Course Numbers, Symbols, and Abbreviations

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 online Class Schedule at onestop.umn.edu/registrar/registration/courses.html.

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.

Course description
Credit will not be granted if credit has been received for the course listed after this symbol.
Prerequisite information

Department
College
Course number
Course designator
Grading option
Course title
Course credits
ACCT 5101. Intermediate Accounting I. (4.0 cr.; A-F or Audit; prereq Grade of at least B- in 2050, mgmt major or mgmt grad student, accounting certificate, select non mgmt students; fall, spring, every year) Valuation, measurement, reporting issues related to selected assets/liabilities of firm. Theory underlying accounting issues. Applying accounting principles.

ACCT 5102W. Intermediate Accounting II. (4.0 cr.; A-F or Audit; prereq 5101 [mgmt or grad mgmt student]; fall, spring, every year) Basic valuation problems encountered in financial reporting. Focuses on valuation of liabilities. Accounting for leases, pensions, and deferred taxes. Introduces consolidated financial statements.

ACCT 5125. Auditing Principles and Procedures. (4.0 cr.; A-F or Audit; prereq [3101 or 5101 or 5100 or 6100], [acct major or grad mgmt student]; fall, spring, summer, every year) 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).

ACCT 5126. Internal Auditing. (2.0 cr.; A-F or Audit; prereq 2050; fall, spring, every year) Financial/operational auditing. Standards. Managing the function.

ACCT 5135. Fundamentals of Federal Income Tax. (4.0 cr.; A-F or Audit; prereq [2050 or MBA 6030], [mgmt or grad mgmt student]; fall, spring, summer, every year) 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.

ACCT 5160. Financial Statement Analysis. (2.0 cr.; A-F or Audit; prereq [5100/6100 or 3101/5101], [accounting or finance major]; fall, spring, every year) Interpretation/analysis of financial statements. Introduces basic techniques of financial statement analysis and applies them in different settings (e.g., in investment/credit decisions).

ACCT 5180. Consolodations and Advanced Reporting. (2.0 cr.; A-F or Audit; prereq 5101, 5102W recommended; spring, every year) Theory underlying preparation of consolidated financial statements, as well as mechanical computations needed to prepare statements.

ACCT 5236. Introduction to Taxation of Business. (2.0 cr.; A-F or Audit; prereq 5135, acct major; fall, spring, every year) 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.

ACCT 5237. Foreign National Tax Consulting. (2.0 cr.; S-N only; prereq 5135, accounting major; spring, every year) Tax return preparation/consulting experience. Partnership between U, IRS, Minnesota State Department of Revenue to provide free tax help to foreign national students, researchers, and visiting professors. Students preparing tax returns for nonresident aliens use commercial tax preparation software.

ACCT 5281. Special Topics in Financial Reporting. (2.0 cr.; A-F or Audit; prereq 5101, 5102W recommended; summer, offered periodically) Covers areas of financial reporting frequently encountered on CPA exam, including partnerships, governmental/nonprofit organizations, bankruptcy, reorganizations.

ACCT 5310. International Accounting. (2.0 cr.; A-F or Audit; prereq 5101; [5102 or 5&5102 recommended]; fall, spring, every year) Causes/history 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.

ACCT 5320. Current Topics in Accounting. (2.0 cr.; S-N only; fall, spring, summer, every year) Topics vary.

ACCT 5420. MAcc directed study. (1.0-4.0 cr.; prereq MAcc student; fall, spring, summer, every year) Internship or directed study in Master of Accountancy degree program.

ACCT 8001. Internal Control. (4.0 cr.; A-F only; prereq MAcc grad major; fall, every year) Internal control from management's perspective. Application of COSO Internal Control - Integrated Framework and Enterprise Risk Management - Integrated Framework.


ACCT 8006. Advanced Audit. (4.0 cr.; A-F only; prereq MAcc student; spring, every year) Auditing of derivatives, business combinations, fair value instruments, and other accounting topics. Evaluating the discipline of forensic accounting.

ACCT 8800. Empirical Research: Topics. (2.0 cr. [max 4.0 cr.]; fall, spring, every year) Current research topics that are cutting-edge and in instructor's area of expertise. Topics vary.


ACCT 8802. Empirical Research-Capital Markets. (4.0 cr. [max 8.0 cr.]; prereq Business admin PhD student or #; fall, spring, odd years) Empirical capital markets research relating to earnings measurement/forecasting. Properties of earnings and earnings components, earnings quality (such as accrual quality and timeliness), earnings management, time-series and analyst forecasts of earnings, voluntary disclosure of accounting information and related regulatory impacts. Econometric issues.


ACCT 8811. Information Economics I. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) 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 8812. Information Economics II. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, every year) Information in capital markets; asset pricing with asymmetric information; economics of disclosure and information acquisition.


ADDS 5031. Applied Psychopharmacology. (2.0 cr.; A-F or Audit; fall, spring, every year) 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 5041. Methods and Models I: Motivational Counseling. (2.0 cr.; A-F or Audit; prereq 5021; fall, spring, summer, every year) Concepts of motivational interviewing. Spirit of MI. Primary counseling skills. Working with resistance. Identifying/eliciting change talk. Transitioning into change, negotiating treatment plan. Strengths/shortcoming of MI.

ADDS 5051. Methods and Models II: Cognitive Behavioral Therapy. (2.0 cr.; A-F or Audit; prereq 5021; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq ADDS 5021; fall, spring, every year) Designing/facilitating therapy groups. Intra-inter-personal dynamics, leadership skills, developmental issues. Application to therapy of chemically addicted individuals. Lectures, discussion, experiential exercises, small groups, readings.

ADDS 5071. Foundations of Co-occurring Disorders. (2.0 cr.; A-F or Audit; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; fall, spring, every year) 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 counselors and cultural competence in addiction counseling. People as individuals. Clinician's own cultural worldview/other cultural worldviews.

ADDS 5091. Assessment and Treatment Planning I. (3.0 cr.; A-F or Audit; prereq [5001 or 5011], 5021, [5003 or 5031]; fall, spring, summer, every year) Core addictions counseling. Clinical assessment, case management, documentation treatment planning, ethical issues. Students begin process of securing internship.

ADDS 5224. Integrating Spirituality in Counseling Practice. (2.0 cr.; A-F only; fall, spring, summer, every year) 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. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Special topics in addiction studies.

ADDS 5993. Directed Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq %; fall, spring, summer, every year) Directed study.

ADDS 5994. Directed Research. (1.0-3.0 cr. [max 9.0 cr.]; A-F only; prereq %; fall, spring, summer, every year) Directed research.

ADDS 5996. Internship in Substance Abuse Counseling. (1.0-8.0 cr.; S-N or Audit; prereq [5001 or 5011], [5021, 5003 or 5031], [5002 or 5041], [4001 or 5091]; fall, spring, summer, every year) Supervised field work experience. Practical application of substance abuse counseling. Assessment, treatment planning, case management.

ADPY 5515. Neuropsychology: University Hospitals. (3.0-9.0 cr.; O-N or Audit; fall, every year)

ADPY 8205. Special Assignments. (1.0-16.0 cr.; )

ADPY 8206. Research. (1.0-16.0 cr.; spring, summer, every year)

ADPY 8249. Clinical Neuropsychopharmacology. (1.0-15.0 cr.; prereq Resident status or 3rd- or 4th-yr med student or 8249 for grad students; ) 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; neurophysiology of sleep, prescription of hypnotics and sedatives, and significance of over-the-counter sleep aids; use of anorexiant, over-the-counter appetite suppressants, and opiate analogesics; geriatric psychopharmacology; classification of drug side effects and principles of drug interaction; abused drugs; and ethnopsychopharmacology.

ADPY 8970. Directed Studies. (1.0-24.0 cr.; spring, summer, every year)

Aerospace Engineering and Mechanics (AEM)


AEM 5251. Computational Fluid Mechanics. (3.0 cr.; A-F or Audit; prereq [4201 or equiv],
[CSci 1113 or equiv], [CSE upper div or grad student]; fall, every year
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.

AEM 5321. Modern Feedback Control. (3.0 cr.; prereq 4321 or EE 4231 or ME 5281 or equiv; fall, every year)
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] [infinity symbol] symmetric. Applications.

AEM 5333. Design-to-Flight: Small Uninhabited Aerial Vehicles. (3.0 cr.; A-F only; [-4202, 43030W, 4601 or equiv, ] #; spring, offered periodically)
Designing, assembling, modeling, simulating, testing/flying 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.

AEM 5401. Intermediate Dynamics. (3.0 cr.; A-F or Audit; prereq CSE upper div or grad, 2012, Math 2243; fall, every year)
Three-dimensional Newtonian mechanics, kinematics of rigid bodies, dynamics of rigid bodies, generalized coordinates, holonomic constraints, Lagrange equations, applications.

AEM 5431. Trajectory Optimization. (3.0 cr.; A-F or Audit; prereq 4321 or EE 4231 or ME 5281 or equiv; fall, spring, offered periodically)

AEM 5451. Optimal Estimation. (3.0 cr.; A-F or Audit; [EE 5251]; prereq [[MAT 2243 or STAT 3021 or equiv. [4321 or EE 4231 or ME 5281 or equiv.]| or #; fall, even years)
Basic probability theory. Batch/recurisive least squares estimation. Filtering of linear/nonlinear systems using Kalman and extended Kalman filters. Applications to sensor fusion, fault detection, and system identification.

AEM 5495. Topics in Aerospace Systems. (1.0-4.0 cr.; A-F or Audit; prereq %; fall, spring, summer, every year)
Topics of current interest. Individual projects with faculty sponsor.

AEM 5501. Continuum Mechanics. (3.0 cr.; prereq CSE upper div or grad, 3031, Math 2243 or equiv or #; fall, every year)
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.

AEM 5503. Theory of Elasticity. (3.0 cr.; A-F or Audit; prereq 4501 or equiv, Math 2263 or equiv or #; spring, every year)
Introductory 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.

AEM 5651. Aeroelasticity. (3.0 cr.; A-F or Audit; prereq 4202, 4301, [grad student and CSE upper div]; fall, every year)

AEM 8000. Seminar: Aerospace Engineering and Mechanics. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq DGS consent; fall, spring, every year)
To be determined

AEM 8201. Fluid Mechanics I. (3.0 cr.; prereq 4201 or equiv, Math 2263; fall, every year)
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.

AEM 8202. Fluid Mechanics II. (3.0 cr.; prereq 8201; spring, every year)
Analysis of compressible viscous flow; creeping flows; boundary layer flow.

AEM 8203. Fluid Mechanics III. (3.0 cr.; prereq 8202; fall, every year)
Analysis of compressible flow and shock waves; method of characteristics for one-dimensional unsteady flow and for two-dimensional steady flow.

AEM 8207. Hydrodynamic Stability. (3.0 cr. [max 4.0 cr.]; prereq 8201; )

AEM 8211. Theory of Turbulence I. (3.0 cr.; prereq 8202; )
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.

AEM 8212. Theory of Turbulence II. (3.0 cr.; prereq 8211; )
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.


AEM 8221. Rheological Fluid Mechanics. (3.0 cr.; prereq 8201 or 5501 or #; ) 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.

AEM 8231. Molecular Gas Dynamics. (3.0 cr.; EM 8361; prereq [4201 or equiv; [4203 or equiv; [ME 3324 or equiv; ] ] )

AEM 8241. Perturbation Methods in Fluid Mechanics. (3.0 cr.; prereq 8202 or #; )
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.

AEM 8251. Finite-Volume Methods in Computational Fluid Dynamics. (3.0 cr.; prereq 8201 or 8202 or equiv, CSci 1107 or equiv; spring, offered periodically)
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.

AEM 8253. Computational Methods in Fluid Mechanics. (3.0 cr.; A-F or Audit; prereq 4201; )

AEM 8261. Nonlinear Waves in Mechanics. (3.0 cr.; prereq 5501 or #; )
Theory of kinematic, hyperbolic, and dispersive waves, with application to traffic flow, gas dynamics, and water waves.

AEM 8271. Experimental Methods in Fluid Mechanics. (3.0 cr.; prereq 4201; #; )
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.
AEM 8295. Selected Topics in Fluid Mechanics. (1.0-4.0 cr. [max 8.0 cr.]; prereq %; fall, spring, summer, offered periodically) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

AEM 8400. Seminar: Aerospace Systems. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Aeroesp Eng grad student; fall, spring, every year) Developing program of research in aerospace systems. Discussions of current research/topics of interest.


AEM 8421. Robust Multivariable Control Design. (3.0 cr.; prereq 5321 or equiv; spring, offered periodically) Application of robust control theory to aerospace systems. Role of model uncertainty/modeling errors in design process. Control analysis and synthesis, including H[sub2] and H[infinity] symbol optimal control design and structural singular value [Greek letter mu] techniques.

AEM 8423. Convex Optimization Methods in Control. (3.0 cr.; A-F or Audit; prereq 5321 or EE 5231 or equiv; fall, offered periodically) Practical aspects of convex optimization methods applied to solve design/analysis problems in control theory.

AEM 8426. Optimization and System Sciences. (3.0 cr.; A-F or Audit; prereq 5321 or 5431, CSE grad student; fall, offered periodically) 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 dynamic systems.


AEM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

AEM 8451. System Identification: Theory and Applications. (3.0 cr.; A-F or Audit; prereq 4321 or equiv; spring, offered periodically) 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.

AEM 8495. Advanced Topics in Aerospace Systems. (1.0-4.0 cr. [max 9.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Individual student projects completed under guidance of a faculty sponsor.

AEM 8500. Research Seminar in Mechanics of Materials. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Seminars given by students, faculty, and visitors on topics drawn from current research.

AEM 8511. Advanced Topics in Continuum Mechanics. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq 5501 or #) 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.

AEM 8521. Advanced Topics in Elasticity. (3.0 cr.; A-F or Audit; prereq 5503,) Contact stresses, finite deformations, and other topics.

AEM 8523. Elastodynamics. (3.0 cr.; A-F or Audit; prereq 4581 or 5501 or #) 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.


AEM 8531. Fracture Mechanics. (3.0 cr.; A-F or Audit; prereq 5503 or #; fall, spring, offered periodically) 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.

AEM 8533. Theory of Plasticity. (3.0 cr.; prereq 5203 or #) Theory of permanent deformation of ductile metals; bilinear 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.

AEM 8541. Mechanics of Crystalline Solids. (3.0 cr.; prereq 5501 or #) 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.

AEM 8551. Multiscale Methods for Bridging Length and Time Scales. (3.0 cr.; A-F or Audit; prereq Basic knowledge of [continuum mechanics, atomic forces], familiarity with partial differential equations, grad student in [engineering or mathematics or physics];) Classical/emerging techniques for bridging length/time scales. Nonlinear thermoelasticity, viscoelastic 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.

AEM 8595. Selected Topics in Mechanics and Materials. (1.0-4.0 cr. [max 8.0 cr.]; prereq %; fall, spring, summer, every year) Includes individual student projects completed under guidance of a faculty sponsor.

AEM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) To be determined

AEM 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr required [Plan A only]; fall, spring, summer, every year) (No description)

AEM 8880. Plan B Project. (1.0-3.0 cr.; prereq Grad aerospace engineering or mechanics major, %; fall, spring, summer, every year) (No description)
AFRO 5101. Seminar: Introduction to Africa and the African Diaspora. (3.0 cr.; fall, spring, offered periodically) Comparative studies, related theories, and pivotal texts in study of Africa and African Diaspora.

AFRO 5103. World History and Africa. (3.0 cr.; A-F or Audit; [AFRO 3103]; prereq Grad student or #; fall, every 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/ethnographic works on Africa spanning nineteenth to twentieth century.


AFRO 5181W. Blacks in American Theatre. (3.0 cr.; [TH 5181W]; spring, offered periodically) Historical survey of significant events in the development of American black theater traditions. Essays, plays, playwrights, and theaters from early colonial references to the Black Arts Movement.

AFRO 5182. Contemporary Black Theatre: 1960-Present. (3.0 cr.; [TH 5182]; fall, even years) Essays, plays, playwrights, and theaters that have contributed significantly to contemporary black theater. From the beginning of the Black Arts movement to the present.

AFRO 5191. Seminar: The African American Experience in South Africa. (3.0 cr.; [HIST 5438]; fall, spring, offered periodically) 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. (3.0 cr.; [AFRO 4406]; spring, offered periodically) Critically examine spatiality of African descendant women in America/larger black diaspora. Writings from black feminist/queer geographies, history, contemporary cultural criticism. Recent black feminist theorizing.

AFRO 5551. Methods: Use of Oral Traditions as Resources for History. (3.0 cr.; ) Use of spoken information through time as a source for writing history. Use of canons of history to analyze and critique oral traditions and integrate them into written history.


AFRO 5627. Seminar: Harlem Renaissance. (3.0 cr.; [AFRO 3627, ARTH 3627, ENGL 5597]; prereq Grad student or #; fall, every year) 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."

AFRO 5864. Proseminar: African-American History. (3.0-4.0 cr.; prereq #; fall, spring, offered periodically) Examination of issues including slavery, Reconstruction, the Great Depression, and civil rights movement using cultural and intellectual history and autobiography/biography. Focuses on dynamics of race, gender, class, region, sexuality, and religion.

AFRO 5865. Proseminar: African-American History. (3.0-4.0 cr.; prereq #; fall, spring, offered periodically) Construction of a detailed research agenda, locating appropriate depositories of primary materials and secondary sources, and developing appropriate methodologies and frameworks.


AFRO 5876. Proseminar: Approaches to African Development. (3.0 cr.; fall, spring, offered periodically) Study, critical analysis, and comparison of primary documents relevant to African development.

AFRO 5910. Topics in African American and African Studies. (3.0 cr. [max 9.0 cr.]; fall, spring, summer, every year) Topics vary by instructor.

AFRO 5932. The Production of Knowledge, Negotiating the Past, and the Writing of African Histories. (3.0 cr.; A-F or Audit; [HIST 5932]; prereq Grad student or #; fall, spring, offered periodically) Recent scholarship on social history of Africa. Focuses on new literature on daily lives of ordinary people in their workplaces, communities, households.

AFRO 5993. Directed Study. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Guided individual reading/study for qualified seniors and graduate students.

AFRO 8202. Seminar: Intellectual History of Race. (3.0 cr.; fall, spring, every year) 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. (3.0 cr.; prereq #; fall, spring, every year) 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.

AFRO 8590. Figures in Contemporary Black Fiction. (3.0 cr. [max 9.0 cr.]; spring, every year) Each term focuses on works of an individual writer, such as Toni Morrison, Paule Marshall, and Jamaica Kincaid. Critical studies.

AFRO 8802. Seminar: Orientalism. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; fall, spring, every year) Topics specified in [Class Schedule].

Agricultural, Food, and Environmental Education (AFEE) College of Food, Agricultural and Natural Resource Sciences

AFEE 5111W. Agricultural Education: Methods of Teaching. (4.0 cr.; fall, every year) 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 Program Organization and Curriculum for Youth. (3.0 cr.; spring, every year) 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. (1.0 cr.; spring, every year)
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. (2.0 cr.; A-F or Audit; prereq Agricultural education major or #; spring, offered periodically) Principles/techniques to advise an FFA chapter. Historical/philosophical basis of FFA, organization/structure. Integration with classroom instruction, public relations, recruitment, and administration of FFA chapters.

AFEE 5220. Special Topics in Agriculture Education and Extension. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Content varies by offering.

AFEE 5231. Agricultural Education Curriculum K-12. (2.0 cr.; A-F or Audit; ) 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. (2.0 cr.; A-F or Audit; ) New developments in methodology; assessment of innovations and procedures; consideration of various levels of instruction.

AFEE 5235. Advanced Supervised Agricultural Experience Programs. (2.0 cr.; ) 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. (1.0-3.0 cr. ; fall, spring, offered periodically) 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 SAE development, school-to-work relationships.

AFEE 5290. Seminar: Current Issues in Agricultural Education and Extension. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Exploration of current issues in agricultural education and extension, strategies of response, implications of response actions, and related leadership roles.


AFEE 5415. Seminar: Teaching Commodity Marketing Strategies. (1.0 cr. [max 4.0 cr.]; A-F or Audit; ) Teaching commodity market planning to farmers and agricultural professionals. Development of marketing plans to enhance price and protect income. Introduction to tools to simulate implementation of plans against actual price scenarios.

AFEE 5697. Teaching Internship: School and Classroom Setting. (2.0 cr.; prereq WHRE 5696 for initial licensure program; fall, every year) 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.

AFEE 5698. Teaching Internship. (3.0-8.0 cr. ; prereq Admission to initial licensure program; spring, every year) Teaching experience in a school system that provides programs to grades 5-12.

AFEE 5993. Directed Study in Agricultural Education. (1.0 cr. ; =ENT 5121; prereq Grad student doing Plan B #; spring, summer, every year) 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. (1.0-4.0 cr. ; A-F or Audit; fall, spring, summer, every year) Students prepare paper dealing with issues in agricultural education applied to professional responsibilities.

AFEE 8090. Seminar: Agricultural Education and Extension. (1.0-3.0 cr. [max 6.0 cr.]; prereq AgEd grad student; fall, spring, offered periodically) Topics on various aspects of agricultural education. Prepare, present, and critique a report.

AFEE 8094. Research in Agricultural Education and Extension. (1.0-6.0 cr.; A-F or Audit; prereq AgEd student doing Plan B research; %; fall, spring, summer, every year) Select problems, prepare bibliographies, analyze and interpret data, and prepare manuscripts on studies.

AGRO 5121. Applied Experimental Design. (4.0 cr.; =ENT 5121; prereq Stat 5021 or equiv or #; spring, every year) 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.

AGRO 5311. Research Methods in Crop Improvement and Production. (1.0 cr.; S-N or Audit; prereq applied plant sciences grad; fall, summer, every year) 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.

AGRO 5321. Ecology of Agricultural Systems. (3.0 cr.; A-F or Audit; =ENT 5321; prereq [3xxx or above] course in [Agro or AnSc or Ent or Hort or PIPa or Soil] or #; fall, every year) Ecological approach to problems in agricultural systems. Formal methodologies of systems inquiry are developed/applied.

AGRO 5431. Applied Plant Genomics and Bioinformatics. (3.0 cr.; prereq Grad student or [genetics course, #]; fall, every year) Analysis, interpretation, visualization of large plant genomic datasets. Basic computer programming, applying large-scale genomics to answer basic/applied biological questions, understanding limitations of each application, presenting concise visual findings from large-scale datasets.

AGRO 5980. Publishing in Plant Science Journals. (2.0 cr.; S-N only; prereq #; fall, every year) 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.

AGRO 5999. Special Topics: Workshop in Agronomy. (1.0-6.0 cr.; prereq Jr or sr or grad student; fall, spring, summer, every year) 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. (2.0 cr.; S-N or Audit; =BBE 8005, SOIL 8005, PLPA 8005, LAAS 8005, HORT 8005; prereq Grad SENG major; #; fall, spring, every 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.
AGRO 8023. Evolution of Crop Plants. (3.0 cr.; A-F or Audit; prereq 9 grad cr in ag or bio science; spring, odd years) Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

AGRO 8201. Advanced Plant Breeding. (3.0 cr.; A-F or Audit; [HORT 8201]; prereq STAT 5301 or equiv; fall, odd years) Principles/current methods involved in breeding agronomic and horticultural crops. Use of genotype/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, and new approaches.

AGRO 8202. Breeding for Quantitative Traits in Plants. (3.0 cr.; prereq [5201, STAT 5021] or #; spring, even years) 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.

