STAT 5031 - Statistical Methods for Quality Improvement (4.0 cr)
  or STAT 5302 - Applied Regression Analysis (4.0 cr)
  or STAT 5303 - Designing Experiments (4.0 cr)
  or STAT 5421 - Analysis of Categorical Data (3.0 cr)

8000-Level Coursework Requirement
Take at least 3 8000-level biological sciences courses from the following list, or select others, in consultation with the advisor. CMB 8202 is recommended.
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
  or BIOC 8216 - Signal Transduction and Gene Expression (3.0 cr)
- GCD 8008 - Mammalian Gene Transfer and Genome Engineering (2.0 cr)
- GCD 8073 - Genetics & Genomics in Human Health (3.0 cr)
- GCD 8131 - Advanced Molecular Genetics and Genomics (3.0 cr)
- GCD 8151 - Cellular Biochemistry and Cell Biology (2.0 - 4.0 cr)
- GCD 8161 - Advanced Cell Biology and Development (3.0 cr)
- CMB 8100 - Research Rotation in Comparative and Molecular Biosciences (1.0 cr)
- CMB 8202 - Mechanisms of Animal Health and Disease II (3.0 cr)
- CMB 8303 - Comparative Models of Disease (2.0 cr)
- CMB 8344 - Mechanisms of Hormone Action (2.0 cr)
- CMB 8571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)
- VMED 8192 - Dairy Health Management: Critical Thinking (1.0 cr)
- VMED 8193 - Welfare of Farmed Animals (1.0 cr)
- VMED 8394 - Research in Veterinary Medicine (1.0 - 3.0 cr)
- VMED 8492 - Seminar: Infectious Diseases and Swine Medicine (1.0 cr)
- VMED 8592 - Infectious Disease Journals: Critical Thinking (1.0 cr)

Additional Coursework
Take additional courses from the following list, or select others in consultation with the advisor, to complete the minimum course credit
requirement.

VPM 4131 - Immunology (3.0 cr)

or VMED 5165 - Surveillance of Foodborne Diseases and Food Safety Hazards (2.0 cr)

or VMED 5180 - Ecology of Infectious Disease (3.0 cr)

or VMED 5181 - Spatial Analysis in Infectious Disease Epidemiology (3.0 cr)

or VMED 5182 - Molecular biology for the Public Health Professional (2.0 cr)

or VMED 5190 - Seminar and Presentation Development (2.0 cr)

or VMED 5442 - Quantitative Methods for Population Health (3.0 cr)

or VMED 5594 - Research in Veterinary Medicine (1.0 - 4.0 cr)

or VMED 5596 - Swine Diseases and Diagnostics (2.0 - 3.0 cr)

or VMED 5910 - Grant Writing: What Makes a Winning Proposal? (2.0 cr)

or VMED 5921 - Seminar in Food Protection and Defense (1.0 cr)

or CMB 5200 - Statistical Genetics and Genomics (4.0 cr)

or CMB 5571 - Pathogenomics and Molecular Epidemiology - Learning to Fly (3.0 cr)

or PUBH 6341 - Epidemiologic Methods I (3.0 cr)

or PUBH 6342 - Epidemiologic Methods II (3.0 cr)

or PUBH 6343 - Epidemiologic Methods III (4.0 cr)

or PUBH 6350 - Epidemiologic Methods III: Lab (1.0 cr)

or PUBH 6385 - Epidemiology and Control of Infectious Diseases (2.0 cr)

Thesis Credits
Take at least 24 doctoral thesis credits.

VMED 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)