AGRO 8241. Chromosomal and Molecular Genetics of Plant Improvement. (3.0 cr.; prereq Introductory Genetics course; spring, odd years) Mixture of classic/current info in molecular plant genetics, biotech, and genomics. Students devise experiments in breeding, genetics, genomics, physiology, cellular/molecular biology, and other areas.

AGRO 8270. Graduate Seminar. (1.0 cr.; A-F or Audit; [HORT 8270]; prereq Grad major in [applied plant sci or agro or ent or hort or plnt brdg or plnt path or soil or #]; fall, spring, every year) Reports/discussions of problems and investigational work.

AGRO 8280. Current Topics in Applied Plant Sciences. (1.0 cr.; S-N or Audit; prereq Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or #; spring, every year) Topics presented by faculty or visiting scientists.

AGRO 8505. Advanced Perspectives in Weed Science. (2.0 cr.; A-F or Audit; prereq Grad major in agro or applied plant sciences or ent or hort or plant brdg or plant path or soil or #; spring, every year) Topics concerning the biochemistry and sustainability of chemical and biological weed control methods. Lecture and student-directed discussion.

AGRO 8900. Advanced Discussions. (1.0-3.0 cr. [max 12.0 cr.]; S-N or Audit; [HORT 8900]; prereq #; fall, spring, every year) Special workshops or courses in applied plant sciences.

American Indian Studies (AMIN) College of Liberal Arts

AMIN 5107. The Structure of Anishinaabemowin, the Ojibwe Language. (3.0 cr.; A-F or Audit; [AMIN 3107]; prereq 3104;) Analysis of grammatical structures of Anishinaabemowin.

AMIN 5108. History of Anishinaabemowin, the Ojibwe Language. (3.0 cr.; A-F or Audit; [AMIN 3108]; prereq 3107 or #;) Historical development of Anishinaabemowin.

AMIN 5109. Anishinaabe Literature. (3.0 cr.; A-F or Audit; [AMIN 3109]; prereq 3107 or 5107 or #;) Readings in Anishinaabe oral literature.

AMIN 5141. American Indian Language Planning. (3.0 cr.; A-F or Audit; [AMIN 3141]; prereq 3103 or 3123 or #;) Planning for maintenance/revitalization of North American indigenous languages. Condition/status of languages. Documentation, cultivation, literacy, education.

AMIN 5303. American Indians and Photography. (3.0 cr.; [AMIN 3303]; fall, odd years) Historical/comparative overview of photos in which American Indian people are central subjects. Primary features of images in American Indian photos. Relationships among those involved in making/viewing photos. Ways in which photos are interpreted. Relation of photos to social contexts in which they are produced and to agencies of those who stand behind their making.

AMIN 5402. American Indians and the Cinema. (3.0 cr.; A-F or Audit; spring, summer, every year) Representations of American Indians in film, historically/contemporarily. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMIN 5407. Craft and Conventions of American Indian Ethnohistory. (3.0 cr.; A-F only; fall, odd years) Conventions and paradigmatic approaches scholars follow to represent/interpret written documents and oral traditions in constructing their narratives. Craft of ethnohistory: techniques, methods, styles of criticism.

AMIN 5409. American Indian Women: Ethnographic and Ethnohistorical Perspectives. (3.0 cr.; [AMIN 3409]; fall, even years) Comparative survey of ethnographic/ethnohistorical writings by/about American Indian women.


AMIN 5890. Problems in American Indian History. (3.0 cr.; [HIST 5890]; prereq #; fall, spring, offered periodically) Intensive consideration of topics in American Indian history. Possible topics include social history, Indian history of particular regions, political systems, education, and American Indian policy.

AMIN 5920. Topics in American Indian Studies. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) Various topics in American Indian studies, depending upon instructor/semester.

AMIN 5991. Graduate Level Directed Studies. (1.0-6.0 cr. [max 9.0 cr.]; A-F or Audit; prereq %; spring, every year) Contact department for further information.

American Studies (AMST) College of Liberal Arts

AMST 5402. American Indians in the Cinema. (3.0 cr.; spring, every year) Representations of American Indians in film, historically/contemporarily. What such representations assert about Native experience and cultural viability. What they reflect about particular relationships of power.

AMST 5920. Topics in American Studies. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Topics specified in Class Schedule.

AMST 8201. Historical Foundations of American Studies. (3.0 cr.; prereq grad AmSt major; fall, every year) Exposition of American studies as a field of inquiry, including its history, major theoretical framework, and interdisciplinary methodologies.

AMST 8202. Theoretical Foundations and Current Practice in American Studies. (3.0 cr.; prereq grad AmSt major or # or %; spring, every year) Analysis of central theoretical work in the field and survey of key methodologies.

AMST 8231. Cultural Fallout: The Cold War and Its Legacy, Readings. (3.0 cr.; fall, spring, every year)
Culture of Cold War, its legacy. How it affected/reflected domestic politics, public policies, civic life, gender expectations, sexuality, class relations, racial justice, and civil rights. Impact of domestic anti-communism and of American cultural politics abroad.

AMST 8232. Cultural Fallout: The Cold War and Its Legacy, Research. (3.0 cr.; prereq 8231; fall, spring, every year)
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.

AMST 8239. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Readings. (3.0 cr.; fall, every year)
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.

AMST 8240. Gender, Race, Class, Ethnicity, and Sexuality in the United States: Topical Development. (3.0 cr. [max 9.0 cr.]; prereq #; spring, every year)
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 groups defined by race, ethnicity, class, or sexual orientation.

AMST 8249. Popular Culture and Politics in the 20th Century: Readings. (3.0 cr.; fall, offered periodically)
Popular arts in their political/social context. Issues of race, gender, class, and nationalism.

AMST 8250. Popular Culture and Politics in the 20th Century: Research Strategies. (3.0 cr.; prereq 8239 or #; fall, offered periodically)
Popular arts in their political/social context. Focuses on issues of race, gender, class, and nationalism.

AMST 8259. Literature, History, and Culture: Research Strategies. (3.0 cr.; prereq #; fall, spring, offered periodically)
Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.

AMST 8260. Literature, History, and Culture: Topical Development. (3.0 cr.; prereq #; fall, spring, offered periodically)
Interdisciplinary study of connections between literary expression and history, particularly as they articulate themes in American culture.

AMST 8288. Working in the Global Economy: Readings. (3.0 cr.; fall, offered periodically)
Debates about global economy/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. (3.0 cr.; prereq 8288 or #; spring, offered periodically)
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.

AMST 8333. Practicum in American Studies. (3.0 cr.; S-N or Audit; prereq #; fall, spring, offered periodically)
Training in teaching undergraduate courses in American studies.

AMST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

AMST 8866. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student and/or degree requirements for 1st/2nd registrations, up to 12 combined cr. or 40/44 registrations, up to 24 combined cr.; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr.; fall, spring, summer, every year) x

AMST 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 0 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

AMST 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

AMST 8920. Topics in American Studies. (3.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Topics specified in Class Schedule.

AMST 8970. Independent Study in American Studies. (1.0-9.0 cr.; prereq #; fall, spring, summer, every year)
Independent study of interdisciplinary aspects of American civilization under guidance of faculty members of various departments.

Anatomy (ANAT)
Medical School

Anesthesiology (ANES)
Medical School

ANES 5587. Adv Clinical Physiology I for Nurse Anesthetists. (3.0 cr.; A-F or Audit; fall, every year)
Cellular mechanisms underlying systems physiology. Cellular physiology, physiology of excitable tissues, renal physiology, cardiovascular physiology, hemostasis.

ANES 5588. Advanced Clinical Physiology II for Nurse Anesthetists. (3.0 cr.; A-F or Audit; prereq Advanced Clinical Physiology I for Nurse Anesthetists; spring, every year)
Respiratory physiology, acid-base physiology, gastrointestinal physiology, metabolism, endocrinology, reproductive physiology, physiology of pregnancy/labor.

ANES 5686. Chemistry and Physics for Nurse Anesthetists. (3.0 cr.; A-F or Audit; prereq General chemistry or #; summer, every year)
Chemical equilibrium, organic chemistry, physics of fluids/gases, anesthetic applications.

ANES 8269. Research in Anesthesia. (1.0 cr.; fall, spring, every year)

Animal Science (ANSC)
College of Food, Agricultural and Natural Resource Sciences

ANSC 5099. Special Workshop in Animal Science. (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; spring, every year)
Topics vary. See Class Schedule or department. Topics may use guest lectures/experts.

**ANSC 5200. Statistical Genetics and Genomics.** (4.0 cr.; prereq [Stat 3021 or equiv]. [Biol 4003 or equiv]; fall, even years) Gene discovery. Genomic selection. Data analysis. Phenotypes/DNA markers. Parametric/non parametric linkage analysis. Mapping quantitative trait loci (QTL); Parentage testing.

**ANSC 5305. Companion & Wild Species Reproduction.** (2.0 cr.; A-F only; prereq #; spring, every year) 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.

**ANSC 5625. Nutritional Biochemistry.** (3.0 cr.; prereq BIOL 3021 or #; fall, every year) Overview of biochemical molecules and pathways important in nutritional events.

**ANSC 5626. Nutritional Physiology.** (3.0 cr.; A-F only; spring, every year) 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.** (4.0 cr.; A-F only; prereq [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology] or #; fall, every year) 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.

**ANSC 5811. Genetic Improvement of Animals.** (3.0 cr.; prereq #) 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.

**ANSC 8121. Linear Model Methods.** (3.0 cr.; prereq Stat 5021; ) 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.

**ANSC 8134. Ethical Conduct of Animal Research.** (3.0 cr.; A-F or Audit; [VMED 8134, CMB 8134]; prereq Grad student or prof school student or #; fall, every year) 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.

**ANSC 8141. Mixed Model Methods for Genetic Analysis.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5200 or CMB 5200 or equiv; spring, odd years) 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, genetic prediction/variance component estimation.

**ANSC 8194. Research in Animal Genetics.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Research in quantitative genetics, cytogenetics, molecular genetics, and other areas related to animal breeding.

**ANSC 8211. Animal Growth and Development.** (3.0 cr.; prereq; spring, every year) 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.

**ANSC 8294. Research in Muscle Chemistry and Physiology.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Research in selected areas.

**ANSC 8311. Animal Bioenergetics.** (3.0 cr.; A-F or Audit; prereq #; BIOL 4331 recommended; fall, spring, every year) 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.

**ANSC 8312. Protein Metabolism.** (3.0 cr.; A-F or Audit; prereq BioC 4331; ) Basic and applied concepts of protein metabolism in farm animals.

**ANSC 8320. Concepts and Developments in Nutritional Physiology.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; spring, every year) Review and critical evaluation of pertinent scientific literature.

**ANSC 8330. Concepts and Developments in Animal Nutrition.** (1.0-2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, every year) Review, critical evaluation of recent research reports.

**ANSC 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**ANSC 8340. Concepts and Developments in Swine Nutrition.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Review and critical evaluation of scientific literature.

**ANSC 8344. Mechanisms of Hormone Action.** (2.0 cr.; prereq Course in biochemistry or cell biology or #; fall, even years) 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.

**ANSC 8394. Research in Animal Nutrition.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Research in selected areas: topics and animal species determined by consultation.

**ANSC 8411. Physiology of Reproduction.** (3.0 cr.; A-F or Audit; prereq 3305 or equiv; ) Emphasis is on gametogenesis, conception, and implantation.

**ANSC 8421. Physiology of Fertilization and Gestation.** (3.0 cr.; prereq 3305 or #; ) Physiological events occurring during gametogenesis; capacitation and fertilization; period of the embryo; period of the fetus; and parturition.

**ANSC 8431. Immunoreproduction.** (3.0 cr.; prereq 3305 or #; ) Blood groups and polymorphic proteins affecting reproduction; immunoglobulin formation; antigens of semen, ova, and genital secretions; immunopathology; maternal-fetal incompatibility; and antibodies to hormones.

**ANSC 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**ANSC 8451. Reproductive Endocrinology.** (2.0 cr.; A-F or Audit; prereq 3305 or 3327 or equiv, BioC 3021; ) Hormonal regulation of mammalian reproductive cycles and seasonal patterns; nutritional and stress effects on reproductive endocrinology; mechanism of hormone action.

**ANSC 8494. Research in Animal Physiology.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) 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.

**ANSC 8510. Graduate Seminar.** (1.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) 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.

**ANSC 8594. Research in Animal Science.** (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Research including experimental studies in disciplines associated with animal production and research, with emphasis on interdisciplinary studies.

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
ANTH 5008. Advanced Flintknapping. (3.0 cr.; A-F or Audit; prereq [3008 or 5269] or #) Hands-on training in techniques of advanced stone tool production, artifact reproduction, and lithic experimental design for academic/artistic purposes.

ANTH 5009. Human Behavioral Biology. (3.0 cr.; A-F or Audit; spring, every year) 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 5021W. Anthropology of the Middle East. (3.0 cr.; =ANTH 3021W; fall, even years) Anthropological field methods of analyzing/interpreting Middle Eastern cultures/societies.

ANTH 5027W. Archaeology of Prehistoric Europe. (3.0 cr.; =HIST 3067W, ANTH 3027W) How archaeologists/historians analyze/interpret artifacts to develop knowledge about formation of European society, from earliest evidence of human occupation to Roman Period.

ANTH 5031W. Ethnographies of Science. (3.0 cr.; A-F only; prereq Sr or grad student or #; spring, odd years) 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.

ANTH 5033. Feminist Anthropology. (3.0 cr.; prereq 3047 or grad or #) Advanced introduction to the development of feminist theory in anthropology. Theoretical and methodological shifts in feminist anthropology and ethnography. Feminist ethnography within the discipline as a whole; current debates concerning the reading and writing of ethnography.

ANTH 5041. Ecological Anthropology. (3.0 cr.; =ANTH 3041, ANTH 8213) Konrad Lorenz, 1930s; J. L. Richard, 1950s; 1960s; modern period. Concepts, theories, and methods of ecological anthropology (ecological ecology) show how humans interact with the biophysical environment. Compare biological and cultural interactions with the environment; examine adaptive strategies cross-culturally.


ANTH 5113. Primate Evolution. (3.0 cr.; A-F only; =ANTH 8113) ape/Old World monkeys.

ANTH 5121. Business Anthropology. (2.0 cr.; =ANTH 4121; prereq MBA student; spring, every year) Anthropological/ethnographic understandings/research techniques.


ANTH 5255. Archaeology of Religion. (3.0 cr.; fall, odd years) Archaeological evidence for origins of religion and its diverse roles in human societies over millennia. What constitutes religion, why it is constantly present in human history. How archaeologists reconstruct beliefs/practices of past peoples.

ANTH 5269. Analysis of Stone Tool Technology. (4.0 cr.; A-F or Audit; prereq 1001 or 3001 or #) Practical lab experience. How to analyze archaeological collections of stone tools to learn about human technological behavior in past. Students analyze archaeological/experimental collections, make stone tools themselves.

ANTH 5325. The Art of the Aztec Empire. (3.0 cr.; =ARTH 5325, RELS 5325; spring, every year) Art/architecture of Nahua-speaking Aztecs of Central Mexico, from their first appearance in archaeological record until Spanish invasion of Central Mexico in 1521. Theoretical/methodological approaches. Critical analysis of scholarly writing and what constitutes “evidence.”

ANTH 5401. The Human Fossil Record. (3.0 cr.; A-F only; =ANTH 3401; prereq 1001 or #; fall, even years) 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.

ANTH 5402. Zooarchaeology Laboratory. (3.0 cr.; A-F only; fall, every year) 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. (4.0 cr.; A-F or Audit; prereq Basic univariate statistics course or #; fall, spring, even years) Quantitative methods used by biological anthropologists. Applying these methods to real anthropometric data. Lectures, complementary sessions in computer lab.

ANTH 5405. Human Skeletal Analysis. (3.0 cr.; A-F only; =ANTH 3405; prereq 1001 or #; spring, every year) Structure, design, and variability of modern human skeleton. Anatomy, functional
ANTH 5422. Anthropologies of Citizenship and Nationalism. (3.0 cr.; A-F only; prereq 3xxx course in [anthropology or related discipline]; spring, odd years)
Why/how citizenship and nationalism have been constructed over time as a force of cultural identity/belonging. Key theories, recent developments in citizenship theory. Defining an anthropological approach to citizenship.

ANTH 5442. Archaeology of the British Isles. (3.0 cr.; A-F only; fall, every year)

ANTH 5444. Archaeological Ceramics. (4.0 cr.; A-F only; prerequisites 3001 or #; spring, every year)
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. Readings, discussion.

ANTH 5446. Archaeology of Representation as Communication. (3.0 cr.; A-F only; spring, every year)
Seminars. Uses of paintings, sculptures, drawings, and photographs as means of communication, from earliest representations of 30,000 years ago to present day.

ANTH 5448. Applied Heritage Management. (3.0 cr.; A-F only; spring, every year)
Contexts of cultural heritage applicable to federal/state protection. Approaches to planning/management. Issues of heritage/stakeholder conflict.

ANTH 5601. Archaeology and Native Americans. (3.0 cr.; =ANTH 3601, AMIN 3602; fall, even years)
Pre-European contact/contact period archaeology of American Indians north of Mexico.

ANTH 5802. Art of the Inka and their Ancestors. (3.0 cr.; =ANTH 5802, AMIN 5802; RELS 5528; spring, every year)

ANTH 5980. Topics in Anthropology. (3.0 cr.; max 6.0 cr.; fall, spring, every year)
Topics specified in Class Schedule.

ANTH 5990. Topics in Archaeology. (3.0 cr.; max 9.0 cr.; A-F or Audit; prerequisites #; fall, spring, summer, every year)
Topics specified in Class Schedule.

ANTH 8001. Ethnography, Theory, History. (3.0 cr.; A-F or Audit; fall, every year)
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. (3.0 cr.; A-F or Audit; spring, every year)

ANTH 8004. Foundations of Anthropological Archaeology. (3.0 cr.; prerequisites 8001, 8002; spring, every year)
Theoretical foundations of anthropological archaeology in historical and contemporary perspective.

ANTH 8005. Linguistic Anthropology. (3.0 cr.; fall, even years)
Introduction to literature of anthropological linguistics.

ANTH 8111. Evolutionary Morphology. (3.0 cr.; fall, offered periodically)

ANTH 8112. Reconstructing Hominin Behavior. (3.0 cr.; A-F or Audit; =ANTH 5112; spring, odd years)
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. (3.0 cr.; A-F only; =ANTH 5113; prerequisites Anthropology doctoral student; fall, odd years)
Evolutionary history of primates, with particular focus on origin/diversification of apes/Old World monkeys.

ANTH 8120. Problems in Culture Change and Applied Anthropology. (3.0-6.0 cr.; fall, spring, offered periodically)
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 8121. Business Anthropology. (3.0 cr.; spring, every year)
Ways in which anthropological understandings and research techniques, particularly ethnographic techniques, can be used to enhance study/practice of business.

ANTH 8201. Humans and Nonhumans: Hybrids and Collectives. (3.0 cr.; spring, offered periodically)
Social life as consisting of relationships not only among human beings, but also between humans and nonhumans: animals, plants, environments, technologies, etc. Focuses on figure of hybrid, its role in formations of collective life.

ANTH 8203. Research Methods in Social and Cultural Anthropology. (3.0 cr.; prerequisites Grad anth major or #; fall, every year)
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.

ANTH 8205. Economic Anthropology. (3.0 cr.; prerequisites ANTH 4053; fall, spring, offered periodically)
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. (3.0 cr.; fall, spring, offered periodically)
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. (3.0 cr.; prerequisites =ANTH 3041, ANTH 5041; fall, spring, offered periodically)
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. (3.0 cr.; prerequisites Grad anth major or #; fall, spring, offered periodically)
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.

ANTH 8219. Grant Writing. (2.0 cr.; prerequisites Grad anth majors preparing to submit research grant proposals next academic yr; fall, spring, offered periodically)
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.

ANTH 8220. Archaeology Field School. (6.0 cr.; prerequisites Grad anth major; summer, every year)
Advanced archaeological field excavation, survey, and research. Intensive training in...
### ANTH 8230. Anthropological Research Design
(3.0 cr.; [max 6.0 cr.]; A-F or Audit; prereq Anth grad student or #; fall, spring, offered periodically)
Training seminar on research development, coordination, grant management, field/laboratory research management, fundraising.

### ANTH 8244. Interpreting Ancient Bone
(4.0 cr.; A-F or Audit; [ANTH 5244]; prereq #; fall, spring, offered periodically)
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.

### ANTH 8333. FTE: Masters
(1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

### ANTH 8444. FTE: Doctoral
(1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

### ANTH 8510. Topics in Archaeology
(3.0-9.0 cr.; fall, spring, every year)
Seminar examines particular aspects of archaeological methods and/or theory. Topics vary according to student and faculty interests.

### ANTH 8666. Doctoral Pre-Thesis Credits
(1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
(No description)

### ANTH 8777. Thesis Credits: Master's
(1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

### ANTH 8810. Topics in Sociocultural Anthropology
(3.0-9.0 cr.; fall, spring, every year)
Seminar examines particular aspects of method and/or theory. Topics vary according to student and faculty interests.

### ANTH 8888. Thesis Credit: Doctoral
(1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

### ANTH 8991. Independent Study
(1.0-18.0 cr.; prereq #; fall, spring, summer, every year)
Under special circumstances and with instructor approval, qualified students may register for a listed course on a tutorial basis.

### ANTH 8992. Directed Reading
(1.0-18.0 cr. [max 54.0 cr.]; prereq #; fall, spring, summer, every year)
tbd

### ANTH 8993. Directed Study
(1.0-18.0 cr.; prereq #; fall, spring, summer, every year)
Directed Study

### ANTH 8994. Directed Research
(1.0-18.0 cr.; prereq #; fall, spring, summer, every year)

## Apparel Studies (APST) College of Design

### APST 5117. Retail Environments and Human Behavior
(3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)
Theory/research related to designed environment across retail channels.

### APST 5121. History of Costume
(4.0 cr.; A-F only; spring, every year)
Analysis/interpretation of primary data about 19th/20th centuries based on historical methods. Critique of cultural, social, economic, technological, political, and artistic data presented through lens of dress in film/literature.

### APST 5123. Living in a Consumer Society
(3.0 cr.; A-F only; prereq Sr or grad student; fall, odd years)

### APST 5124. Consumers of Design
(3.0 cr.; A-F only; prereq 5123 or DHA 5123 or equiv or #; spring, odd years)
Contemporary approaches to consumer behavior.

### APST 5170. Topics in Apparel Studies
(1.0-4.0 cr.; [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)
In-depth investigation of specific topic, announced in advance.

### APST 5193. Directed Study in Apparel Studies
(1.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Directed study in apparel studies.

### APST 5267. Dress and Culture
(3.0 cr.; A-F or Audit; prereq 4212 or #; fall, even years)
Cultural factors of identity expressed through dress. Focuses on issues of cultural diversity through analysis of dress and textiles within a specific world region.

### APST 5268. Behavioral Aspects of Dress
(3.0 cr.; A-F or Audit; fall, odd years)
Research and social science theories as applied to appearance/dress as manifestations of human behavior.

### APST 8170. Topics in Apparel Studies
(1.0-3.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Independent study/review of books/periodicals under tutorial guidance.

### APST 8192. Readings in Apparel Studies
(1.0-3.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Directed study in apparel studies.

### APST 8222. Plan B Master's Project
(3.0 cr.; S-N or Audit; prereq DHA master's student; #; fall, spring, every year)
Plan B master's project.

### APST 8267. Retailing: Strategic Perspectives
(3.0 cr.; A-F or Audit; fall, even years)
Selected topics in the field of retailing. Students extend their thinking regarding consumer behavior to strategic retail management.

### APST 8272. Multichannel Consumers: Theories in Retail and Consumer Studies
(3.0 cr.; A-F or Audit; prereq DES 8102 or equivalent quantitative methods class; spring, even years)
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.

### APEC 5031. Methods of Economic Data Analysis
(3.0 cr.; prereq Math 1271, Stat 5021, knowledge of matrix algebra; fall, every year)
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 technique to understand market behavior.
APEC 5032. Economic Data Analysis for Managerial and Policy Decisions. (3.0 cr.; prereq 5031 or #; spring, every year) Statistical/econometric methods for the analysis of large data sets to support managerial/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/updating data estimates.

APEC 5151. Applied Microeconomics: Firm and Household. (3.0 cr.; prereq 3001 or Math 1271 or Math 2243 or equiv or grad student or #; fall, every year) Quantitative techniques for analysis of economic problems of firms and households. Links between qualitative tools and economic analysis Regressions analysis, mathematical programming, and present value analysis.

APEC 5152. Applied Macroeconomics: Income and Employment. (3.0 cr.; prereq 3001 or Math 1271 or Math 2243 or equiv or grad student or #; fall, every year) 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.


APEC 5341. Public Finance. (3.0 cr.; A-F or Audit; prereq 3001 or Econ 3101 or PA 5021; spring, every year) Which services should the public sector provide? Which level of government should provide them? How should governments fund those services? Which types of taxes should be levied and on whom? Applying economic theory/analysis to spending, revenue, and tax policy issues facing governments.


APEC 5481. Futures and Options Markets. (3.0 cr.; [APEC 4481]; prereq grad student; spring, every year) Economic concepts related to futures/options trading. Hedging, speculation.

APEC 5511. Labor Economics. (3.0 cr.; prereq [3001 or Econ 3101 or PA 5021]; PA 5032 or equiv], grad student] or #; fall, every year) Theoretical foundations of labor markets. Intertemporal/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.

APEC 5611. Economic Aspects of Environmental Management. (3.0 cr.; A-F or Audit; prereq [Sr or grad student] in [biological science or conservation biology or ecology or fisheries or forestry or public affairs or water resources or wildlife conservation] or CLA or #; spring, offered periodically) Economists approach to environmental problems such as water/air pollution. Application of supply/demand concepts to evaluation of environmental resources. Methods of evaluation. Analysis of pollution control policies from economic point of view.

APEC 5651. Economics of Natural Resource and Environmental Policy. (3.0 cr.; [PA 5722]; prereq [[3001 or ECON 3101]. [3611 or ECON 3611 or ESPM 3261]] or #; fall, every year) 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.

APEC 5711. U.S. Agricultural and Environmental Policy. (3.0 cr.; prereq 3001 or Econ 3101; spring, offered periodically) 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.

APEC 5721. Economics of Science and Technology Policy. (3.0 cr.; prereq 3001 or Econ 3101 or #; fall, every year) Economics of innovation, technical change, and research/development. Productivity measurement. Knowledge stocks, research labs/spillowers. Econometric/welfare surplus methods for evaluating economic consequences of R&D. Economics of intellectual property rights.

APEC 5731. Economic Growth and International Development. (3.0 cr.; prereq 3002 or [Econ 3101, Stat 3022]; Econ 4211 recommended; spring, offered periodically) Economics of research/development. Technical change, productivity growth. Impact of technology on institutions. Science/technology policy.

APEC 5751. Global Trade and Policy. (3.0 cr.; prereq 3001 or Econ 3101 or PA 5021; fall, every year) 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.

APEC 5811. Cooperative Organization. (3.0 cr.; [APEC 3840]; prereq Grad student or #; spring, every year) Introduction to cooperative form of business. Extensive applications to agricultural/food cooperatives. Active-student learning process with group activities/written exercises.

APEC 5891. Independent Study: Advanced Topics in Farm and Agribusiness Management. (1.0-4.0 cr. ; prereq #; fall, spring, every year) Special topics or individual work suited to the needs of particular groups of students.

APEC 5991. Special Topics and Independent Study in Applied Economics. (1.0-4.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year) Special classes, independent study, and supervised reading/research on subjects/problems not covered in regularly offered courses.

APEC 8001. Applied Microeconomic Analysis of Consumer Choice and Consumer Demand. (2.0 cr. ; A-F or Audit; prereq [5151 or ECON 401 or ECON 5151 or intermediate microeconomic theory]. [MATH 2243, MATH 2263] or equiv or #; fall, every year) Consumer behavior/demand. Introduction to welfare analysis. General equilibrium analysis in pure exchange economy. Part of four-course sequence (APEC 8001-8004).

APEC 8002. Applied Microeconomic Analysis of Production and Choice Under Uncertainty. (2.0 cr.; A-F or Audit; prereq [[8001 or ECON 8001 or ECON 8101]. [[MATH 2243, MATH 2263] or equiv] or #; fall, every year) 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).

APEC 8003. Applied Microeconomic Analysis of Game Theory and Information. (2.0 cr.; A-F or Audit; prereq [[8002 or ECON 8002 or ECON 8102]. [[MATH 2243, MATH 2263] or equiv] or #; spring, every year) 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. Part of four-course sequence (APEC 8001-8004).

APEC 8004. Applied Microeconomic Analysis of Social Choice and Welfare. (2.0 cr.; A-F or Audit; prereq [[8003 or ECON 8003 or ECON 8103]. [[MATH 2243, MATH 2263] or equiv] or #; spring, every year) 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).

APEC 8202. Mathematical Optimization in Applied Economics. (3.0 cr.; prereq [5151, Econ 5151] or equiv or #; fall, every year) 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. Model building and solution techniques.

APEC 8203. Applied Welfare Economics and Public Policy. (3.0 cr.; prereq calculus, intermediate econ theory; spring, every year) 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.

APEC 8204. Applied Financial Economics. (3.0 cr.; A-F or Audit; prereq Econ 5151 or [Econ 8001, Econ 8002]) Introduction to major theories of asset pricing under competitive markets, symmetric information. Equilibrium/ Arbitrage models of financial markets, option pricing models. Applications of asset pricing theory; agricultural markets, financial derivatives, interest rates, agricultural credit.

APEC 8205. Applied Game Theory. (3.0 cr.; prereq [8101, 8102, 8103, 8104] or [Econ 8001, Econ 8002, Econ 8003, 8004] or #; fall, every year) Topics in game theory, application to economic problems. For each topic, important theory/ equilibrium concepts are followed by extensive applications. Focuses on static/dynamic games of complete/incomplete information, evolutionary games.

APEC 8206. Dynamic Optimization: Applications in Economics and Management. (3.0 cr.; prereq 5151 or equiv or #; spring, every year) Formulation/solution of dynamic optimization problems using optimal control theory and dynamic programming. Analytical/numerical solution methods to solve deterministic/ stochastic problems for various economic applications.

APEC 8211. Econometric Analysis I. (4.0 cr.; prereq [Stat 4102 or Stat 5102], Ph.D. student] or #; fall, every year) Classical multiple linear regression, stochastic regressors, heteroscedasticity, autocorrelated disturbances, panel data, discrete dependent variables.

APEC 8212. Econometric Analysis II. (4.0 cr.; prereq 8211 or equiv or #; spring, every year) 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.

APEC 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APEC 8341. Applied Public Finance. (3.0 cr.; A-F; only; prereq 8001-8004 or Econ 8001-8004 or Econ 8101-8104; spring, offered periodically) 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.

APEC 8401. Consumer Behavior and Household Economics. (2.0 cr.; A-F or Audit; prereq Econ 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], [ECON 8103 or concurrent registration in ECON 8103], [ECON 8104 or concurrent registration in ECON 8104], [ECON 8105 or concurrent registration in ECON 8105], [ECON 8106 or concurrent registration in ECON 8106], [APEC 8211 or concurrent registration in 8211], [8212 or concurrent registration in 8212], [MATH 1271 or equiv]; fall, spring, offered periodically) Microeconometric analysis of consumer theory and demand analysis. Theoretical/empirical issues. Measurement issues and index numbers in consumer theory, develops empirical demand specifications. Theoretical and empirical consumer demand specifications are then applied to current topics in food assistance, food nutrition, and health topics.

APEC 8404. Labor Economics and Human Capital. (2.0 cr.; A-F or Audit; prereq [8403, Econ 8001, Econ 8002] or [Econ 8101, Econ 8102] or #; fall, every year) Topics in applied microeconomics related to labor supply and human capital. Focuses on household decisions and resulting outcomes in labor market. Household labor supply. Estimation of labor supply/earnings functions. Theory of human capital, wage structure/determination, and impacts of tax/transfer policies.

APEC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APEC 8501. Labor Economics I. (2.0 cr.; A-F or Audit; prereq 8003 or equiv or 88003, 8211, 5032 or equiv; spring, offered periodically) Theoretical and empirical studies of compensating differentials, discrimination, personnel economics, and gross flows.


APEC 8601. Natural Resource Economics. (3.0 cr.; prereq [5151, 8202, 8206] [ECON 5151 or equiv]] or #; fall, spring, offered periodically) Economic analysis of resource use/ management. Capital theory, dynamic resource allocation. Applications to renewable/ nonrenewable resources. Empirical studies, policy issues.

APEC 8602. Economics of the Environment. (3.0 cr.; prereq 8004 or Econ 8004 or Econ 8104 or equiv or #; fall, every year)
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.

APEC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) Doctoral Pre-Thesis Credits

APEC 8701. International Economic Development, Growth, and Trade. (3.0 cr.; prereq Econ 8002 or Econ 8102 or #; fall, every year) Development, growth, and trade of developing nations and emerging market economies. Course links stylized characteristics of economic development, economic policy, and political economy using modern economic theory and empirical methods of analysis.

APEC 8702. Economic and Trade Policy: Sectoral and Institutional Issues. (3.0 cr.; prereq ECON 8002 or ECON 8102 or #; spring, every year) International trade across developed/developing countries. National policies, regional agreements/treaties, multilateral arrangements such as World Trade Organization. Applying international trade and multinationals theory and econometric methods.

APEC 8703. Microeconomic Analysis of Economic Development. (3.0 cr.; A-F or Audit; prereq Econ 8001-04 or Econ 8101-04, and ApEc 8211-8212 or #. Concurrent registration is ok.) Topics concerning microeconomics of economic development in low-income countries. Focuses on behavior of agricultural households, poverty, inequality, education, health/nutrition, and evaluation of development programs.

APEC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APEC 8793. Master’s Paper: Plan B Project. (1.0-6.0 cr.; S-N or Audit; prereq Agri/ApEc MS student or ApEc MS student; fall, spring, summer, every year) Students work under guidance of adviser to complete their Plan B Project paper.


APEC 8804. Managerial Economics. (3.0 cr.; prereq [Econ 8001, 8002, 8003, 8004] or [Econ 8101, Econ 8102, Econ 8103, Econ 8104] or #; majors must register on A-F basis.; fall, spring, offered periodically) 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.

APEC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq ApEc PhD student; max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Doctoral thesis credit.

APEC 8901. Graduate Seminar: MS & PhD. (1.0 cr.; S-N or Audit; prereq ApEc MS student or ApEc PhD student; spring, every year) Attendance/active participation in applied economics research seminars. Effective research methods. Research topics/observe professional methods of research presentations.

APEC 8902. Graduate Research Development Seminar. (1.0 cr.; S-N or Audit; prereq ApEc MS student or ApEc PhD student; fall, spring, every year) Faculty, students, outside speakers present research ideas/results, which participants critique. Topics vary according to interests of speakers.

APEC 8903. PhD Qualifying Paper Seminar I. (1.0 cr.; S-N only; prereq 8001-8004 or Econ 8001-8004 or Econ 8101-8104; fall, every year) Support for writing second year Qualifying Paper. Purpose of paper is to provide guided opportunity for doctoral students to complete substantial research paper.

APEC 8904. PhD Qualifying Paper Seminar II. (1.0 cr.; S-N only; prereq APEC 8903; spring, every year) Provides support to doctoral students writing second year Qualifying Paper. Purpose of paper is to provide guided opportunity for students to complete substantial research paper.

APEC 8991. Advanced Topics in Applied Economics. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Special seminars or individual work on subjects suited to needs of students.

Applied Applied Sciences (APSC) College of Food, Agricultural and Natural Resource Sciences

APSC 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; =SOIL 8123, PLPA 8123; prereq Grad student;) 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 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

APSC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

APSC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APSC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

APSC 8891. Advanced Topics in Applied Economics. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Special seminars or individual work on subjects suited to needs of students.

Applied Professional Studies (APS) College of Continuing Education

APS 5100. Topics in Applied Professional Studies. (1.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Topics in Applied Professional Studies.

APS 5101. Polyculture Design. (3.0 cr.; A-F or Audit; prereq SOIL 5125, HORT 1001, %; summer, offered periodically) Design/systems thinking with plant mechanisms.
APS 5201. Career and Job Search Preparation for Graduate Students. (1.0 cr.; S-N only; prereq %; fall, spring, every year) Job search and career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan.

APS 8001. Introduction to Research in the Biological Sciences. (1.0 cr.; S-N only; prereq Admitted MBS student; fall, spring, summer, every year) Resources available at U of M/College of Continuing Education that will help complete Master of Biological Sciences degree. Required of all MBS students.

APS 8002. Final Project Course for Plan B MBS Students. (2.0 cr.; S-N only; prereq %; fall, spring, summer, every year) Synthesize/completely Plan B graduate final project.

APS 8003. Capstone Course for Plan C MBS Students. (2.0 cr.; S-N only; prereq %; fall, spring, summer, every year) MBS students synthesize/completely Plan C graduate final project.

APS 8110. Graduate Seminar Series. (1.0 cr. [max 3.0 cr.]; S-N only; prereq %; fall, spring, summer, every year) Recent developments in student's field of interest presented in research seminars by scientific experts.

Arabic (ARAB) College of Liberal Arts

ARAB 5101. Advanced Arabic I. (3.0 cr. [max 4.0 cr.]; prereq [3102, successful completion of the Arabic language proficiency exam] or %; fall, every year) Advanced readings in classical/modern Arabic. Compositions based on texts.

ARAB 5102. Advanced Arabic II. (3.0 cr. [max 4.0 cr.]; prereq 5101 or %; spring, every year) Readings of Arabic texts. Writing compositions based on texts. Continuation of 5101.

Architecture (ARCH) College of Design

ARCH 5101. Architectural Design Studies. (7.0 cr.; S-N only; prereq 3+ track for MArch; summer, every year) Principles/methods architecture design. Theories, history, technologies, media, and processes as foundation for critical thinking. Analytic modeling, visual thinking.

ARCH 5110. Architecture as Catalyst. (1.0 cr. [max 3.0 cr.]; S-N only; prereq MArch; spring, every year) Topical workshops on design methods, theories, or emerging practices.

ARCH 5212. Undergraduate Architecture Studio 05: Advanced Design. (6.0 cr.; A-F only; prereq Passing grade in 3281, 3282, 4283, 4284; spring, every year) 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.


ARCH 5301. Conceptual Drawing. (3.0 cr.; A-F only; prereq MArch major or %; spring, every year) Drawing as way of analyzing, exploring, and generating design ideas. Projection systems, diagramming, mapping. Different modes of visual perception. Nonverbal structures.

ARCH 5311. Theory of Architectural Representation. (3.0 cr.; A-F or Audit; [ARCH 4311]; prereq [5371, 5372, MArch] or instr consent; fall, every year) Integration of emerging computer graphics with photography and architectural graphic conventions. Historical, theoretical, and critical issues of representation. Influence of visual media on architectural field.

ARCH 5313. Visual Communication Techniques in Architecture. (3.0 cr.; A-F or Audit; [ARCH 4313]; prereq MArch major or %; spring, every year) Delineation, presentation, and design techniques. Various visual media and methods of investigation.

ARCH 5321. Architecture in Watercolor. (3.0 cr.; A-F or Audit; [ARCH 4321]; prereq MArch grad student or %; fall, spring, summer, every year) Watercolor as a tool in design process. Foundation principles, techniques, medium, tools, materials. Color relationships, mixing, composition, applications to design.

ARCH 5361. 3-D Computer Architectural Modeling and Design. (3.0 cr.; A-F or Audit; [ARCH 4361]; prereq MArch major; fall, spring, summer, every year) 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.

ARCH 5372. Computer Methods II. (1.0 cr.; S-N or Audit; [LA 5375, LA 5372, LA 5377]; prereq 5371, & 8252 and MArch major or %; spring, every year) Current techniques, computer programs, and their application to architectural computing and design.

ARCH 5381. Introduction to Computer Aided Architectural Design. (3.0 cr.; A-F or Audit; prereq Arch or BED or MArch or grad student in LA or %; fall, every year) 2-D drawing, 3-D modeling/animation, printing, plotting. Electronic networking/communications, database management, spreadsheet analysis, land-use analysis, project management.

ARCH 5382. Computer Aided Architectural Design. (3.0 cr.; A-F or Audit; prereq 5381 or arch grad major or %; spring, every year) 2-D/3-D CAD, image manipulation. Advanced multimedia visualization techniques for design, including solid modeling, photo-realistic imaging, animation, video-editing/recording.

ARCH 5410. Topics in Architectural History. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq MS Arch or MArch major or %; fall, spring, every year) Advanced study in architectural history. Readings, research, seminar reports.

ARCH 5411. Principles of Design Theory. (3.0 cr.; A-F or Audit; prereq MArch major or %; fall, every year) Principles of design and their instrumentation. How and why architecture theory is generated. Types and significance of formal analysis. Theoretical positions and modes of criticism.

ARCH 5421. Architecture and Interpretation: The Cave and the Light. (3.0 cr.; A-F only; [ARCH 4421W]; prereq [3411, 3412] or %; fall, odd years) Historical/HERMENEUTICAL investigation of areography of grotto. Intertwined themes of descent into earth and ascent to light, from earliest strata of human culture to present day.

ARCH 5423. Gothic Architecture. (3.0 cr.; A-F or Audit; [ARCH 4423]; prereq MS Arch or MArch major or %; spring, even years) History of architecture and urban design in Western Europe, from 1150 to 1400.

ARCH 5424. Renaissance Architecture. (3.0 cr.; A-F or Audit; [ARCH 4424]; prereq MS Arch or MArch major or %; spring, offered periodically) History of architecture and urban design in Italy, from 1400 to 1600. Emphasizes major figures (Brunelleschi, Alberti, Bramante, Palladio) and evolution of major cities (Rome, Florence, Venice).

ARCH 5425. Baroque Architecture. (3.0 cr.; A-F or Audit; [ARCH 4425]; prereq MS Arch or MArch major or %; fall, odd years) Architecture and urban design in Italy, from 1600 to 1750. Emphasizes major figures (Bermini, Borromini, Cortona, Guarini) and evolution of major cities (Rome, Turin).

ARCH 5431. Eighteenth-Century Architecture and the Enlightenment. (3.0 cr.; A-F or Audit; [ARCH 4431W]; prereq MArch grad student or %; fall, spring, every year) Architecture, urban planning, and garden design in Europe and America from 1650 to 1850.

ARCH 5432. Modern Architecture. (3.0 cr.; A-F or Audit; [ARCH 4432]; prereq MS Arch or MArch major or %; fall, offered periodically)
Architecture and urban design in Europe and the United States, from early 19th century to World War II.

ARCH 5434. Contemporary Architecture. (3.0 cr.; A-F or Audit; [ARCH 4434]; prereq MS Arch or M Arch major or #; fall, every year) Developments, theories, movements, and trends in architecture and urban design, from World War II to present.

ARCH 5441. Minnesota: Architecture and Landscapes. (3.0 cr.; A-F only; [ARCH 4441]; [ARCH 3411, 3412] recommended; spring, every year) History of major architectural monuments, urban phenomena, and landscape forms of Minnesota. Interrelationships between architecture, geography, and people.

ARCH 5445. Suburbia. (3.0 cr.; A-F only; [ARCH 4445W]; fall, every year) Suburbia, from origins in 18th-century England to present. Historical changes and present challenges, especially in America. Ideology, mythology, planning, development, geography, transportation, the family. Specific sites/designs. Representations in film, television, popular literature, and music.

ARCH 5446. Architecture Since World War II: Postwar Experimentation: Aesthetics and Politics of Architecture. (3.0 cr.; A-F only; prereq M Arch major; fall, every year) 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.

ARCH 5450. Topics in Architectural Theory. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Arch major or M Arch major or #; fall, spring, summer, every year) Selected topics in architectural theory and criticism.

ARCH 5451. Architecture: Defining the Discipline. (4.0 cr.; A-F only; prereq M Arch major; fall, spring, offered periodically) Paradigms through which architecture has defined itself. Implications for its practice, product, and architecture in general. Lecture, discussion, design exercises.

ARCH 5452. Architecture: Design, Form, Order, and Meaning. (4.0 cr.; A-F or Audit; prereq M Arch major or #; fall, spring, every year) 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.

ARCH 5461. North American Indian Architecture. (3.0 cr.; [ARCH 4461]; prereq M Arch major or instr consent; spring, every year) Historic/contemporary principles/theories of North American Indian architecture. Culture, technology, environment, art, and craft of North American Indians in their settlements/architecture.

ARCH 5465. LeCorbusier's Search for Theory and Identity in His Formative Years. (3.0 cr.; A-F only; prereq M Arch major; spring, every year) Seminar. Charles-Edouard Jeanneret's transition from apprentice of watchcase engraving to student of architecture, 1902-20. Early education, travels, design of houses in La Chaux de Fonds, transition to life in Paris, success in establishing theoretical identity.

ARCH 5513. Environmental Technology I: Thermal Design in Architecture. (3.0 cr.; A-F or Audit; prereq M Arch major or #; fall, every year) Thermal and climatic issues in the design of small and mid-size buildings. Investigations in built and mechanical methods to modify climate. Evaluation of the impact of design techniques on energy use, the environment, and architectural meaning.

ARCH 5514. Environmental Technology II: Lighting and Acoustic Design. (3.0 cr.; A-F or Audit; prereq M Arch major or #; fall, every year) Principles of daylighting, electric lighting, and acoustic design in architecture. Relationship between luminous and acoustic environments, human comfort and architectural experience. Analytical methods, design process, and modeling of daylighting.


ARCH 5516. Technology Two: Luminous and Thermal Design. (6.0 cr.; A-F only; prereq M Arch; spring, every year) 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.

ARCH 5517. Technology Three: Structural Systems. (3.0 cr.; A-F only; prereq M Arch student; fall, every year) 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.

ARCH 5521. Material Investigation: Concrete. (4.0 cr.; A-F only; prereq M Arch or MS; spring, every year) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where concrete is primary building material.

ARCH 5523. Material Investigation: Steel and Glass. (4.0 cr.; A-F only; prereq Grad student; spring, every year) Design projects identify common problems and improvements, investigate alternatives and develop solutions where steel and glass are the primary building materials.

ARCH 5527. Material Investigations: Stone and Water. (4.0 cr.; A-F only; prereq M Arch or MS; spring, every year) Design projects identify common problems/improvements, investigate alternatives, and develop solutions where wood is primary building material.

ARCH 5539. Daylighting and Architecture Design. (4.0 cr.; A-F only; prereq M Arch major; spring, every year) Ecological design approaches that combine ecological, physiological, and experiential aspects to enhance relationship to place. How formal, aesthetic, and experiential aspects of daylighting support/offset sustainable architectural design.

ARCH 5541. Material Strategies. (3.0 cr.; A-F only; prereq M Arch or Arch MS major; fall, every year) 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.

ARCH 5550. Topics in Technology. (1.0-4.0 cr. [max 12.0 cr.]; A-F only; prereq M Arch major; fall, spring, summer, every year) Selected topics in architecture technology, e.g., construction, environmental management, energy performance, lighting, materials.

ARCH 5561. Tech 1, Structures for Building. (2.0 cr.; A-F only; prereq M Arch major or #; fall, every year) Role of structure in architectural design. Common systems found throughout history. Review systems to identify parameters that influence structural decisions.

ARCH 5562. Tech 2, Intro to Building Technology. (2.0 cr.; A-F only; prereq M Arch or #; fall, every year) Origin/development of architectural idea. Designs as direct means of representing our underlying intentions.

ARCH 5563. Tech 3: Advanced Building Technology Integrated Building Systems. (0.0-2.0 cr.; A-F only; prereq M Arch or #; fall, every year) Logic of integrating building systems. Improving understanding of/thinking critically about integration principles, theories, practice, application. Identifying/working through problems/project architect must address.

ARCH 5564. Tech 4: Building Structural Systems. (0.0-2.0 cr.; A-F only; prereq M Arch or #; fall, every year) 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.

ARCH 5571. Architectural Structures I: Wood and Steel Design. (3.0 cr.; A-F or ...

ARCH 5611. Design in the Digital Age. (3.0 cr.; A-F or Audit; prerequisites Grad student or upper level undergraduate; spring, every year) 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.

ARCH 5621. Professional Practice in Architecture. (3.0 cr.; A-F or Audit; prerequisites M Arch major or #; fall, spring, summer, every year) 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.

ARCH 5630. Practicum: Advanced Issues in Practice. (3.0 cr. [max 6.0 cr.]; S-N only; prerequisites M.S. Architecture or MArch; fall, spring, every year) Advanced architectural practice topics not normally covered in curricula are examined/evaluated as foundation for licensure ARE 4.0 testing processes.

ARCH 5650. Topics in Architectural Practice. (1.0-4.0 cr. [max 16.0 cr.]; prerequisites 5621, Arch major or #; fall, spring, summer, every year) Topics in architectural practice, methods of design production, marketing, operation, and relationships among clients, architecture, and society.

ARCH 5651. Building Stories. (3.0 cr. [max 12.0 cr.]; A-F only; spring, every year) Professional practice education by means of case study analysis.

ARCH 5670. Topics in Historic Preservation. (1.0-3.0 cr. [max 12.0 cr.]; prerequisites MS Arch or M Arch major or #; fall, offered periodically) Selected topics in the theory, philosophy, research, and methods of architectural historic preservation.

ARCH 5671. Historic Preservation. (3.0 cr.; fall, every year) 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 5673. Historic Property Research and Documentation. (3.0 cr.; prerequisites 3412, 3641, 4671, 5671, 4672 or 5672 or #; spring, every year) Philosophy, theory, methods of historic building research. Descriptive analysis of buildings, building documentation, historical archaeology, architectural taxonomy.

ARCH 5677. Preservation of the Vernacular Built Environment and Cultural Landscape. (3.0 cr.; prerequisites Grad student, open to upper level (junior/senior) undergraduates with #. Honors student encouraged.; spring, offered periodically) Theoretical, methodological, practical implications of preserving vernacular environment such as commercial blocks, strips/buildings, warehouses/sheds, wharves/piers, abandoned streetcar tracks/railroad spurs.

ARCH 5711. Theory and Principles of Urban Design. (3.0 cr.; A-F or Audit; prerequisites M Arch major or LA grad major or grad student or #; spring, every year) Seminar. Debate on dominant theories/paradigms informing city design from renaissance to 21st century. Critical issues central to current debates.

ARCH 5721. Case Studies in Urban Design. (3.0 cr.; A-F or Audit; prerequisites M Arch major or LA grad major or grad student or #; spring, every year) Seminar. Case studies in urban design.

ARCH 5731. Territorial City. (3.0 cr.; A-F only; fall, every year) Seminar. 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. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prerequisites Arch major; fall, spring, summer, every year) Special topics in theory/practice of urban design.

ARCH 5993. Directed Study. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prerequisites #; fall, spring, every year) Guided individual reading or study.

ARCH 8101. Subjects and Methods in Architecture. (2.0 cr.; S-N or Audit; prerequisites Grad Arch major or #; fall, spring, offered periodically) The discipline of architecture.

ARCH 8250. Advanced Topics in Design. (1.0-6.0 cr.; S-N or Audit; prerequisites Admitted to 3+ track for MArch prog or #; spring, offered periodically) Design studio.

ARCH 8251. Graduate Architectural Design I. (9.0 cr.; A-F or Audit; prerequisites MArch or #; fall, every year) Design projects focus 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.

ARCH 8252. Graduate Architectural Design II. (6.0 cr.; A-F or Audit; prerequisites 8251, grad Arch major or #; spring, every year) Fundamental architectural problems involving design as a creative inquiry. Individual and collaborative effort.

ARCH 8253. Graduate Architectural Design III. (9.0 cr.; A-F or Audit; prerequisites 8251, MArch or #; fall, every year) Issues of design process, representation, programming, technology, and urban relations.

ARCH 8254. Technical Applications in Design. (4.0 cr. [max 8.0 cr.]; A-F or Audit; prerequisites #8253, MArch major or #); fall, every year) 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.

ARCH 8255. Graduate Architectural Design V. (6.0 cr. [max 12.0 cr.]; A-F or Audit; prerequisites #8254, grad Arch major or #; fall, spring, every year) Fundamental architectural problems involving design as a creative inquiry. Individual/collaborative effort.

ARCH 8295. Directed Graduate Architectural Design. (6.0 cr.; A-F or Audit; prerequisites 8251, grad Arch major or #; spring, every year) 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.

ARCH 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prerequisites Master's student,
adviser and DGS consent; fall, spring, summer, every year) (No description)

ARCH 8350. Advanced Topics in Representation. (1.0-3.0 cr.; A-F or Audit; prereq Grad Arch major or #; summer, every year) Theory and practice of visual representation in architecture.

ARCH 8450. Topics in Theory. (1.0-3.0 cr.; A-F or Audit; prereq 5411, grad Arch major or #; fall, spring, every year) Topics vary

ARCH 8494. Directed Research in Architectural History. (1.0-3.0 cr.; A-F or Audit; prereq Grad Arch major or #; spring, every year) tbd

ARCH 8550. Topics in Technology. (1.0-3.0 cr.; A-F or Audit; prereq Grad Arch major or #; fall, spring, every year) Special topics in theory/practice of architecture technologies.

ARCH 8561. Sustainable Design Theory and Practice. (3.0 cr.; A-F or Audit; prereq [5513, [grad MS or MArch]] or #; fall, every year) 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.

ARCH 8563. Energy and Indoor Environmental Quality Issues in Sustainable Design. (3.0 cr.; A-F or Audit; prereq [5513, [grad MS or MArch]] or #; spring, every year) 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.

ARCH 8565. Materials Performance in Sustainable Building. (3.0 cr.; A-F or Audit; prereq [5512, grad MS or March] or #; fall, every year) 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.

ARCH 8567. Site and Water Issues in Sustainable Design. (3.0 cr.; A-F only; prereq [5512, [grad MS or Master]] or #; spring, every year) 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.

ARCH 8650. Topics in Architectural Practice. (1.0-3.0 cr.; A-F or Audit; prereq Grad Arch major or #; )

ARCH 8750. Topics in Urban Design. (1.0-3.0 cr.; A-F or Audit; prereq Grad Arch major or #; )

ARCH 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only; fall, spring, summer, every year]) (No description)

ART 5105. Advanced Dimensional Painting. (4.0 cr.; prereq 3105 or #; spring, every year) 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.

ART 5106. Advanced Drawing: Interpreting the Site. (4.0 cr.; prereq 3106 or #; summer, every year) Search for personal content as inspired by site. Field trips (2/3 of course) to draw or paint from various metropolitan area locations. Interpretations enhanced by experimentation with new marks/symbols.

ART 5107. Advanced Drawing Using Digital Media. (4.0 cr.; prereq 3107 or #; fall, spring, every year) Advanced, individual creative work using digital technology as tool/component in contemporary drawing practice.

ART 5110. Advanced Drawing. (4.0 cr. [max 16.0 cr.]; prereq 3101 or 3111 or #; fall, spring, every year) Developing personal direction in form/content. Various media. Various aesthetic/conceptual approaches.

ART 5120. Advanced Painting. (4.0 cr. [max 16.0 cr.]; prereq 3102 or #; fall, spring, every year) Developing personal vision/content through painting. Emphasizes critical thinking, self-evaluation, and independent pursuit of ideas.


ART 5300. Advanced Sculpture. (4.0 cr. [max 12.0 cr.]; prereq 3300; fall, spring, every year) Studio practice. Historical/contemporary methods/concepts. Individualized sculptural aesthetic/imagery/thinking in various media platforms. Individual/collaborative modes for contemporary sculptural practice.

ARTS 5310. Advanced Sculpture: Direct Metal. (4.0 cr. [max 8.0 cr.]; prereq 3301 or #; fall, offered periodically) Direct metal sculpture in steel, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculpture imagery.

ARTS 5320. Advanced Sculpture: Spatial Problems. (4.0 cr. [max 8.0 cr.]; prereq 3302 or #; fall, spring, every year) Sculptural practice outside traditional media/approaches. Installation, theater, public art, architecture as topics for individual investigations into spatial organization.

ARTS 5330. Advanced Sculpture: Metal Casting. (4.0 cr. [max 12.0 cr.]; prereq 3303 or #; fall, spring, every year) Metal casting of sculpture in bronze, iron, aluminum, other metals. Studio practice, investigation of historical/contemporary methods/concepts. Development of personal sculptural imagery.


ARTS 5350. Advanced Sculpture: Kinetics. (4.0 cr. [max 8.0 cr.]; prereq 3305 or #; spring, every year) Studio practice in kinetic sculpture. Historical/contemporary methods/concepts of sculpture produced by motion. Development of personal imagery.

ARTS 5360. Advanced Performance Art and Installation. (4.0 cr. [max 8.0 cr.]; prereq 3306 or #; fall, spring, offered periodically) Studio practice in performance art and installation; investigation of historical and contemporary methods and concepts of interdisciplinary expression. Development of personal imagery.


ARTS 5390. Advanced Sculpture Methods and Practice. (4.0 cr. [max 12.0 cr.]; prereq 5300; fall, spring, every year) Work in selected sculptural processes with intense studio activity. Development of innovative methods/techniques.

ARTS 5400. Seminar: Concepts and Practices in Art. (3.0 cr. [max 6.0 cr.]; prereq BFA candidate or #; fall, spring, every year)

ARTS 5402. Artists' Books. (4.0 cr.; prereq 3402 or #; fall, spring, every year)
Advanced projects in creation of unique, handmade books using various structures, media, techniques. Critical, historical, theoretical issues surrounding contemporary book arts.

ARTS 5403. Women's Images and Images of Women. (3.0 cr.; [ARTS 3403]; prereq 1001 or #; fall, spring, every year)
Women's place in Western art from the artist's perspective. Women as artists and the imagery they have created. Women as the object of imagery and the social and political attitudes those images convey. Survey of women artists from late-Renaissance through contemporary feminism; relevant issues.

ARTS 5441. Professional Practices. (3.0 cr.; A-F only; prereq Grad student or [Art BFA student or Art Major, jr or sr]; fall, spring, offered periodically)
Theoretical issues, business practices, professional skills required for career management/development in visual arts.

ARTS 5444. Bachelor of Fine Arts Exhibition. (1.0 cr.; S-N only; prereq 5400, BFA candidate, sr; fall, spring, every year)
Final solo or small group exhibition and artist's statement developed in consultation with faculty adviser. Visual documentation of work and statement as appropriate to media.

ARTS 5490. Workshop in Art. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Selected topics and intensive studio activity. Topics vary yearly.

ARTS 5510. Advanced Printmaking. (4.0 cr. [max 12.0 cr.; prereq 3510 or #; fall, spring, every year])
In-depth research of personal imagery using a broad range of historical and contemporary approaches. Development of imagery using color, photo-mechanical, digital processes. Cross-media approaches.

ARTS 5550. Advanced Papermaking. (4.0 cr. [max 8.0 cr.]; prereq 3505 or #; fall, spring, offered periodically)
Distinct expressive qualities of handmade paper, its versatility as contemporary art form. Independent research pursued in consultation with instructor.

ARTS 5610. New Media: Making Art Interactive. (4.0 cr. [max 12.0 cr.; prereq 3601 or #; fall, spring, offered periodically])

ARTS 5620. Narrative Digital Video. (4.0 cr. [max 12.0 cr.; prereq 3602; fall, spring, every year])
Individual, advanced, creative projects with narrative forms of video art. Documentary, live action, memoir. Relationships between conceptual, aesthetic, and artistic process.

ARTS 5630. Advanced Experimental Video. (4.0 cr. [max 12.0 cr.; prereq 3603 or #; fall, spring, every year])

ARTS 5640. Advanced Animation. (4.0 cr. [max 12.0 cr.; prereq 3604 or #; fall, spring, every year])
Two/three-dimensional animation with digital technologies. Individual projects. Expansion of personal voice/visual clarity within framework of animated imagery and time-based artwork.

ARTS 5650. Advanced Sound Art. (4.0 cr. [max 12.0 cr.; prereq 3605; fall, spring, every year])
Sound art practice/theory. Emphasizes individual creative projects using sound as primary material. History of experimental sound art from early 20th century to present. Critics, readings, writing, public presentations.

ARTS 5670. Interdisciplinary Media Collaborations. (3.0 cr. [max 9.0 cr.; prereq Upper-division undergraduate or graduate student in art, creative writing, dance, music or theater.; fall, spring, every year])
Interdisciplinary, collaborative artist teams explore modes of creative expression at intersections of the arts. Students collaborate to co-author/work/produce works of art for public presentation. Emphasizes integration of media arts with visual art, music, dance, and theater to produce interdisciplinary/collaborative art.

ARTS 5690. Art for the People/Art on Wheels: Advanced Projects. (4.0 cr. [max 12.0 cr.; prereq Arts 3609; spring, every year])
Advanced research in the Minneapolis Art on Wheels (MAW) project/participation in a student-run public art group. Use MAW's hardware/software technologies for mobile projections and current urban projection techniques that rely on bicycles. Opportunities to develop/exhibit large scale works in public spaces.

ARTS 5701. Performed Photography: Documentation of Artistic Acts and Social Interventions. (4.0 cr.; prereq Two 3xxx [photography or video] courses; fall, spring, offered periodically)
Studio course. Use of image-based media to document various artistic, site-specific acts that may otherwise go unnoticed. Relationship between original event (performance, social intervention, sculptural prop, ephemeral gesture) and memory trace left in image/record.

ARTS 5710. Advanced Photography. (4.0 cr. [max 12.0 cr.; prereq Two semesters of 3xxx photography or #; fall, spring, every year])
Design/implementation of individual advanced projects. Demonstrations, lectures, critique. Reading, writing, discussion of related articles/exhibitions.

ARTS 5810. Advanced Ceramics. (4.0 cr. [max 16.0 cr.; prereq [3801, 3802, 3810] or #; fall, spring, every year])
Critical discourse of aesthetics. History of, contemporary issues in clay and criticism. Independent, advanced projects.

ARTS 5821. Ceramic Materials Analysis. (4.0 cr.; prereq 3801 or 3802 or #; fall, spring, offered periodically)
Ceramic materials, their interrelationships. Advanced investigation of glazes, slip formulation, clay bodies in high/low temperature ranges. Individual interests related to students' aesthetic needs.

ARTS 5990. Independent Study in Art. (1.0-4.0 cr. [max 12.0 cr.; prereq Major, completed regular course with instructor, #; fall, spring, every year])
Independent study project designed by student in consultation with instructor.

ARTS 8100. Practice and Critique: Drawing and Painting. (3.0 cr. [max 12.0 cr.]; prereq Art MFA student; fall, spring, every year)
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8300. Practice and Critique: Sculpture. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ARTS 8400. Theoretical Constructions in Contemporary Art. (3.0 cr. [max 6.0 cr.]; fall, spring, every year)
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 8401. Studio and Pedagogy: Philosophy and Practice. (3.0 cr. [max 6.0 cr.]; spring, every year)
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 8410. Studio Critique/Visiting Artists Seminar. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq 8400; fall, spring, every year)
Studio based critique to foster critical dialogue about art practice across media/disciplines. Colloquium for ideas/theories that migrate between artistic practice, influence studio work. Introduction to work/ideas of visiting artists/critics.

ARTS 8420. Seminar: Visiting Artists Program. (2.0 cr. [max 12.0 cr.; S-N only; prereq MFA student; fall, spring, every year)}
Introduction to work/ideas of visiting artists/critics. Individual studio critiques, group discussion. Students connect/extend topics to their thesis and supporting paper.

ARTS 8490. Workshop in Art. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Selected topics/intensive studio activity. Topics vary yearly.

ARTS 8500. Practice and Critique: Printmaking. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) 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. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8700. Practice and Critique: Photography. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8800. Practice and Critique: Ceramics. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) Creative practice/critique. Colloquium emphasizing individual goals/directions. Aesthetics, history, theory, contemporary issues in practices/criticism.

ARTS 8990. M.F.A. Creative Thesis. (1.0-9.0 cr. [max 18.0 cr.]; prereq Art MFA candidate, passed oral/written prelim; #; fall, spring, every year) Research/studio work in preparation for thesis exhibition and supporting paper.

Art History (ARTH)

College of Liberal Arts

ARTH 5108. Greek Architecture. (3.0 cr.; =[CNES 5108]; prereq Arth/Clas 3008, jr or sr or grad, or #; spring, offered periodically) Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor, and Italy.

ARTH 5112. Archaic and Classical Greek Art. (3.0 cr.; prereq jr or sr or grad or #; fall, offered periodically) Sculpture, painting, architecture, and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture, archaeological problems such as identifying and dating buildings; analysis of methods and techniques.

ARTH 5112. Archaic and Classical Greek Art. (3.0 cr.; prereq Jr, Clas/Arth 5111; fall, offered periodically) Sculpture, painting, architecture and minor arts in Greek lands from the 9th through 5th centuries B.C. Examination of material remains of Greek culture; archaeological problems such as identifying and dating buildings; analysis of methods and techniques. Emphasis on Periklean Athens.

ARTH 5113. Heritage After Iraq and Afghanistan: Debates in Art History, Museum Studies, and the Art Market. (3.0 cr.; fall, spring, offered periodically; Pre- and postwar Iraq, looting of the Baghdad Museum, systematic looting of archaeological sites; destruction of Afghanistan's cultural heritage under the Taliban, looting/trade in antiquities since the overthrow; art/war in historical/contemporary perspectives; nationalist uses of archaeology, museology.

ARTH 5114. Hellenistic and Islamic Asia: Art and Archaeology of Hellenistic, Scythian, Kushan, and Sogdian Asia. (3.0 cr.; fall, spring, every year) 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 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3.0 cr.; =[CNES 5172]; prereq one intro art history course or #; fall, spring, offered periodically) The architecture, painting, and sculpture of urban lands, country estates, and tombs in the Roman World. Relationships between public and private spheres, and literary and physical evidence; usefulness of physical evidence in illuminating gender roles.

ARTH 5188. Art and Archaeology of Early Christianity and the Late Roman Empire. (3.0 cr.; =[RELS 5252]; fall, spring, offered periodically) Emergence of Christian visual culture in Rome. Age of Tetrarchs and Constantine the Great. Age of Justinian. Development of liturgical environments such as Jewish synagogue and Christian church. Melding of imperial and Christian art, architecture, and ritual. Constantinople, from its founding through sixth century. Church architecture. Early icon/ manuscript painting.

ARTH 5192. Persia and the Ancient Iranian World: Art and Archaeology of Achaemenid to Sassanian Persia. (3.0 cr.; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; spring, offered periodically) 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. Print Culture in Early Modern Europe. (3.0 cr.; A-F or Audit; ) Cultural history of printed images in Europe from their emergence in 16th century through about 1750. Book illustration, reproductive printmaking. History of print connoisseurship. Prints and scientific knowledge. Role of print culture in major social/political events such as Protestant Reformation.

ARTH 5323. Art of the Italian Renaissance: 14th-16th Centuries. (3.0 cr.; fall, every year) Chronological/thematic study of painting, sculpture, and architecture. Emphasizes major artists/commissions, but lesser schools/followers also considered.

ARTH 5324. 15th-Century Painting. (3.0 cr.; prereq Jr or sr or grad or #; fall, spring, offered periodically) The origin, character, and development of painting in Northern and Southern Europe.

ARTH 5325. Art of the Aztec Empire. (3.0 cr.; =[ANTH 5325, RELS 5325]; spring, every year) Art/architecture of Nahua-speaking Aztecs of Central Mexico, from first appearance in archaeological record until Spanish invasion in 1521. Major scholarly problems, theoretical/methodological approaches. Analysis of scholarly writing.

ARTH 5335. Baroque Rome: Art and Politics in the Papal Capital. (3.0 cr.; =[HIST 3706, ARTH 3335, RELS 5612, RELS 3612]; fall, every year) Center of baroque culture--Rome--as city of spectacal and pageantry. Urban development. Major works in painting, sculpture, and architecture. Emphasizes ecclesiastical/private patrons who transformed the Eternal City into one of the world's great capitals.

ARTH 5411. Gender and Sexuality in Art Since 1863. (3.0 cr.; fall, spring, offered periodically) 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 assumptions about gender/sex. Critical reading/writing.


ARTH 5417. Twentieth Century Theory and Criticism. (3.0 cr.; prereq 3464 or #; fall, offered periodically) Trends in 20th-century art theory, historical methodology, criticism. Key philosophical ideas of modernism/postmodernism: formalism, semiotics, poststructuralism, feminism, marxism, psychoanalysis, deconstruction.

ARTH 5422. Off the Wall: History of Graphic Arts in Europe and America in the Modern Age. (4.0 cr.; spring, offered periodically)
History/theory of creation of lithography, social caricature (e.g., Daumier, Gavarni), revival of etching (e.g., Goya, mid-century practitioners, Whistler), and color lithography (e.g., Toulouse-Lautrec, Vuillard, Bonnard). Media changes of 20th century. Revolutionary nature of new media.

ARTH 5454. Design Reform in the Era of Art Nouveau. (3.0 cr.)
History of art nouveau in France, Belgium, England, Germany, Austria, Scotland, United States. Innovations in architecture, graphics, decorative arts; continental variants of the style. Major promoters and pioneers of modern design. Critical issues of design reform; texts integrated with principal monuments.

ARTH 5466. Contemporary Art. (3.0 cr.; prereq 3464 or #; spring, offered periodically)
Survey of the art and important critical literature of the period after 1970. Origins and full development of postmodern and subsequent aesthetic philosophies.

ARTH 5484. The Art of Picasso and the Modern Movement. (4.0 cr.; fall, spring, every year)
Works of Picasso in all media. Blue, Rose, Cubist, Classical, and later periods of Picasso’s development against innovations in media; collage, utilization of found-objects, printmaking and ceramics. Autobiographical nature of imagery gives methodological basis for exploring frequently personalized themes.

ARTH 5494. East/West, West/East. (3.0 cr.; fall, spring, every year)
Beginning in the early 18th century and culminating at the dawn of the First World War. Chinoiserie, Orientalism, Japonisme, and western influence in Japan during the Meiji Era. Historical and critical context of trade competition, the colonial race, and the shrinking geopolitical map as the period progresses. Paintings to prints, decorative arts to architecture, and world fair exhibitions to photography.

ARTH 5535. Style, Tradition, and Social Content in American Painting: Colonial Era to 1876. (3.0 cr.;)
America’s colonial, Revolutionary era, and 19th-century painters’ responses to the influence of European aesthetics. Key American painting types: portraiture, rural genre, and landscape from Copley and Gilbert Stuart to the Hudson River School and the chroniclers of the Western frontier.

ARTH 5546. American Architecture: 1840 to 1914. (3.0 cr.;)
American architecture from 1840 to 1914, examined in relation to European precedents and American sociohistorical conditions. Critical attention to problems of style, the architectural profession, vernacular vs. “high” architecture, technology, economics, urbanism, and social reform.

ARTH 5556. American Art in the Gilded Age. (3.0 cr.; fall, spring, offered periodically)
Major artists, artistic movements, and aesthetic concerns that dominated American art history from the Civil War to the turn of the century.

Nationalism and cosmopolitanism as well as masculinity and femininity, industrialization and the “incorporation of America,” methods of art instruction and its social role. Place of art in civic life.

ARTH 5575. Boom to Bust: American Art from the Roaring Twenties to the Great Depression. (3.0 cr.; fall, spring, every year)
American art/culture from 1917 to 1940. Boom of post-WWII affluence, bust of stock market crash, Midwestern Dust Bowl. How tumultuous times influenced painting, sculpture, photography, and industrial design.

ARTH 5577. Art of the Harlem Renaissance. (3.0 cr.; fall, every year)
Visual side of Harlem Renaissance, as represented by painters, illustrators, sculptors, and photographers. How African-Americans in 1920s/30s tried to reclaim visual field for purpose of racial redefinition.

ARTH 5655. African American Cinema. (3.0 cr.; =ARTH 3655, AFRO 3655, AFRO 4655; fall, offered periodically)
African American cinematic achievements, from silent films of Oscar Micheaux through contemporary Hollywood and independent films. Class screenings, critical readings.

ARTH 5765. Early Chinese Art. (3.0 cr.; spring, every year)
Art/material culture of early China from Neolithic age (ca. 10000-2000 BCE) to early imperial period (221 BCE-906 CE).

ARTH 5766. Chinese Painting. (3.0 cr.; fall, odd years)
Major works from the late bronze age to the modern era that illustrate the development of Chinese landscape painting and associated literary traditions.

ARTH 5775. Formation of Indian Art: 2500 BCE to 300 CE. (3.0 cr.;)
Sculpture/architecture, from Indus Valley civilization through Kushana period.

ARTH 5776. Redefining Tradition: Indian Art, 400 to 1300. (3.0 cr.;)
India’s art/architecture, from earliest free-standing temples through 13th century. Focuses on temples, associated sculpture. Murial painting, beginnings of Islamic architecture in India.

ARTH 5777. The Diversity of Traditions: Indian Art 1200 to Present. (3.0 cr.; fall, spring, summer, every year)
Issues presented by sculpture, architecture and painting in India, from prehistoric Indus Valley civilization to present day.

ARTH 5781. Age of Empire: The Mughals, Safavids, and Ottomans. (3.0 cr.;)
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.

ARTH 5785. Art of Islamic Iran. (3.0 cr.;)
Architecture, painting, and related arts in Iran from the inception of Islam (7th century) through the 20th century. Understanding the nature of Islam in Persianate cultural settings and how artistic production here compares to the Islamic world.

ARTH 5786. Theorizing City and Space in the Mediterranean and Western Asia. (3.0 cr.; spring, even years)
Development of greatest cities of Eastern Mediterranean/Western Asia from age of Alexander to rise of Islam. Methodological/theoretical approaches to study of cities where as much evidence exists in texts as archaeological form.

ARTH 5787. Visual Cultures in Contact: Cross-Cultural Interaction in the Ancient and Early Medieval Worlds. (3.0 cr.; fall, even years)
Evaluate critical perspectives from variety of interdisciplinary conversations. Framework for studying cross-cultural interaction among ancient visual cultures that integrates practical, cognitive, object oriented approaches. Cross-continental movement/selective appropriation of objects/motifs.

ARTH 5801. Spoken Word and Painted Texts in the Americas (200-1650 A.D.). (3.0 cr.; fall, spring, every year)
Art/architecture of people of Andes, from first appearance in archaeological record until Spanish Invasion in 16th century. Problems, theoretical/methodological approaches. Analysis of scholarly writing, focusing on evidence.

ARTH 5826. The Cinema of Alfred Hitchcock. (3.0 cr.; =ARTH 3826; fall, even years)
Achievement/significance of Alfred Hitchcock. British/American periods of career, major films, television program. Biographical, historical, technological, industrial, aesthetic issues surrounding his achievement.

ARTH 5940. Topics: Art of the Film. (3.0 cr.; fall, spring, every year)
Topics in film history including individual directors (e.g., Hitchcock, Welles), genres (e.g., westerns, musicals), and other topics (e.g., American independent filmmaking, film noir).

ARTH 5950. Topics: Art History. (3.0 cr.; max 9.0 cr.; fall, spring, summer, every year)
Topics specified in Class Schedule.

ARTH 5993. Directed Study. (1.0-4.0 cr.; max 12.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
TBD

ARTH 5994. Directed Research. (1.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
tbd
ARTH 8001. Art Historiography: Theory and Methods. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Key texts, from Renaissance to present, from western/non-western fields, relating to history/criticism of both art and visual culture. Focuses on recent critical theory, its re-examination of assumptions underlying the discipline.

ARTH 8120. Computer Applications in Art History and Archaeology. (3.0 cr.; fall, spring, every year) Seminar. Potential of digital technology as applied to art history/archaeology. Computer technologies as affecting methodologies of art history/archaeology. Way in which art history/archaeology can contribute to emerging computer applications.

ARTH 8190. Seminar: Issues in Ancient Art and Archaeology. (3.0 cr. [max 12.0 cr.]; [CNES 8190]; prereq #; fall, spring, every year) Selected topics, with special attention to current scholarly disputes. Topics specified in Class Schedule.

ARTH 8200. Seminar: Medieval Art. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Focus on a major art historical theme, artist, period, or genre.


ARTH 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ARTH 8340. Seminar: Baroque Art. (3.0 cr. [max 12.0 cr.]; prereq #; spring, every year) Topics vary.

ARTH 8400. Seminar: Issues in 19th-Century Art. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, offered periodically) 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.


ARTH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ARTH 8500. Issues in Latin American Art. (3.0 cr. [max 12.0 cr.]; spring, every year) Topics vary.

ARTH 8520. Seminar: American Art and Material Culture. (3.0 cr. [max 12.0 cr.]; [AMST 8520]; prereq #; fall, spring, offered periodically) 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.

ARTH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

ARTH 8710. Seminar: Islamic Art. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, offered periodically) Focus depends on current research interests of the professor and needs and interests of graduate students in Islamic and Asian art history.

ARTH 8720. Seminar: East Asian Art. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, offered periodically) 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.

ARTH 8770. Seminar: Art of India. (3.0 cr. [max 12.0 cr.]; prereq 3 cr art history, #; fall, spring, offered periodically) Selected problems and issues in history of South Asia art. Topic varies by offering.

ARTH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

ARTH 8890. Seminar: Film History and Criticism. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) Selected topics in film history and theory, including specific directors, genres, movements, periods, and critical issues (e.g., violence).

ARTH 8950. Seminar: Issues in the History of Art. (3.0 cr. [max 12.0 cr.]; prereq 3 cr art history, #; fall, spring, every year) Theoretical or topical issues. Topics vary.

ARTH 8970. Directed Studies. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) tbd

ACL 5100. Topics in Arts and Cultural Leadership. (1.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Topics in arts and cultural leadership.

ACL 5200. Trends and Impacts in Arts and Cultural Leadership. (3.0 cr.; A-F or Audit; prereq %; fall, every year) Seminar exploring the theoretical foundations/policies from which nonprofit arts and culturally-related organizations are built and the practical influences that affect leaders and their ability to achieve mission delivery, set strategic goals and translate strategy into successful, daily operations.

ACL 5220. Philanthropy, Development, and Strategic Leadership. (3.0 cr.; A-F or Audit; prereq %; fall, every year) Funding sources available to nonprofit organizations/strategies employed to acquire/sustain necessary resources. Investigate/discuss complexities and nuances of both earned/unearned income for nonprofits, motives/perspectives of funders and donors, role of communications strategies in support of fund-raising, importance of leadership in acquiring resources to sustain/grow a successful organization. Participants interact with leaders from the foundation and nonprofit community during most class sessions, including the State Arts Board, St. Paul Foundation, TPT, Jerome Foundation, Bush Foundation.


ACL 5950. Special Topics. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Special topics.

ACL 5993. Directed Studies. (1.0-4.0 cr. [max 15.0 cr.]; A-F only; prereq Grad student, %; fall, spring, summer, every year) Guided individual reading or study for qualified graduate students.

ACL 8001. Introduction to Interdisciplinary Inquiry. (3.0 cr.; A-F or Audit; prereq ACL student or %; fall, spring, summer, every year) Emphasizes what students need to know to successfully complete their individually crafted program, including critical thinking, clear writing, interdisciplinary research.

ACL 8002. Final Project Seminar. (3.0 cr.; S- N only; prereq ACL student or %; spring, every year) Required final project seminar for graduate students in MPS in Arts/Cultural Leadership program.

ACL 8201. Leadership: Skills and Practice. (1.0 cr. [max 2.0 cr.]; A-F only; prereq ACL student, %; summer, every year) Opportunity to meet several arts/nonprofit leaders from Twin Cities community. How leaders effectively build relationships, work
with artists, board members, staff, community groups. Explore personal leadership strengths through Gallup’s Strengths Finder tool, personal reflection, readings, in-class discussion.

ACL 8202. Nonprofit Board Practicum. (1.0 cr. [max 2.0 cr.]; A-F only; prereq ACL student, %; summer, every year) Fiduciary, strategic, generative governance explored through lens of peer-learning/ facilitation by seasoned board/non-profit professional. Role of executive leader to board. How executive leadership can foster healthy organization in concert with strong/highly functioning board.

Asian American Studies (AAS)
College of Liberal Arts

AAS 5920. Topics in Asian American Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics specified in Class Schedule.

AAS 5993. Directed Readings. (1.0-4.0 cr. [max 8.0 cr.]; fall, offered periodically) Directed reading--must be set up with individual instructor.

AAS 5996. Graduate Proseminar. (1.0 cr. [max 4.0 cr.]; S-N only; fall, spring, every year) Discussions/presentations from various disciplinary perspectives on 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 Literatures (ALL)
College of Liberal Arts


ALL 5276. Liberalism and Its Critics: Global Perspectives. (3.0 cr.; A-F only; fall, odd years) 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 5436. Literature by 20th-Century Japanese Women in Translation. (3.0 cr.; fall, offered periodically) Literary/historical exploration of selected works by Japanese women writers in variety of genres. All literary texts read in English.

ALL 5671. Hinduisms. (3.0 cr. = [HIST 3492, ALL 3671, RELS 5671, RELS 3671]; fall, spring, offered periodically) Development of Hinduism focusing on sectarian trends, modern religious practices, myths and rituals, pilgrimage patterns and religious festivals, and the interrelationship between Indian social structure and Hinduism.

ALL 5836. Persian Fiction in Translation. (3.0 cr. = [ALL 3836, MELC 5601, MELC 3601]; fall, offered periodically) Impact of westernization on Iran, from 1920s to present. Materials produced by Iranian writers, film makers, and intellectuals. Internal/external forces that bind contemporary Iranian society to world civilization. Works of Hedayat (especially Blind Owl), Chubak, Ali-Ahmad, Dañoeshvar, and Behrangani are analyzed/interpreted.

ALL 5900. Topics in Asian Literature. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

ALL 5920. Topics in Asian Culture. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics specified in Class Schedule.

ALL 5990. Directed Study. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Individual reading/study, with guidance of a faculty member, on topics not covered in regular courses. Prereq-instr consent, dept consent, college consent.

ALL 8001. Critical Approaches to Asian Literary and Cultural Studies. (3.0 cr.; fall, odd years) Constructions of national identity, its consolidation in current disciplinary/academic structures.


ALL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, [adviser, DGS] consent; fall, spring, summer, every year) x

ALL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, [adviser, DGS] consent; fall, spring, summer, every year) x

ALL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) x

ALL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year) x

ALL 8920. Topics in Asian culture. (1.0-3.0 cr. [max 9.0 cr.]; S-N only; fall, spring, every year) Topics specified in Class Schedule. ALL 8990. Directed Readings. (1.0-4.0 cr. [max 16.0 cr.]; prereq PhD student; fall, spring, every year) Directed readings in foreign language(s) of specialty, where appropriate.

Astronomy (AST)
College of Science and Engineering


AST 5201. Methods of Experimental Astrophysics. (4.0 cr.; prereq Upper div CSE or grad or #; spring, odd years) 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.

AST 8001. Radiative Processes in Astrophysics. (4.0 cr.; prereq #; ) 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).

AST 8011. High Energy Astrophysics. (4.0 cr.; prereq #; ) Energetic phenomena in the universe. Radiative processes in high energy regimes; supernovae, pulsars, and X-ray binaries; radio galaxies, quasars, and active galactic nuclei.

AST 8021. Stellar Astrophysics. (4.0 cr.; prereq #; ) Stellar structure, evolution, and star formation. Emphasizes contemporary research.

AST 8031. Astrophysical Fluid Dynamics. (4.0 cr.; prereq #; fall, offered periodically) Introduction to physics of ideal/non-ideal fluids with application to problems of...

AST 8041. Comparative Planetology. (4.0 cr.; prereq #: ) Overview of current 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.

AST 8051. Galactic Astronomy. (4.0 cr.; prereq #: ) Content, structure, evolution, and dynamics of Milky Way Galaxy. Emphasizes recent observations from space-/ground-based telescopes.


AST 8081. Cosmology. (4.0 cr.; prereq #: ) Role of gravity in cosmology. Background, recent research advances.

AST 8110. Topics in Astrophysics. (2.0-4.0 cr.; prereq #: Fall, Spring, offered periodically) Current topics in Astrophysics.

AST 8120. Topics in Astrophysics. (2.0-4.0 cr.; prereq #: )

AST 8200. Astrophysics Seminar. (1.0-3.0 cr.; prereq #: Fall, Spring, every year) TBD

AST 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; Fall, Spring, Summer, every year) (No description)

AST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; Fall, Spring, Summer, every year) (No description)

AST 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; Fall, Spring, Summer, every year) TBD

AST 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; Fall, Spring, Summer, every year) (No description)

AST 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; Fall, Spring, Summer, every year) (No description)

AST 8990. Research in Astronomy and Astrophysics. (1.0-4.0 cr.; prereq #: Fall, Spring, every year) Research under supervision of a graduate faculty member.

Biochemistry (BIOC)

BIOC 5001. Biochemistry, Molecular and Cellular Biology. (5.0 cr.; =BIOC 6001; prereq undergrad course in biochemistry, #; Fall, every year) Integrated course in biochemistry, molecular biology, cell biology, and developmental biology.

BIOC 5213. Selected Topics in Molecular Biology. (3.0 cr.; A-F only; prereq 4332 or 8002 or [3021, BIOL 4003] or #: Fall, every year) 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.

BIOC 5216. Current Topics in Signal Transduction. (3.0 cr.; A-F only; prereq BioC 4332 or Biol 4004 or #: Spring, every year) Principles of cell signaling. Important signaling pathways/experimental approaches to study signal transduction. Discussion of current issues/unsolved problems in field.

BIOC 5225. Graduate Laboratory in NMR Techniques. (1.0 cr.; S-N only; prereq 8001 or #: Spring, every year) Practical aspects of nuclear magnetic resonance (NMR) spectroscopy. Hands-on experience with 500/600 MHz instruments. Sample preparation/handling, contamination sources, tube/probe options, experiment selection, experimental procedures, software, data processing.

BIOC 5309. Biocatalysis and Biodegradation. (3.0 cr.; =MICE 5309; Spring, every year) 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. (3.0 cr.; A-F only; Fall, every year) 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. (3.0 cr.; A-F or Audit; =MICB 5352; prereq [3021 or 4331 or BIOL 3021 or MICB 4111] or [BIOL 3301 or MICB 3301] or #: Spring, offered periodically) 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 biopharmaceuticals.


BIOC 5361. Microbial Genomics and Bioinformatics. (3.0 cr.; prereq College-level courses in [organic chemistry, biochemistry, microbiology]; Fall, Spring, every year) Introduction to genomics. Emphasizes microbial genomics. Sequencing methods, sequence analysis, genomics databases, genome mapping, prokaryotic horizontal gene transfer, genomics in biotechnology, intellectual property issues.

BIOC 5444. Muscle. (3.0 cr.; =PHSL 5444; prereq 3021 or BIOL 3021 or 4331 or BIOL 4331 or PHSL 3061 or #: Spring, every year) Muscle molecular structure/function and disease. Muscle regulation, ion transport, and force generation. Muscular dystrophy and heart disease.

BIOC 5527. Introduction to Modern Structural Biology. (4.0 cr.; prereq [intro biochemistry, intro physics] or physical chemistry or #: Fall, every year) 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.

BIOC 5528. Spectroscopy and Kinetics. (4.0 cr.; prereq Intro physical chemistry or equiv; intro biochemistry recommended; Spring, every year) 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.
BIOC 5531. Macromolecular Crystallography I: Fundamentals and Techniques. (1.0 cr.; S-N or Audit; prereq [One organic chemistry or biochemistry course, [two calculus or college physics courses]] or instructor approval; fall, every year) Macromolecular crystallography for protein structure determination/engineering. Determining macromolecule structure by diffraction.

BIOC 5532. Macromolecular Crystallography II: Techniques and Applications. (1.0 cr.; S-N or Audit; prereq 5531; spring, every year) Determining structure of macromolecule by diffraction. Using software in macromolecular crystallography.

BIOC 5960. Special Topics in Biochemistry. (3.0 cr.; A-F only; prereq [[Biochemistry or Molecular Biology]] or #; fall, spring, every year) In-depth study of topics in biochemistry.

BIOC 8001. Biochemistry: Structure, Catalysis, and Metabolism. (3.0 cr.; prereq BMBB or MCDB&G grad student or #; fall, every year) 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.

BIOC 8002. Molecular Biology and Regulation of Biological Processes. (3.0 cr.; A-F only; prereq [BMBB or MCDB&G] grad student or #; fall, every year) 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.

BIOC 8084. Research and Literature Reports. (1.0 cr.; max 5.0 cr.; S-N or Audit; prereq Grad BMBB major or #; fall, spring, every year) Current developments.

BIOC 8184. Graduate Seminar. (1.0 cr. [max 5.0 cr.; S-N or Audit; prereq grad BMBB major or DGS consent; fall, spring, every year] Reports on recent developments in the field and on research projects in the department.

BIOC 8213. Selected Topics in Molecular Biology. (4.0 cr.; [GCD 8213]; prereq 8002 or #; fall, every year) Current topics such as DNA replication, recombination and gene conversion, regulation of gene expression, chromatin structure and transcription, developmental gene regulation, organellar gene expression, RNA splicing, initiation/control of translation, animal viruses, transposable elements, somatic recombination, oncogenes.

BIOC 8216. Signal Transduction and Gene Expression. (3.0 cr.; prereq 8002 or #; fall, spring, every year) Cell signaling, metabolic regulation in development. Prokaryotic/eukaryotic systems used as models for discussion. Literature-based course.

BIOC 8290. Current Research Techniques. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; prereq Grad BMBB major; fall, spring, every year) Research project carried out in laboratory of a staff member.

BIOC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BIOC 8401. Ethics, Public Policy, and Careers in Molecular and Cellular Biology. (1.0 cr. [max 2.0 cr.; S-N or Audit; prereq Grad student in [BMBB or MCDB&G]; fall, spring, every year) 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.

BIOC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BIOC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

BIOC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

BIOC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

BTHX 5000. Topics in Bioethics. (1.0-4.0 cr. [max 8.0 cr.]; prereq Grad student or #; fall, spring, every year) Bioethics topics of contemporary interest. Topics specified in Class Schedule.

BTHX 5010. Bioethics Proseminar. (2.0 cr.; A-F only; prereq Bioethics grad student or grad minor; fall, every year) Introduction to topics in bioethics.
Readings from history, social science, literature, and first-person accounts.

BTHX 5900. Independent Study in Bioethics. (1.0-4.0 cr.; max 8.0 cr.; prereq #; fall, spring, summer, every year)
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.

BTHX 8000. Advanced Topics in Bioethics. (1.0-4.0 cr.; max 8.0 cr.; prereq Grad student; fall, spring, every year)
Topics of contemporary interest. Topics specified in Class Schedule.

BTHX 8114. Ethical and Legal Issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCGD MS; genetic counseling specialization or #; spring, every year)
Professional ethics. Ethical/legal concerns with new genetic technologies.

BTHX 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser consent, DGS consent; fall, spring, every year)
Supervised placement to apply knowledge/skills from core courses. Individualized plan is developed between student, bioethics adviser or DGS, and mentor at practicum site.

BTHX 8500. Practicum in Bioethics. (1.0-4.0 cr.; max 16.0 cr.; Student Option No Audit; prereq Bioethics grad [major or minor] or #; fall, spring, every year)
In-depth study of special topic in life sciences. 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.

Bioinformatics (BINF)
College of Biological Sciences

BINF 5480. Bioinformatics Journal Club. (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, summer, every year)
Bioinformatics Journal Club

BINF 5490. Topics in Bioinformatics. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year)
Independent or group study in bioinformatics.

Biological (BIOL)
College of Biological Sciences

BIOL 5272. Applied Biostatistics. (3.0 cr.; A-F only; =Biol 3272; prereq One semester of college-level [calculus or statistics or computer programming], general biology; fall, every year)

BIOL 5309. Molecular Ecology And Ecological Genomics. (3.0 cr.; prereq BIOL 3407 or BIOL 3409 or BIOL 4003; fall, even years)
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.

BIOL 5407. Ecology. (3.0 cr.; =BIOL 3408W, BIOL 3807, EEB 3001, BIOL 3407); prereq [One semester college biology, MATH 1142 or MATH 1271 or MATH 1281 or equiv], grad student or #; fall, spring, every year)
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.

BIOL 5409. Evolution. (3.0 cr.; =BIOL 3809, BIOL 2822, BIOL 4049); prereq One semester of college biology, grad student or fall, every year)
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.

BIOL 5910. Special Topics in Biology for Teachers. (1.0-4.0 cr. [max 12.0 cr.]; prereq BA or BS in science or science education or elementary education or K-12 licensed teacher; spring, summer, every year)
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.

BIOL 5950. Special Topics in Biology. (1.0-4.0 cr. [max 8.0 cr.]; A-F only; fall, spring, summer, offered periodically)
In-depth study of special topic in life sciences.

Biomedical Engineering (BMEN)
Institute of Technology

BMEN 5001. Advanced Biomaterials. (3.0 cr.; A-F or Audit; prereq 3301 or MatS 3011 or grad student or #; fall, every year)
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.

BMEN 5041. Tissue Engineering. (3.0 cr.; prereq CSE upper div or grad student or med student or #; fall, every year)
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.

BMEN 5101. Advanced Bioelectricity and Instrumentation. (3.0 cr.; prereq [CSE upper div, grad student] or #; spring, offered periodically)
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.

BMEN 5111. Biomedical Ultrasound. (3.0 cr.; prereq [[3401 or equiv], [MATH 2373 or equiv], [MATH 2374 or equiv], [CSE upper div or grad student] or #; spring, every year)
Introduction to biomedical ultrasound, including physics of ultrasound, transducer technology, medical ultrasound imaging, photoacoustic imaging, applications of non-linear acoustics, and high-intensity ultrasound.

BMEN 5151. Introduction to BioMEMS and Medical Microdevices. (2.0 cr.; A-F or Audit; prereq CSE sr or grad student or medical student; spring, every year)
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.

BMEN 5201. Advanced Biomechanics. (3.0 cr.; prereq [[3001 or equiv], [CSE upper div or grad student] or #; fall, spring, offered periodically)
Introduction to biomechanics of musculoskeletal system. Anatomy, tissue material properties. Kinematics, dynamics,

**BMEN 5311. Advanced Biomedical Transport Processes.** (3.0-4.0 cr.): [CHEN 5753, ME 5381]; prereq CSE upper div or grad student or #; [CHEN 5103 or ME 5342] recommended; spring, every year) Introduction to biological fluid, mass, and heat transport. Mass transfer across membranes. Fluid flow in vessels/interstitium. Heat transfer in cells, tissues, and body. Applications to blood oxygenation, respiration, drug delivery, and tissue engineering.

**BMEN 5321. Microfluidics in Biology and Medicine.** (3.0 cr.): A-F only; prereq [3111, AEM 4201, ChEn 4005, ME 3331 or ME 3332 or CSE grad student or #]; fall, every year) 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.

**BMEN 5351. Cell Engineering.** (3.0 cr.; prereq [2401, 2501 or 85501, [MATH 2243 or MATH 2373]] or CSE upper div or grad student or #; fall, spring, offered periodically) Engineering approaches to cell-related phenomena important to cell/tissue engineering. Receptor/ligand binding. Trafficking/signaling processes. Applications to cell proliferation, adhesion, and motility. Cell-matrix interactions.

**BMEN 5401. Advanced Biomedical Imaging.** (3.0 cr.; A-F or Audit; prereq CSE upper div or grad student or #; fall, every year) Functional biomedical imaging modalities. Principles/applications of technologies that offer high spatial/temporal resolution. Bioelectromagnetic and magnetic resonance imaging. Other modalities.

**BMEN 5411. Neural Engineering.** (3.0 cr.; prereq 3401 recommended; fall, every year) Theoretical basis. Signal processing techniques. Modeling of nervous system, its response to stimulation. Electrode design, neural modeling, cochlear implants, deep brain stimulation. Prosthetic limbs, micrtiution control, prosthetic vision. Brain machine interface, seizure prediction, optical imaging of nervous system, place cell recordings in hippocampus.

**BMEN 5412. Neuro modulation.** (3.0 cr.; A-F only; prereq 5411 or #; spring, every year) 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.** (3.0 cr.; A-F or Audit; prereq 5411, [3201 or 3401 or equiv recommended]; spring, every year) Neural interface technologies currently in use in patients as well as the biophysical, neural coding, and hardware features relating to their implementation in humans. Practical and ethical considerations for implanting these devices into humans.

**BMEN 5421. Introduction to Biomedical Optics.** (3.0 cr.; A-F or Audit; prereq CSE sr or grad student; spring, offered periodically) 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.

**BMEN 5444. Muscle.** (3.0 cr.; spring, offered periodically) Muscle structure/function: molecular mechanism by which force is generated.

**BMEN 5501. Biology for Biomedical Engineers.** (3.0 cr.; prereq Engineering upper div or grad student; fall, spring, offered periodically) Concepts of cell/tissue structure/function. Basic principles of cell biology. Tissue engineering, artificial organs.

**BMEN 5701. Cancer Bioengineering.** (3.0 cr.; A-F or Audit; prereq [Upper division CSE undergraduate, CSE graduate student] or #; fall, every year) 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).

**BMEN 5910. Special Topics in Biomedical Engineering.** (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Special topics in biomedical engineering.

**BMEN 5920. Special Topics in Biomedical Engineering.** (2.0-3.0 cr. [max 6.0 cr.]; fall, every year) Special topics in biomedical engineering.

**BMEN 8001. Polymeric Biomaterials.** (3.0 cr.; A-F or Audit; prereq [5001, [CHEN 4214 or MTS 4214 or equiv]] or #; spring, every year) Introduction to polymeric biomaterial research. Molecular engineering, characterization of properties, material-cell interaction, biocompatibility/bioactivity. Applications in biology and medicine.

**BMEN 8101. Biomedical Digital Signal Processing.** (3.0 cr.; A-F or Audit; prereq [MATH 2243 or MATH 2373], [MATH 2263 or MATH 2374] or equiv; fall, every year) Signal processing theory for analyzing real world digital signals. Digital signal processing and mathematically derived algorithms for analysis of stochastic signals. Spectral analyses, noise cancellation, optimal filtering, blind source separation, beamforming techniques.


**BMEN 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**BMEN 8334. Laboratory Neuroengineering.** (1.0 cr. [max 6.0 cr.]; S-N only; prereq Grad student in CSE or neuroscience; fall, spring, every year) Lab rotation in neuroengineering.

**BMEN 8335. Neuroengineering Practicum.** (3.0 cr. [max 6.0 cr.]; A-F only; prereq PhD student in BMEn, EE, ME, or NSci or #; spring, every year) Topics/issues in neuroengineering. Ethics, professional conduct, conflicts, plagiarism, copyright, authorship, research design considerations, IRB, intellectual properties, review process, professional presentations, proposal writing.

**BMEN 8381. Bioheat and Mass Transfer.** (3.0 cr.; prereq CSE grad student, upper div transport/fluids course; [physics, biology] recommended; fall, offered periodically) Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedical relevant applications.

**BMEN 8401. New Product Design and Business Development.** (4.0 cr.; A-F or Audit; 8801, 8802 must be taken same yr; fall, every year) 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.

**BMEN 8402. New Product Design and Business Development.** (4.0 cr.; A-F or Audit; [ME 8222]; 8401, 8402 must be taken same yr; fall, every year) 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.
BMEN 8601. Biomedical Engineering Seminar. (1.0 cr.; S-N or Audit; fall, every year) Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8602. Biomedical Engineering Seminar. (1.0 cr.; S-N or Audit; spring, every year) Lectures and demonstrations of university and industry research introducing students and faculty to methods and goals of biomedical engineering.

BMEN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

BMEN 8710. Directed Research. (1.0-3.0 cr.; fall, spring, summer, every year) TBD

BMEN 8720. Internship in Biomedical Engineering. (1.0-3.0 cr. [max 6.0 cr.]; S-N or Audit; prereq Grad BMEn major; fall, spring, summer, every year) Supervised lab or industrial experience unrelated to student's normal academic or employment experience.

BMEN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No GradeAssociated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) Thesis credit: doctoral.

BMEN 8820. Plan B Project. (2.0-3.0 cr.; prereq BMEn MS student; fall, spring, summer, every year) Project chosen by student and adviser to satisfy M.S. Plan B project requirement. Written report required.

BMEN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq PhD student in biomedical engineering; max 14 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credit: doctoral.

BMEN 8900. Special Topics in Biomedical Engineering. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; fall, spring, offered periodically) Topics in biomedical engineering.

BMEN 8910. Independent Study. (1.0-3.0 cr.; prereq Grad BMEn major; fall, spring, summer, every year) Research or study of a topic determined by interests of student in consultation with faculty supervisor. Requires approval by faculty supervisor and director of graduate studies.

BMN 2015. Introduction to Biomedical Engineering. (1.0 cr.) (A-F or Audit; fall, spring, summer, every year) Systems/synthetic biology methods used to characterize/engineer biological systems at molecular/cellular scales. Integration of quantitative experimental approaches/mathematical modeling to elucidate biological functions. Nonlinear dynamics with specific emphasis on behavior of excitable systems (neurons/cardiac myocytes).

BMSC 8900. Research: Biomedical Sciences. (1.0-7.0 cr. [max 42.0 cr.]; S-N or Audit; prereq Enrollment in MD/PhD program; Content determined by interest of student in consultation with faculty supervisor. Requires approval by faculty supervisor and director of graduate studies.

Biomedical Science (BMSC) Medical School


BME 5023. Process Control and Instrumentation. (3.0 cr.; =BME 4023W; prereq Grad student or #; fall, every year) Fundamental principles in system dynamics/control. Emphasizes process systems and problems faced by process engineers.

BBE 5095. Special Problems. (1.0-5.0 cr.; prereq #; fall, spring, summer, every year) Advanced individual-study project. Application of engineering principles to specific problem.

BBE 5202. Wood and Fiber Science. (3.0 cr.; A-F or Audit; spring, every year) Wood as a bio-material. Wood's anatomical/cellular structure compared with other plant-derived materials. Wood's physical properties/chacteristics in various applications. Non-wood fiber, bio-product characteristics.

BBE 5203. Environmental Impacts of Food Production. (3.0 cr.; A-F or Audit; prereq intended for non-engineering students; Credit will not be granted if credit has been received for AGET 5203; fall, spring, every year) Crop production intensity, animal raising options, food processing waste alternatives, pest control.

BBE 5212. Safety and Environmental Health Issues in Plant and Animal Production and Processing. (3.0 cr.; A-F or Audit; prereq grad student or sr or #; Credit will not be granted if credit has been received for AGET 5212.; fall, spring, summer, every year) Safety/health issues in food production, processing and horticultural work environments using public health, injury control, and health promotion frameworks: regulation, engineering, education. Traumatic injury, occupational illness, ergonomics, pesticide health effects, biotechnology, air contaminants.


BBE 5302. Biodegradation of Bioproducts. (3.0 cr.; =BME 4302; prereq Grad student or #; spring, every year) Organisms and their importance to bio-based products: deterioration, control, bioprocesses for benefit.

BBE 5303. Introduction to Bio-based Materials Science. (3.0 cr.; =BME 4303; prereq Grad student or #; spring, every year) Principles of materials science, their application to bio-based materials. Project required.


BBE 5333. Off-road Vehicle Design. (4.0 cr.; A-F only; =BME 4333; prereq [2001, 4003] or [AEM 2021, AEM 3031], [3012 or &3012 or CE 3502 or &CE 3502], upper div CSE or #; spring, every year)

BBE 5401. Bioproducts Engineering. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) Unit operations of bioproducts engineering/ manufacture. Project required.

BBE 5402. Bio-based Products Engineering Lab I. (1.0 cr.; A-F or Audit; = [BBE 4402]; prereq Grad student or #; spring, every year) Laboratory exercises in bio-based products engineering.

BBE 5403. Bio-based Products Engineering Lab II. (1.0 cr.; A-F or Audit; = [BBE 4403]; prereq Grad student or #; fall, every year) Laboratory exercises in bio-based products engineering.

BBE 5404. Biopolymers and Biocomposites Engineering. (3.0 cr.; A-F or Audit; = [BBE 4404]; prereq grad student or #; fall, every year) Structure/properties of biopolymers. Engineering of composites from biopolymers/ plant-based materials.


BBE 5412. Biocomposites and Biomass Energy. (4.0 cr.; = [BBE 4412V]; prereq Grad student or #; spring, every year) Manufacturing processes, end-use applications of bio-based products.

BBE 5413. A Systems Approach to Residential Construction. (4.0 cr.; = [HSG 4413, BBE 4413]; prereq Grad student or #; spring, every year) Dynamic/integrated 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.

BBE 5414. Advanced Residential Building Science. (4.0 cr.; = [BBE 4414]; prereq Grad student or #; fall, every year) Building science theory, advanced applications for residential buildings. Focuses on heat/mass transfer.

BBE 5416. Building Testing & Diagnostics. (2.0 cr.; = [BBE 4416]; prereq Grad student or #; spring, every year) Theoretical basis for performance testing. Diagnostics applications for residential structures. Focuses on existing structures and retrofit/medial applications. Digital differential pressure gauges, blower doors, airflow hoods/ grids, duct pressure testing, infrared thermography. Hands-on sessions for equipment use, problem solving.

BBE 5480. Special Topics. (3.0-4.0 cr. [max 12.0 cr.]; = [BBE 3480]; prereq Sr or grad student; fall, spring, every year) Topics specified in Class Schedule.

BBE 5503. Marketing of Bio-based Products. (4.0 cr.; A-F or Audit; = [BBE 3503]; prereq Grad student or #; fall, every year) 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.

BBE 5504. Bio-based Products Development and Management. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, every year) Concepts of new product development and product management and their application to bio-based products.

BBE 5513. Watershed Engineering. (3.0 cr.; A-F or Audit; prereq 3023, upper div CSE; fall, every year) 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.

BBE 5523. Ecological Engineering Design. (3.0 cr.; A-F only; = [BBE 4523]; prereq [[CHEM 1022 or CHEM 106M], CHEM 106E], prereq 3021, grad student or #; spring, every year) 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.

BBE 5535. Assessment and Diagnosis of Impaired Waters. (3.0 cr.; A-F only; = [BBE 4535]; prereq Grad student or #; fall, every year) 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.

BBE 5608. Environmental and Industrial Microbiolog. (3.0 cr.; A-F only; = [BBE 4608]; prereq [BIOL 1001 or BIOL 1009], CHEM 1011; fall, every year) 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.

BBE 5713. Biological Process Engineering. (3.0 cr.; A-F only; = [BBE 4713]; prereq [3003, [4013 or 84013], upper div CSE or grad student]; spring, every year) 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.

BBE 5723. Food Process Engineering. (3.0 cr.; A-F or Audit; = [BBE 4723]; prereq [4013 or 84013], upper div CSE or grad student]; spring, every year) 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.

BBE 5733. Renewable Energy Technologies. (3.0 cr.; A-F or Audit; = [BBE 4733]; prereq Grad student or #; spring, every year) 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.

BBE 8001. Seminar I. (1.0 cr.; A-F only; fall, every year) Presentation/discussions on current research topics, research philosophy/principles, proposal writing, professional presentations.

BBE 8002. Seminar II. (1.0 cr. [max 2.0 cr.]; A-F only; prereq 8001 or 8001 equiv; fall, every year) Organization/ critique of seminars on new developments in biosystems and agricultural engineering.

BBE 8003. Research Seminar II. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq 8002 or equiv; spring, every year) Moderate and critique seminars in biosystems and agricultural engineering.

BBE 8005. Supervised Classroom or Extension Teaching Experience. (2.0 cr.; S-N or Audit; = [SOIL 8005, PLPA 8005, AGRO 8005, LAAS 8005, HORT 8005]; prereq #; fall, spring, every year) 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.

BBE 8013. Parameter Estimation in Biosystems and Agricultural Engineering. (3.0 cr.; A-F or Audit; prereq Stat 3021 or equiv, computer programming course; fall, spring, offered periodically) Procedures for estimating parameter values and parameter uncertainty from experimental data. Values and interpretation of linear and nonlinear models using ordinary and weighted least-squares methods. Design of experiments. Application to biosystems and agricultural engineering problems.

BBE 8094. Advanced Problems and Research. (2.0-6.0 cr.; prereq 5095; fall, spring, offered periodically)
BBE 8300. Research Problems. (1.0-10.0 cr.; prereq #: fall, spring, every year) Independent research under faculty guidance.

BBE 8303. Machinery Modeling. (3.0 cr.; prereq [3012 or CE 3502], AEM 2021; fall, spring, offered periodically) 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.

BBE 8304. Advanced Topics in Wood Drying. (2.0 cr.; prereq 4304; fall, every year) 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.

BBE 8306. Graduate Seminar. (2.0 cr. [max 6.0 cr.]; spring, offered periodically) Communication of scientific knowledge related to wood and paper science through the media of poster sessions, oral presentations, and the Internet.

BBE 8307. Advances and Methods in Forest Products Pathology and Preservation. (2.0 cr.; prereq 4303; spring, every year) Principles of wood protection, methods of evaluating preservatives. Emphasizes international developments.

BBE 8311. Mechanics of Wood and Wood Composites. (2.0 cr.; prereq #: spring, every year) Advanced topics on behavior of wood composites.

BBE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BBE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BBE 8513. Hydrologic Modeling of Small Watersheds. (3.0 cr.; prereq [3012 or CE 3502], hydrology course;) Study/representation of hydrologic processes by mathematical models. Stochastic meteorological variables, infiltration, overland flow, return flow, evapotranspiration, channel flows. Approaches for model calibration/evaluation.

BBE 8523. Coupled Heat, Moisture, and Chemical Transport in Porous Media. (3.0 cr.; A-F or Audit; prereq [CSci 5301 or equiv], [Math 5512, Math 5513] or equiv, [Soil 5232 or equiv], computer programming;) 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.

BBE 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 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; fall, spring, summer, every year) TBD

BBE 8703. Managing Water in Food and Biological Systems. (3.0 cr.; prereq Chem 3501 or FScn 5451 or MatS 3011 or #;) Qualitative and quantitative analysis of water in foods and biological materials using NMR and MRI. Water and chemical reactivity, microbial activity, physiochemical properties and changes, and structural properties and changes in foods and biological materials.

BBE 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

BBE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Business Administration (BA) Curtis L. Carlson School of Management

BA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

BA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; 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; fall, spring, summer, every year) TBD

BA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Carlson Executive MBA (CMBA) Curtis L. Carlson School of Management

CMBA 5554. International Residency. (1.5 cr.; A-F only; spring, every year) Students travel to an international location for nine days. Engage in discussions with international colleagues, to apply program concepts and develop broader sensitivity to cultural/social differences. Pre-trip preparation, on-site discussion, and trip assignment are also required. Held in late March.

CMBA 5611. Statistics and Decision Making. (3.0 cr.; A-F only; fall, every year) Explorative data analysis, inferential procedures, statistical process control, regression analysis.


CMBA 5613. Organizational Behavior. (3.0 cr.; A-F only; fall, every year) Theories/frameworks for analyzing behavior of individuals, groups, and the organization itself. Providing leadership in organizations. Organizational structure, culture, politics, and human resource management.

CMBA 5614. Operations Management. (3.0 cr.; A-F only; fall, every year) Strategic impact of operations decisions. Strategy, process design, productivity, quality management, business process re-engineering, forecasting, demand management, inventory, production planning, scheduling, supply chain, international operations.

CMBA 5621. Financial Management. (3.0 cr.; A-F only; spring, every year) 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 5622. Economics. (3.0 cr.; A-F only; spring, every year) Fundamental micro/macro economic tools/applications. Determination of interest rates, GDP, employment, prices (inflation), Federal Reserve policy, how does it affects business. Timely readings.

CMBA 5623. Marketing Management. (3.0 cr.; A-F only; spring, every year) Developing/implementing a firm’s strategy in target markets. Applying analytic concepts and decision tools to product offering, distribution, pricing, and communication program.


CMBA 5625. Entrepreneurship and Innovation. (3.0 cr.; A-F only; spring, every year) 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; fall, every year)
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. (3.0 cr.; A-F only; fall, every year)
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 Management. (1.5 cr.; A-F only; fall, every year)
Various information technologies, their applications. Competitive advantages associated with information technology. Organizational/managerial implications.

CMBA 5713. Managerial Accounting. (3.0 cr.; A-F only; fall, every year)

CMBA 5714. Advanced Marketing. (3.0 cr.; A-F only; fall, every year)

CMBA 5715. Advanced Financial Management. (3.0 cr.; A-F only; fall, every year)
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 3.0 cr.]; A-F only; spring, every year)
Topics reflects strengths, talents, and interests of class. Topics integrate different aspects of curriculum while not being limited by specific area/paradigm.

CMBA 5722. International Business. (3.0 cr.; A-F only; spring, every year)

CMBA 5723. Ethics. (1.5 cr.; A-F only; fall, spring, every year)

CMBA 5724. International Residency. (1.5 cr.; A-F only; spring, every year)
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.

Carlson School of Management (CSOM)

Curtis L. Carlson School of Management

CSOM 8101. Methods and Topics in Applied Economics. (4.0 cr.; spring, every year)
Intermediate methods/topics in business research.

Center for Allied Health Programs (CAHP)

Academic Health Center Shared

CAHP 5110. Foundations of Interprofessional Communication and Collaboration. (1.0 cr.; S-N only; prereq Enrolled CLSP or OT student; fall, every year) 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.

Center for Spirituality and Healing (CSPH)

CSPH 5000. Explorations in Integrative Therapies and Healing Practices. (1.0-4.0 cr. [max 12.0 cr.]; prereq Jr or sr or grad student or #; fall, spring, summer, every year) Research/practice on therapies, delivery of complementary therapies, regulatory issues.

CSPH 5101. Introduction to Integrative Healing Practices. (3.0 cr.; prereq Jr or sr or grad student; or instructor consent; fall, spring, summer, every year) Cultural contexts of healing traditions. Integrative therapies presented by practitioners, including traditional Chinese medicine, meditation, mind-body healing, spiritual practices, energy healing, naturopathy, herbalism, movement therapies, homeopathy, manual therapies, nutrition.

CSPH 5102. Art of Healing: Self as Healer. (1.0 cr.; prereq Jr or sr or grad student or #; fall, spring, every year) Introduction to individual transformational journey as part of health science education. Students become aware of their responsibility/resources to facilitate development of the self. Research data, experience of self that is part psychoneuroimmunology, mind-body-spirit approaches. Lecture, scientific literature, meditation, imagery, drawing, group interaction.

CSPH 5111. Ways of Thinking about Health. (2.0 cr.; S-N or Audit; prereq Jr, Sr, or grad student standing); #; fall, every year) Cultural contexts explored through field-trip immersion experiences. Aspects of different health care systems. Indigenous North American, Vedic, traditional Chinese, biomedicine. Writing assignment.

CSPH 5115. Cultural Awareness, Knowledge and Health. (3.0 cr.; prereq Jr or sr or grad student or #; spring, every year) 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.

CSPH 5201. Spirituality and Resilience. (2.0 cr.; prereq Jr or sr or grad student or #; spring, summer, every year) Links between resilience and spirituality. Applications of resilience/health realization model to students’ personal/professional lives. Review of literature, theory, and research.

CSPH 5211. Peacemaking and Spirituality: A Journey Toward Healing and Strength. (2.0-3.0 cr.; prereq Jr or sr or grad student or #; fall, summer, every year) 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.

CSPH 5212. Peacebuilding Through Mindfulness: Transformative Dialogue in the Global Community . (3.0 cr.; prereq Jr or sr or grad student or #; spring, summer, every year) 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.

CSPH 5215. Forgiveness and Healing: A Journey Toward Wholeness. (3.0 cr.; prereq Jr or sr or grad student or #; spring, summer, every year)
Impact of forgiveness on process of inter-/intra-personal healing. Forgiveness/healing in health care and social work settings from multiple spiritual/secular traditions.

CSPH 5221. Significant Spiritual Texts of the 20th Century. (3.0 cr.; prereq Jr or sr or grad student or #; fall, spring, every year) Diverse "spiritual classics" (i.e., elements of western canon that have proven over time to be resources of values). Resources of meaning for inner-life healers. How to establish a personal library for life-long journey of spiritual development.

CSPH 5225. Meditation: Integrating Body and Mind. (2.0 cr.; prereq Jr or sr or grad student or #) 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.

CSPH 5226. Advanced Meditation: Body, Brain, Mind, and Universe. (1.0 cr.; prereq [5225, Jr or sr or grad student]) or #) 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.

CSPH 5301. Cultures, Faith Traditions, and Health Care. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad student or #; spring, every year) Culturally/spiritually based health care practices of selected native/immigrant populations in Minnesota. Clinical implications. Personal/professional conflicts for delivery of competent care to culturally diverse groups by those trained in Western health care.

CSPH 5311. Introduction to Traditional Chinese Medicine. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad student or #; spring, summer, every year) 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.

CSPH 5313. Acupressure. (1.0 cr.; fall, summer, every year) Principles/applications. Location, indications 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. (2.0 cr.; prereq Jr student or #) Ethics, spirituality, and healing from 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.

CSPH 5317. Yoga: Ethics, Spirituality, and Healing. (2.0 cr.; summer, every year) 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. (4.0 cr. [max 12.0 cr.;] Student Option No Audit; prereq [5315, 5317] or #; fall, summer, every year) 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.

CSPH 5321. Public Health Priorities in the Developing World. (2.0 cr.; [INMD 7567]; prereq Jr or sr or grad student or #; summer, every year) Primary public health problems, priorities, and interventions in developing countries. Issues related to culture/indigenous health systems and of concern to health care providers who work abroad or with refugee communities in countries of resettlement.

CSPH 5325. Latinos: Culture and Health. (3.0 cr.; prereq Jr or sr or grad student or #; fall, spring, every year) How Latino world view (cosmovision) affects health and compares with U.S. perspective. Differences in perception of time, family involvement, community "belonging," gender roles, and communication styles. Folkloric beliefs. Specific issues such as AIDS, pregnancy, women's issues, pharmacy, and nutrition. Health issues of workers. Cultural competency.

CSPH 5331. Foundations of Shamanism and Shamanic Healing. (2.0 cr.; S-N or Audit; prereq Jr or sr or grad student or #) 3 ½-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.

CSPH 5332. Global Healing Traditions: Amazonian Plant Spirit Medicine. (2.0 cr.; S-N or Audit; prereq [5331, Jr or sr in health science or practicing health professional]) or #) 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.

CSPH 5341. Overview of Indigenous Hawaiian Healing. (2.0 cr.; fall, every year) Traditional Hawaiian healing, ho'olomilo (massage), la'au lapa'a'au (herbal medicine) and ho'opoono-pono (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. (3.0 cr.; prereq Jr or sr or grad student or #; fall, spring, summer, every year) Biologically active substances used in traditional cultures. Ethnopharmacology's past, current, and potential contributions to human knowledge. Concrete examples.

CSPH 5405. Plants in Human Affairs. (4.0 cr.; prereq Jr or sr or grad student or #;) Twelve-day, intensive course. Introduction to ethnobotany/ethnopharmacology. Lectures, field trips, presentations by local experts.


CSPH 5421. Botanical Medicines in Integrative Healthcare. (3.0 cr.; prereq Jr or sr or grad student or #; fall, every year) 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.


CSPH 5431. Functional Nutrition: An Expanded View of Nutrition, Chronic Disease, and Optimal Health. (2.0 cr.; prereq [Jr or sr or grad student] in Health Sciences or #) 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.

CSPH 5503. Aromatherapy Fundamentals. (1.0 cr.; prereq Jr or sr or grad student; spring, summer, every year) 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 common use by the public and in clinical settings. Topical application, inhalation.

CSPH 5511. Interdisciplinary Palliative Care: An Experiential Course in a Community Setting. (2.0 cr.; prereq #; fall, spring, every year) 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.

CSPH 5521. Therapeutic Landscapes. (3.0 cr.; prereq Jr or sr grad student) in [health sciences or therapeutic recreation or horticulture or landscape architecture] or health professional or #; spring, every year) Principles of therapeutic design for specific population requirements. Therapeutic landscape design. Incorporates interdisciplinary interaction between horticulture, landscape architecture, and health science departments.

CSPH 5522. Therapeutic Horticulture. (3.0 cr.; prereq 5101 or Hort 5072 or #;) Central elements of therapeutic horticulture in context of multiple health care settings. Evidence-based history, principles, precepts, and practical application of therapeutic horticulture. Various plant/plant-related modalities from current research findings are related to populations, using therapeutic horticulture as a treatment intervention.

CSPH 5523. Applications in Therapeutic Horticulture. (2.0 cr.; Student Option No Audit; summer, every year) How to develop comprehensive program plans in therapeutic horticulture. Evidence-based principles, facilitation techniques. Documentation, assessment, program development techniques, evaluation. Leadership training, program plan components, book reviews, readings, comprehensive exam.

CSPH 5533. Introduction to Energy Healing. (2.0 cr.; prereq Jr or sr or grad student or #; fall, every year) Healing techniques that use energetic systems in body to enhance body's ability to heal. Therapeutic touch, healing touch, Reiki, acupuncture, reflexology, magnets, homeopathy, other modalities. Scientific theories on mechanisms of energetic medicine and ways to measure energy. Students interact with practitioners of energy healing.

CSPH 5535. Reiki Healing. (1.0 cr.; S-N only; prereq Jr or sr or grad student or #; fall, spring, summer, every year) 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.

CSPH 5536. Advanced Reiki Healing: Level II. (1.0 cr.; S-N only; prereq 5535, #; spring, every year) 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.

CSPH 5541. Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind. (2.0 cr.; prereq Sr or grad student or #; fall, every year) Experimental training in the cultivation of happiness, emotional health, and healing for multi-disciplinary professions. Ancient/contemporary, eastern/western approaches. How to increase positive emotions and mind states. Meditation, integrative approaches. Case examples.

CSPH 5545. Mind-Body Healing Therapies. (2.0 cr.; A-F or Audit; prereq Grad student or Jr or sr or #;) Philosophies/paradigms. Four modalities commonly used in allopathic nursing, medicine and other health professions (biofeedback, hypnosis, imagery/visualization, meditation). Experiential and group discussion format.

CSPH 5555. Introduction to Body and Movement-based Therapies. (2.0 cr.; prereq Jr or sr or grad student or #;) 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.

CSPH 5561. Overview of the Creative Arts in Health Coaching. (2.0 cr.; prereq Jr or sr or grad student; summer, every year) 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.

CSPH 5601. Music, Health and Healing. (2.0 cr.; prereq Jr or sr or grad student or #; fall, summer, every year) Music therapy, music medicine, music psychotherapy. Techniques/interventions. Hypotheses/rationale related to interventions. Related research.


CSPH 5611. Healthy Humor. (1.0 cr.; prereq Jr or sr or grad student or #;) Use of humor to enhance communication, treatment, and relationships with patients. How to create a positive work environment and outlook. Physiologic effects/benefits of humor/laughter. Humor and spirituality. Connection between positive outlook and health.

CSPH 5621. Foundations of Integrative Imagery, Phase I. (2.0 cr.; A-F only; prereq Grad student in health sciences or licensed health care professional; fall, summer, every year) Fundamental principles, core concepts of imagery. Current scientific research in the health sciences. Applications for pain/symptom relief, preparation for surgery, promotion of healing, and cancer care. Scope of clinical practice, precautions and safeguards.

CSPH 5631. Healing Imagery I. (2.0 cr.; prereq Jr or sr or grad student; spring, every year) How imagery and imagery interventions are implemented for healing and to promote health/well-being. Experience/create imagery interventions. Instructional strategies include experiential, discussions, readings, lecture, and individual learning interventions.


CSPH 5701. Fundamentals of Health Coaching I. (4.0 cr.; A-F only; prereq Admitted to Integrative Therapies and Healing Practice certificate program's health coaching track or #; fall, every year) Tenets of health coaching model. Tools for self development, deep listening, communication. Building blocks for optimal health from holistic perspective. How to identify/benchmark stages/patterns of change, interface with interdisciplinary health care providers, educate clients on self-care practices.

CSPH 5702. Fundamentals of Health Coaching II. (4.0 cr.; A-F or Audit; prereq 5701; spring, every year) 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.


CSPH 5705. Health Coaching Professional Internship. (2.0 cr.; S-N only; prereq 5701, 5702, 5703, admitted to postbaccalaureate certificate in integrative therapies/healing practices health coaching track, [5101, 5102, 5704 recommended]; spring, every year) 120 hours of health coaching practice. Students work with individual clients in acute/longitudinal encounters, provide wellness teaching, design career plan.

CSPH 5711. Optimal Healing Environments. (3.0 cr.; prereq Jr or sr or grad student or #: fall, every year) Development/implemention 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.

CSPH 8100. Special Topics in Complementary Therapy and Healing Practices. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, offered periodically) 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. (2.0 cr.; prereq Grad student; fall, spring, every year) Seminar. Students evaluate peer-reviewed literature in complementary/alternative healing practices (CAHP) research. Identifying strengths/weaknesses of published research, synthesizing findings from multiple studies.

CSPH 8191. Independent Study in Integrative Therapies and Healing Practices. (1.0-6.0 cr.; ; prereq #: fall, spring, summer, every year) Individual study with faculty guidance. Students write proposal, including outcome objectives/work plan. Faculty member directs work, evaluates project.

**Chemical Engineering (CHEN)**

**College of Science and Engineering**

- **CHEN 5531. Electrochemical Engineering and Renewable Energy.** (3.0 cr.; A-F only; =MAT 5531; prereq [MAT 3011 or #]; [upper div CSE or grad student]; fall, every year) Fundamentals of electrochemical engineering. Electrochemical mass transfer electrokinetics, thermodynamics of electrochemical cells, modern sensors. Formation of thin films and microstructured materials. Computer-based problems.

- **CHEN 5551. Survey of Renewable Energy Technologies.** (3.0 cr.; A-F or Audit; prereq [Upper div or #: basic knowledge of chemistry, thermodynamics; fall, every year] Technologies to generate renewable energy/chemicals. Biomass, solar, wind, hydroelectric. Emphasizes biomass processing using chemical/biological methods. Renewable technologies compared with fossil fuel technologies.

- **CHEN 5595. Special Topics.** (1.0-4.0 cr. [max 12.0 cr.]; A-F only; prereq ChEn major upper div; fall, spring, summer, every year) New or experimental special topics.

- **CHEN 5751. Biochemical Engineering.** (3.0 cr.; A-F or Audit; prereq [3005 or 4005], [84006] or [84006]; &8102 or 84102; spring, every year) 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.

- **CHEN 5753. Biological Transport Processes.** (3.0-4.0 cr.; A-F or Audit; [BMEN 5311, ME 5381]; prereq 3005 or 4005 or equiv; spring, every year) Fluid, mass, heat transport in biological systems. Mass transfer across membranes, fluid flow in capillaries, interstitium, veins, and arteries Heat transfer in single cells/tissues. 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.

- **CHEN 5771. Colloids and Dispersions.** (3.0 cr.; A-F or Audit; prereq Physical chemistry; fall, every year) Preparation, stability, coagulation kinetics or colloidal solutions. DLVO theory, electrokinetic phenomena. Properties of micelles, other microstructures.


- **CHEN 8102. Principles and Applications of Rheology.** (2.0 cr.; A-F or Audit; prereq 8101; spring, offered periodically) 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.


- **CHEN 8112. Rheology Laboratory Project.** (1.0 cr.; A-F or Audit; prereq 8101, [4702 or 84702 or 8102 or 84102]; spring, every year) How to make rheological lab measurements. Students select/characterize rheologically interesting material with help of instructor. Oral/ written report. Half-semester course.

- **CHEN 8115. Electron Microscopy of Soft Matter.** (2.0 cr.; A-F or Audit; prereq Chemical engineering or materials science/engineering grad major or #: 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.

- **CHEN 8201. Applied Mathematics I: Linear Analysis.** (3.0 cr.; A-F or Audit; =CHEN 4701; prereq Chemical engineering grad student or #: fall, every year) 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.
CHEN 8202. Applied Mathematics II: Nonlinear Analysis. (2.0 cr.; A-F or Audit; prereq [Grad-level course in linear analysis, chemical engineering grad major] or #; spring, every year)

CHEN 8211. Physical Chemistry of Polymers. (4.0 cr.; [CHEM 8211, MATS 8211; prereq Undergrad physical chem or #; spring, every year)

CHEN 8221. Synthetic Polymer Chemistry. (4.0 cr.; A-F or Audit; [CHEM 5221, MATS 6221, MATS 4221; prereq [Undergraduate organic chemistry course, undergrad physical chemistry course] or #; fall, every year)
Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

CHEN 8301. Physical Rate Processes I: Transport. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)

CHEN 8302. Physical Rate Processes II: Mass Transfer. (3.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; )
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.

CHEN 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CHEN 8401. Physical and Chemical Thermodynamics. (3.0 cr.; A-F or Audit; prereq [Undergraduate [engineering course or chemistry course in thermodynamics], Chemical engineering grad student] or #; fall, every year)
Principles of classical thermodynamics. Introduction to nonequilibrium thermodynamics, with applications in chemical engineering and materials science.

CHEN 8402. Statistical Thermodynamics and Kinetics. (3.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; spring, every year)
Introduction to statistical mechanical description of equilibrium and non-equilibrium properties of matter. Emphasizes fluids, classical statistical mechanics.

CHEN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CHEN 8501. Chemical Rate Processes: Analysis of Chemical Reactors. (3.0 cr.; A-F or Audit; prereq [Course in chemical reactor engineering, chemical engineering grad student] or #; spring, every year)

CHEN 8502. Process Control. (3.0 cr.; A-F or Audit; prereq Chemical Engineering grad major or #; )
For linear systems: stability, controllability, observability, pole-placement via state feedback, 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.

CHEN 8503. Chemical Rate Processes: Homogeneous Reactions. (3.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; )
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.

CHEN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined or; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr; fall, spring, summer, every year)
tbd

CHEN 8752. Quantitative Biology for Engineers. (3.0 cr.; A-F or Audit; [CHEM 5752; prereq Chemical engineering grad student or #; )

CHEN 8754. Systems Analysis of Biological Processes. (3.0 cr.; prereq Grad student in [life sciences or chemical/physical sciences or engineering]; ChEn students must take A/F; spring, every year)
Relating biological processes at molecular level to physiological level of cells/organisms/populations. Methodology for analyzing data. Quantification of molecular interplays.

CHEN 8771. Interfaces and Colloids. (3.0 cr.; A-F or Audit; prereq Physical Chemistry; fall, every year)
Interfacial tension/thermodynamics, capillarity, contact anglek wettability, adhesion, preparation/stability of colloids, DLVO theory, electrorheokinetic phenomena, micelles, rheology of dispersions.

CHEN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

CHEN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

CHEN 8900. Seminar. (1.0 cr.; S-N or Audit; fall, every year)
Presentation and discussion of papers concerning newer developments in chemical engineering, materials science, and related fields.

CHEN 8901. Seminar. (1.0 cr. [max 9.0 cr.]; S-N only; spring, every year)
Presentation and discussion of papers concerning the newer developments in chemical engineering.

CHEN 8902. Seminar: Finite Element Methods of Computer-aided Analysis. (1.0 cr.; A-F or Audit; prereq Chemical engineering grad student or #; spring, every year)
Fundamentals of finite element method as applied mathematics. How to construct finite element codes and put them into operation.

CHEN 8993. Directed Study. (1.0-12.0 cr.; fall, spring, summer, every year)

CHEN 8994. Directed Research. (1.0-12.0 cr.; fall, spring, summer, every year)

CHEN 8995. Special Topics. (1.0-4.0 cr.; fall, spring, summer, every year)
New or experimental courses offered by department or visiting faculty.

Chemical Physics (CHPH)
Institute of Technology

CHPH 8081. M.S. Plan B Project I. (4.0 cr.; A-F only; prereq Grad chem phys major; spring, every year)
Topic arranged by student adviser. Written report required.

CHPH 8082. M.S. Plan B Project II. (4.0 cr.; A-F only; prereq Grad chem phys major; spring, every year)
Topic arranged by student adviser. Written report required.
CHEM 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHEM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHEM 8601. Seminar: Modern Problems in Chemical Physics. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad chem physics major or #; fall, spring, every year) Topics in chemical physics.

CHEM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required [Plan A only]; fall, spring, summer, every year) (No description)

CHEM 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 or total required [Plan A only]; fall, spring, summer, every year) (No description)

CHEM 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 or required; fall, spring, every year) (No description)

Chemistry (CHEM) Institute of Technology

CHEM 5210. Materials Characterization. (4.0 cr.; prereq grad student or #; spring, every year) Modern tools/techniques for both bulk- and thin-film characterization. Topics may include ion-solid interactions, Rutherford back scattering, 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.

CHEM 5245. Introduction to Drug Design. (3.0 cr.; A-F or Audit; =MEDC 5245, PHAR 6245); prereq 2302 or equiv.) Concepts that govern design/discovery of drugs. Physical, biorganic, medicinal chemical principles applied to explain rational design and mechanism of action drugs.

CHEM 5541. Dynamics. (3.0 cr.; =CHEM 8541); prereq Undergrad physical chem course, #.) Hamilton's/Lagrange's equations of motion. Normal modes and molecular rotation. Langevin equation and Brownian motion. Time correlation functions, collision theory, cross-sections, energy transfer. Molecular forces and potential energy surfaces. Classical electrodynamics.

CHEM 5551. Quantum Mechanics I. (3.0 cr.; =CHEM 8551); prereq Undergrad physical chem course, #; fall, offered periodically) 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.

CHEM 5755. X-Ray Crystallography. (4.0 cr.; A-F or Audit; prereq Chem grad student or #; spring, every year) Essentials of crystallography as applied to modern, single crystal X-ray diffraction methods. Practical training in use of instrumentation in X-ray crystallography facility in Department of Chemistry. Date collection, correction/refinement, structure solutions, generation of publication materials, use of Cambridge Crystallographic Structure Database.


CHEM 8025. Introduction to Graduate Research. (1.0-2.0 cr.; A-F or Audit; prereq Grad student in chem; fall, every year) New areas of chemistry, hands-on exposure to graduate research. Students rotate through up to two different labs for seven weeks. Labs are run by chemistry graduate faculty members.

CHEM 8066. Professional Conduct of Chemical Research. (1.0 cr.; S-N or Audit; prereq Chem grad student; fall, spring, every year) 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.

CHEM 8081. M.S. Plan B Project I. (1.0-4.0 cr.; A-F or Audit; prereq grad chem major; fall, spring, summer, every year) 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.

CHEM 8082. M.S. Plan B Project II. (1.0-4.0 cr.; A-F or Audit; prereq grad chem major; fall, spring, summer, every year) 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.

CHEM 8151. Analytical Separations and Chemical Equilibria. (4.0 cr.; prereq #; fall, spring, every year) 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.

CHEM 8152. Analytical Spectroscopy. (4.0 cr.; prereq grad chem major or #; fall, every year) 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.

CHEM 8153. Extracting Signal From Noise. (5.0 cr.; A-F or Audit; prereq [4101 or equiv], differential equations course; spring, every year) 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.

CHEM 8155. Advanced Electroanalytical Chemistry. (4.0 cr.; spring, every year) Thermodynamics/kinetics of electron/ion transfer, electric double layer, mass transfer by diffusion/migration. Ion-selective potentiometry, chronocamperometry, chronocoulometry, cyclic voltammetry, pulse voltammetry, ion-transfer voltammetry, impedence spectroscopy, bioelectrocatalysis, rotating disk electrodes, microelectrodes, chemically modified electrodes. Scanning electrochemical microscopy. EC-STM, quartz crystal microbalance.

CHEM 8157. Bioanalytical Chemistry. (4.0 cr.; A-F or Audit; spring, offered periodically) 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. (4.0 cr.; prereq Sem of organic chem.) Detailed understanding of relaxation processes, chemical exchange, quadrupolar effects, NOW, 2D NMR, NMR hardware, and solid state NMR. NMR imaging and Pulsed Field Gradient (PFG) NMR are discussed.
CHEM 8180. Special Topics in Analytical Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; ) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8201. Materials Chemistry. (4.0 cr.; A-F or Audit; [CHEM 4201]; prereq [4701, 3502] or #, fall, every year) 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.


CHEM 8221. Synthetic Polymer Chemistry. (4.0 cr.; = [CHEM 5221, CHEM 6221, MATS 8221, MATS 2221, CHEM 4221]; prereq Undergrad organic chemistry course, undergraduate physical chemistry course) or #; fall, every year) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

CHEM 8280. Special Topics in Materials Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; fall, spring, offered periodically) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8321. Organic Synthesis. (4.0 cr.; prereq 2302 or equiv; fall, every year) Core course; fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry.

CHEM 8322. Advanced Organic Chemistry. (4.0 cr.; prereq 2302 or equiv; spring, every year) Modern studies. Topics, which vary by year, include natural products, heterocycles, asymmetric synthesis, organometallic chemistry, and polymer chemistry.

CHEM 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHEM 8352. Physical Organic Chemistry. (4.0 cr.; prereq 4011 or 8011; spring, every year) Fundamental concepts, mechanistic tools for analyzing organic reaction mechanisms.

CHEM 8361. Interpretation of Organic Spectra. (4.0 cr.; prereq 2302 or equiv; fall, every year) Practical application of nuclear magnetic resonance, mass, ultraviolet, and infrared spectral analyses to solution of organic structural problems.

CHEM 8380. Special Topics in Organic Chemistry. (1.0-4.0 cr.; prereq grad chem major or #; spring, offered periodically) Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8411. Introduction to Chemical Biology. (4.0 cr.; prereq 2302 or equiv; fall, every year) Chemistry of amino acids, peptides, proteins, lipids, carbohydrates, and nucleic acids. Structure, nomenclature, synthesis, and reactivity. Overview of techniques used to characterize these biomolecules.

CHEM 8412. Chemical Biology of Enzymes. (4.0 cr.; prereq 2302 or equiv; spring, offered periodically) Enzyme classification with representative examples from current literature. Strategies used to decipher enzyme mechanisms. Chemical approaches for control of enzyme catalysis.

CHEM 8413. Nucleic Acids. (4.0 cr.; prereq 2302 or equiv; ) 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.

CHEM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHEM 8480. Special Topics in Biological Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; spring, offered periodically) Topics (and availability) vary by year, depending on instructor and development of the field.

CHEM 8541. Mechanics, and Reaction Dynamics I. (4.0 cr.; prereq grad physical chem course; fall, every year) 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.

CHEM 8562. Thermodynamics, Statistical Mechanics, and Reaction Dynamics II. (4.0 cr.; prereq 8561; spring, every year) 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.

CHEM 8563. Molecular Simulations. (2.0 cr.; prereq grad chem major or #; spring, every year) 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.

CHEM 8564. Laser Spectroscopy. (2.0 cr.; prereq grad chem major or #; spring, every year) Fundamentals of light-molecule interactions/manifestation in spectroscopic observables. Time correlation functions, spectroscopic lineshapes, linear/nonlinear material responses, material susceptibilities. Role of lasers in measuring quantities.

CHEM 8580. Special Topics in Physical Chemistry. (2.0-4.0 cr. [max 8.0 cr.]; prereq grad chem major or #; spring, offered periodically) Topics (and availability) vary depending on instructor and development of the field.

CHEM 8601. Seminar: Modern Problems in Chemistry. (1.0 cr.; S-N or Audit; prereq grad chem major or #; fall, spring, every year) Weekly seminar series on modern chemical topics.
CHEM 8602. Seminar Presentation: Modern Problems in Chemistry. (1.0 cr.; A-F or Audit; prereq grad chem major or #; fall, spring, every year)
Weekly seminar series on modern chemical topics presented by students.

CHEM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

CHEM 8700. Advanced Concepts in Medicinal Chemistry: Combinatorial Methods in Chemical Biology. (2.0 cr.; A-F or Audit; =MEDC 8700, PHAR 6247H; prereq [2302 or equiv]; Bioc 4331 or equiv); 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.

CHEM 8715. Physical Inorganic Chemistry. (4.0 cr.; prereq 4701 or equiv, grad chem major or #; fall, every year)
Physical methods and concepts applied to inorganic and organometallic systems, including many of the following methods: NMR, IR, UV-VIS, ESR, M[ol]esbauer and mass spectroscopy, magnetic measurements, X-ray diffraction.

CHEM 8725. Organometallic Chemistry. (4.0 cr.; prereq 4701 or equiv, grad chem major or #; 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.

CHEM 8735. Bioinorganic Chemistry. (4.0 cr.; prereq 4701 or equiv, grad chem major or #; Survey of role of metal ions in biology; emphasizes structure, function, and spectroscopy of metalloproteins and their synthetic analogs.

CHEM 8745. Advanced Inorganic Chemistry. (4.0 cr.; prereq 8715, grad chem major or #; spring, offered periodically)
Survey of topics in main group and transition metal chemistry; emphasizes synthesis, structure, physical properties, and chemical reactivity.

CHEM 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

CHEM 8780. Special Topics in Inorganic Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; Topics (and availability) vary by year depending on instructor and development of the field.

CHEM 8880. Special Topics in Chemistry. (2.0-4.0 cr.; prereq Grad chem major or #; spring, every year)
Topics (and availability) vary depending on instructor and development of the field.

CHEM 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 16 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

Chicano Studies (CHIC)

CHIC 5374. Migrant Farmworkers in the U.S.: Families, Work, and Advocacy. (4.0 cr.; spring, every year)
Socioeconomic/political forces that impact migrant farmworkers. Effects of the laws and policies on everyday life. Theoretical assumptions/strategies of unions and advocacy groups. Role/power of consumer. How consuming cheap food occurs at expense of farmworkers.

CHIC 5920. Topics in Chicana(o) Studies. (3.0 cr.; prereq Sr or grad student; fall, spring, every year)
Multidisciplinary themes in Chicana(o) studies. Issues of current interest.

CHIC 5993. Directed Studies. (1.0-3.0 cr. [max 16.0 cr.]; prereq #; fall, spring, summer, every year)
Guided individual reading, research, and study for completion of the requirements for a senior paper or honors thesis.

Child Psychology (CPSY)

CPSY 5187. Master's Paper in Early Childhood Education. (2.0-4.0 cr.; S-N only; prereq Students must have satisfied all licensure requirements and student teaching; fall, spring, summer, every year)
Students choose an ECE topic/write a paper using primarily empirical research data/provide rationale for chosen topic, interpret, analyze, and critique the research studies, draw conclusions, describe how research may be applied to field, provide suggestions for future research.

CPSY 5251. Social and Philosophical Foundations of Early Childhood Education. (2.0 cr.; A-F only; prereq Student in ECE or ECSE; fall, every year)
Surveys imagery, history, philosophy, and psychology of early childhood education. Trends in early education, including diversity, special needs, legislation, public policy, and educationally appropriate practice.

CPSY 5252W. Facilitating Social and Emotional Learning in Early Childhood Education. (3.0 cr.; A-F only; prereq Student in ECE or ECSE; spring, every year)

CPSY 5253. Facilitating Cognitive and Language Learning in Early Childhood Education. (3.0 cr.; A-F only; prereq Student in ECE or ECSE; fall, every year)
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.

CPSY 5254. Facilitating Creative and Motor Learning in Early Childhood Education. (2.0 cr.; A-F only; prereq Student in ECE or ECSE; spring, every year)
Unique/diverse qualities and characteristics children possess while progressing through universal sequence of physical growth/development and creative development. Students engage in inquiry, research/planning, and reflection as they complete the action-oriented and applied assignments with small groups of children.

CPSY 5281. Student Teaching in Early Childhood Education. (1.0-6.0 cr.; S-N or Audit; prereq MEd student in early childhood ed or early childhood special ed; fall, spring, summer, every year)
Application of theory/research relating to teaching preschool children. For individuals obtaining ECE licensure.

CPSY 5301. Advanced Developmental Psychology. (3.0 cr.; A-F only; fall, every year)
Overview of theories/research regarding human development across lifespan. Contexts that shape development. Theoretical frameworks that are applied to study of human development, cognitive, social, emotional development. Research methods in developmental psychology.

CPSY 5413. Early Childhood and Public Policy. (3.0 cr.; fall, every year)
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. (1.0-3.0 cr.; prereq Early Childhood Policy Certificate student; #; spring, offered periodically)
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.

CPSY 5501. Foundations in Infant and Early Childhood Mental Health I. (3.0 cr.; A-F only; prereq [Baccalaureate degree in an early-childhood-related field from an accredited U.S. institution or documented equiv], experience in early childhood [research or practice]; fall, odd years)
History, theory, research, concepts, and issues in infant mental health. Issues pertinent to difficulties in development. Readings, visual material. Expert guest lectures.

CPSY 5503. Foundations in Infant and Early Childhood Mental Health II. (3.0 cr.; A-F only; prereq 5501; spring, even years)

CPSY 5506. Infant Observation Seminar I. (1.0 cr.; Student Option No Audit; prereq 5501; #: spring, even years)
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. (1.0 cr.; Student Option No Audit; prereq 5506; summer, even years)
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 5511. Infant Observation Seminar III. (1.0 cr.; Student Option No Audit; prereq 5508; fall, even years)
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. Assessment in Infant and Early Childhood Mental Health: DC 0-3R. (2.0 cr.; prereq [Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]; summer, even years)
Infant Mental Health diagnostic manual DC 0-3R. Assessment using the manual. Lectures, discussions, cooperative learning, class exercises, case studies.

CPSY 5515. Assessment in Infant and Early Childhood Mental Health: NCAST . (2.0 cr.; S-N only; prereq [Baccalaureate degree in early-childhood-related field from accredited U.S. institution or documented equiv], [experience in early childhood research or practice]; summer, even years)
Achieving reliability in two observational measures of parent-child interaction: (1) nursing child assessment feeding (2) teaching Scales. Discussion, lecture, videotapes, listening/observation tasks.

CPSY 5518. Prevention and Intervention in Infant and Early Childhood Mental Health I. (3.0 cr.; A-F only; prereq 5501, 5503, 5506, 5508; fall, even years)
Students design prevention/intervention programs and apply evidence-based strategies in workplace/practicum settings. Readings, in-class reflective practice groups.

CPSY 5521. Prevention and Intervention in Infant and Early Childhood Mental Health II. (3.0 cr.; A-F only; prereq 5518; spring, even years)
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 . (1.0 cr.; S-N only; prereq &5518 or &5521; spring, odd years)
Principles/strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

CPSY 5525. Reflective Supervision in Infant and Early Childhood Mental Health: Clinical. (1.0 cr.; S-N only; prereq &5518 or &5521; spring, odd years)
Principles and strategies of reflective supervision/consultation. Discussion, final assignment designated by instructor.

CPSY 8102. Writing Developmental Psych Grants for NIH and NSF. (1.0-3.0 cr. [max 4.0 cr.; A-F only; prereq Doctoral students in second year of study or beyond; spring, even years])
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.

CPSY 8301. Developmental Psychology: Cognitive Processes. (4.0 cr.; prereq Doctoral student; #; fall, every year)
Perceptual, motor, cognitive and language development, and biological bases of each. Conceptual framework of research issues.

CPSY 8302. Developmental Psychology: Social and Emotional Processes. (4.0 cr.; prereq Doctoral student; #; spring, every year)
Normative issues and individual differences in social development from infancy through adolescence. Emphasizes developmental psychopathology, life span considerations.

CPSY 8307. Prelim Seminar. (1.0 cr.; S-N only; prereq Child psychology PhD student in second year of study; spring, every year)
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.

CPSY 8311. Landmark Issues and Great Controversies in Child Development. (2.0 cr.; S-N or Audit; prereq CPSy doctoral student or #: fall, every year)
History of developmental psychology and child development/movement in context of conceptual/theoretical controversies. Presentations by students/instructor.

CPSY 8321. Seminar in Teaching Developmental Psychology. (1.0 cr.; prereq CPSy doctoral student or #: fall, every year)
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.

CPSY 8322. Apprenticeship in Teaching Developmental Psychology. (1.0-3.0 cr.; prereq Child psychology doctoral student; #; spring, every year)
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/issuues.

CPSY 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CPSY 8360. Special Topics in Developmental Psychology. (1.0-3.0 cr. [max 21.0 cr.;] prereq Doctoral student; fall, spring, every year)
Intensive study in specialized areas of developmental psychology. Topics/credits vary.

CPSY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CPSY 8606. Advanced Developmental Psychopathology. (3.0 cr.; prereq Doctoral student or #: fall, every year)
Alternative formulation of childhood disorders, emphasizing competency training rather than medical nosology.

CPSY 8660. Advanced Developmental Psychology. (1.0-4.0 cr. [max 21.0 cr.;] prereq Doctoral student; fall, spring, offered periodically)
Intensive study in advanced areas of developmental psychology. Topics/credits vary.

CPSY 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.;] No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

CPSY 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 80.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

CPSY 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

CPSY 8980. Research Seminar in Child Psychology. (1.0-3.0 cr. [max 15.0 cr.;] prereq Doctoral student; fall, spring, summer, every year)
Participation in organized research group in developmental psychology.

**CPSY 8993. Directed Study in Child Psychology.** (1.0-4.0 cr.; prereq Doctoral student or #; fall, spring, every year) TBD

**CPSY 8994. Research Problems in Child Psychology.** (1.0-6.0 cr. [max 24.0 cr.]; prereq Doctoral student or #; fall, spring, every year) Individual empirical investigation.

**CPSY 8996. Directed Field Experiences in Child Psychology.** (1.0-6.0 cr.; S-N or Audit; prereq Doctoral student, #; fall, spring, summer, every year) 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.

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**Child and Adolescent Psychiatry (CAPY)**

**Medical School**

**CAPY 5623. Assessment and Treatment Interventions: Anxiety and Depression in Children and Adolescents.** (1.0 cr.; fall, spring, offered periodically) Characteristics of depression and suicidal behavior in children/adolescents. Methods of crisis intervention, treatment, and prevention.


**CAPY 5660. ADHD Throughout the Life Span: Perspectives on Diagnosis, Assessment, and Developmental Course.** (1.0-2.0 cr.; = [CAPY 5620, CAPY 5669]; prereq Upper div; fall, summer, every year) 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.


**CAPY 5663. Building Friendships and Peer Relationship Skills: Interventions for Socially Rejected Children.** (1.0 cr.; spring, offered periodically) Basic milestones in social development. Behaviors/mechanisms leading to peer acceptance/rejection during childhood.

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**Strategies for promoting social skill acquisition. Behavioral, social-cognitive, and emotional-regulation intervention approaches.**


**CAPY 5669. Attention Deficit Hyperactivity Disorder Throughout the Life Span: Current Perspectives on Treatment.** (1.0 cr.; = [CAPY 5660, CAPY 5620]; fall, offered periodically) Standard medication, psychosocial, and educational interventions. Recent advances in long-acting stimulant medications. Setting up behavioral programs in home/school. Educational accommodations in school. Coaching. Cognitive-behavioral/ neuro-biofeedback therapies.

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**China Executive MBA (CHMB)**

**Curtis L. Carlson School of Management**

**CHMB 5800. Organizational Behavior.** (3.0 cr.; A-F only; fall, every year) 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.** (3.0 cr.; A-F only; fall, every year) 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.

**CHMB 5802. Statistics and Decision Making.** (3.0 cr.; A-F only; fall, every year) Exploratory data analysis, basic inferential procedures, statistical process control, regression analysis.

**CHMB 5803. Operations Management.** (3.0 cr.; A-F only; fall, every year) 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.** (3.0 cr.; A-F only; spring, every year) 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. (3.0 cr.; A-F only; spring, every year) 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. (3.0 cr.; A-F only; spring, every year) 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 5808. Strategic Marketing. (3.0 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. (3.0 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 5811. Information Technology Management. (3.0 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. (3.0 cr.; A-F only; fall, spring, every year) 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 5814. Business, Government, and Macroeconomics. (3.0 cr.; A-F only; ) Analyzing major economic events, predicting their ramifications. Changes in monetary/fiscal policies, unemployment, international financial markets, country risk, financial crises. Implications of macroeconomic policies and global trends for economic growth. Topics are presented within an integrated conceptual framework and are supported by experiences of the U.S., Europe, Japan, and enveloping countries.

CHMB 5815. International Human Resources Management. (3.0 cr.; A-F only; spring, every year) 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. (6.0 cr.; A-F only; fall, spring, every year) 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.

Chinese (CHN)

College of Liberal Arts

CHN 5011. Research Methods. (4.0 cr.; prereq 3032 or 3112; ) Introduction to the sources and approaches of research in language and literature.

CHN 5040. Readings in Chinese Texts. (3.0 cr. [max 12.0 cr.; A-F or Audit; prereq 4042 or equiv or #; fall, spring, every year] Students read authentic materials of various types to increase reading/speaking ability. Topics specified in Class Schedule.

CHN 5101. Chinese Survival Skills. (1.0 cr.; S-N or Audit; prereq Enrolled in U of M law school; summer, every year) For students about to depart for China who have had no formal Chinese language instruction.

CHN 5111. Beginning Intensive Chinese. (2.0 cr.; prereq Enrolled in U of M Law School; summer, every year) Offered in Beijing.

CHN 5112. Intermediate Intensive Chinese. (2.0 cr.; prereq Enrolled in U of M Law School; summer, every year) Offered in Beijing.

CHN 5120. Topics in Chinese Linguistics. (4.0 cr. [max 8.0 cr.; prereq 4121 or 4125; ] Studies of the structure and change in the Chinese language.

CHN 5211. Introductory Classical Chinese I. (3.0 cr.; =JPN 5211, KOR 5211; prereq Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; fall, offered periodically) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

CHN 5212. Introductory Classical Chinese II. (3.0 cr.; =JPN 5212, KOR 5212; prereq 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or its equivalent or #; spring, offered periodically)

Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

CHN 5393. Directed Study. (1.0-5.0 cr. [max 18.0 cr.; ] fall, spring, every year) Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

CHN 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CHN 8494. Directed Research. (1.0-5.0 cr. [max 16.0 cr.; ] fall, spring, every year) Individual study/research with guidance of a faculty member.

CHN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; ] No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

CHN 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.; ] No Grade Associated; prereq Max 18 cr per semester or summer, 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

CHN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.; ] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Civil Engineering (CE)

College of Science and Engineering

CE 5094. Civil Engineering Research. (1.0-4.0 cr.; prereq #; fall, spring, every year) Research or independent study in concrete, structural steel, soils, hydraulics, hydrology/ municipal, environmental, or transportation problems. Investigations, reports, tests, designs.

CE 5180. Special Topics. (1.0-4.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Topics vary depending on faculty and student interests.

CE 5211. Traffic Engineering. (3.0 cr.; prereq 3201, Stat 3021 or equiv; spring, offered periodically) 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 generation and traffic impact analysis. Safety and traffic studies.
CE 5212. Transportation Policy, Planning, and Deployment. (4.0 cr.; [PA 5232]; prereq 3201 or equiv; fall, every year)

CE 5213. Transit Planning and Management. (3.0 cr.; A-F only; prereq CE Jr, Sr, CE Grad student or #; fall, every year)

CE 5214. Transportation Systems Analysis. (4.0 cr.; prereq 3201; fall, every year)
Systems approach, its application to transportation engineering/planning. Prediction of flows and level of service. Production functions, cost optimization, utility theory, demand modeling, transportation network analysis, equilibrium assignment, decision analysis, multidimensional evaluation of transportation projects.

CE 5253. Asphalt and Portland Cement Concrete Materials. (4.0 cr.; prereq 3402, upper div CSE) or grad student or #; spring, offered periodically

CE 5341. Wave Methods for Nondestructive Testing. (4.0 cr.; A-F or Audit; prereq [AEM 2021, AEM 3531] or #; fall, offered periodically)
Introductory wave methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging technologies based on propagation of elastic waves such as ultrasonic/resonant frequency methods, seismic surveys, and acoustic emission monitoring. Lecture, lab.

CE 5351. Advanced Mathematics for Civil Engineers. (3.0 cr.; A-F or Audit; prereq [Math 2263 or Math 2374 or equiv], [sr or grad student] in civil engineering) or #; )
Emphasizes skills relevant for civil engineers. Mathematical principles explained in an engineering setting. Applications from various areas in civil engineering.

CE 5411. Applied Structural Mechanics. (3.0 cr.; A-F or Audit; prereq [Upper div CSE or grad student] or #; fall, every year)
Principal stresses and failure criteria in 3 dimensions. Introduction to plane elasticity, energy methods, torsion of beams, and bending of unsymmetrical beams.

CE 5414. Prestressed Concrete Design. (3.0 cr.; A-F or Audit; prereq [Grade of at least C- in 4401, [upper div CSE or grad student]] or #; fall, every year)
Design of prestressed concrete structures. Time dependent effects, behavior, flexure, shear, torsion, deflections, continuous systems.

CE 5415. Masonry Structures. (3.0 cr.; A-F or Audit; prereq [Grade of at least C- in 3401, [upper div CSE or grad student]] or #; 4401 recommended; fall, offered periodically)

CE 5511. Urban Hydrology and Land Development. (4.0 cr.; A-F or Audit; prereq CE 4501; fall, every year)
Urban hydrology for small watersheds and the management of storm water quality and quantity.

CE 5541. Environmental Water Chemistry. (3.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 3501, Chem 1021, Chem 1022; fall, every 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.

CE 5542. Experimental Methods in Environmental Engineering. (3.0 cr.; A-F or Audit; prereq 3501, Chem 1021, Chem 1022; fall, spring, offered periodically)
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.

CE 5543. Introductory Environmental Fluid Mechanics. (4.0 cr.; A-F or Audit; prereq 3502 or AEM 4201 or Chen 3005; fall, odd years)

CE 5551. Environmental Microbiology. (3.0 cr.; A-F or Audit; prereq [Upper div or grad student] or #; every year)
Role of microorganisms in environmental bioremediation, pollution control, water/wastewater treatment, biogeochemistry, and human health. Lecture.

CE 5552. Environmental Microbiology Laboratory. (1.0 cr.; A-F only; prereq 5551 or 5551; fall, every year)
Basic microbiological techniques: isolation, identification enumeration of bacteria, BOD, biodegradable kinetics, disinfection. Lab.

CE 5561. Air Quality Engineering. (3.0 cr.; A-F only; prereq Grad student in engineering or #; spring, every year)
Introduction to air pollution problems/solutions, local to global. Quantitative analysis of chemistry and physics of atmospheric pollutants. Sources, sinks, and controls; atmospheric transport and transformation; air quality management and regulation; health impacts; global issues.

CE 5570. Design for Sustainable Development: Discovery. (1.0-3.0 cr.; A-F only; prereq Juniors or seniors with minimum 3.0 GPA or grad student; fall, every year)
Intensive, experiential learning opportunity on infrastructure, development, environment issues in Delhi, India.

CE 5571. Acara Global Venture Design: Grand Challenges. (3.0-4.0 cr. [max 8.0 cr.]; A-F only; prereq #; fall, every year)
Project-based course focused on designing venture solutions to global grand challenges related to environment, health, development. Identify specific social-environmental problem. Design financially-viable venture solution. Collaborate with professional mentors/technical experts. Create venture plan, may pitch for funding. Course is part of Acara program.

CE 5572. Acara Social Venture Launchpad: Ideas to Impact. (2.0 cr. [max 4.0 cr.]; A-F only; prereq #; spring, every year)
Project-based Acara entrepreneurship course in which students refine existing venture solutions to social-environmental challenges. Students work on business model/develop effective pitch. Teams interact with entrepreneurs, investors/Acara staff.

CE 5573. Design for Sustainable Development: Create II. (1.0-5.0 cr. [max 10.0 cr.]; S-N only; spring, every year)
Weekly discussion on social or environmental venture.

CE 8022. Numerical Methods for Free and Moving Boundary Problems. (3.0 cr.; A-F or Audit; prereq 8401 or #)
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.

CE 8094. Civil Engineering Research. (1.0-4.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year)
Research or independent study in concrete, structural steel, soils, hydraulics, hydrology, and municipal, environmental, or transportation problems. Investigations, reports, tests, or designs.

CE 8200. Seminar: Transportation. (1.0 cr.; max 3.0 cr.; S-N or Audit; fall, spring, every year)
Content depends on instructor and student. Sample topics: traffic safety, traffic flow theory, transportation materials, transportation planning, transportation economics.

CE 8202. Networks and Places: Transportation, Land Use, and Design. (4.0 cr.; A-F or Audit; spring, every year)
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.

CE 8212. Advanced Travel Demand Modeling and Supply Analysis. (3.0 cr.; prereq 5211 or equiv, Stat 3021; fall, spring, odd years) Application of random utility theory to model travel demand; deterministic and stochastic trip assignment; network design problems; transportation planning software.

CE 8213. Advanced Transportation Seminars. (1.0 cr.; S-N or Audit; =ME 8772; fall, spring, offered periodically) 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.

CE 8214. Transportation Economics. (4.0 cr.; A-F or Audit; spring, offered periodically) Application of microeconomic theory to transportation. Demand/demand estimation, cost/cost estimation, pricing/investment, regulation/deregulation. Urban/intercity passenger transportation, freight transportation.

CE 8215. Transportation Data Analysis. (3.0 cr.; prereq [8210 or 8211], [STAT 5021 or equiv]; spring, odd years) 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.

CE 8216. Urban Traffic Operations. (3.0 cr.;) 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.


CE 8231. Advanced Pavement Engineering. (3.0 cr.; prereq 4231 or #) Advanced concepts in pavement analysis and design; computation of stresses and strains in flexible and rigid pavement systems; review of Boussinessq theory, Burmeister model, and Westergaard model; load transfer in rigid pavements; temperature induced stresses; mechanics of drainage.

CE 8233. Advanced Bituminous Materials Characterization. (3.0 cr.; prereq [3402, grad student]); ( ) Applications of viscoelasticity, rheology, elastoplasticity, and fracture mechanics to bituminous materials characterization. Lectures, discussion of advanced research reading assignments, laboratory assignments.

CE 8300. Seminar: Geomechanics. (1.0-3.0 cr.; [max 4.0 cr.]; S-N or Audit; =GEOE 8830); fall, spring, every year) Presentations on various topics.


CE 8311. Advanced Rock Mechanics. (3.0 cr.; A-F or Audit; =GEOE 8311); prereq CSE grad student, 4311 or GeoE 4311 or #; fall, offered periodically) 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.


CE 8331. Modeling Geomechanical Processes. (3.0 cr.; A-F or Audit; =GEOE 8331); prereq CSE grad student, 5321 or GeoE 5321; fall, offered periodically) Data-limited nature of problems in geomechanics. Dimensional analysis. Regimes of solution. Similarity of solutions. Elements of fracture mechanics, elastoplasticity, poroelasticity. Applications to stability of underground excavations, fluid flow in fracture, tool-rock interaction, hydraulic fracturing.

CE 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CE 8336. Boundary Element Methods I. (3.0 cr.; A-F or Audit; =GEOE 8336); prereq CSE grad student; fall, even years) 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.

CE 8337. Boundary Element Methods II. (3.0 cr.; A-F or Audit; =GEOE 8337); prereq 8336, GeoE 8336 or #; fall, offered periodically) Transient and nonlinear problems.


CE 8352. Advanced Groundwater Mechanics II. (3.0 cr.; A-F or Audit; =GEOE 8352); prereq 4351, CSE grad student or #; fall, offered periodically) 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.

CE 8361. Engineering Model Fitting. (3.0 cr.; A-F or Audit; prereq CSE grad student or #; fall, even years) 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.

CE 8400. Seminar: Structures. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year) 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.

CE 8401. Fundamentals of Finite Element Method. (3.0 cr.; A-F or Audit; prereq 4411 or #; spring, every year)
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.

CE 8402. Nonlinear Finite Element Analysis. (3.0 cr.; A-F or Audit; prereq 8401 or #; offered alt yrs; )

CE 8411. Plate Structures. (3.0 cr.; A-F or Audit; prereq 5411 or #; offered alt yrs; )

CE 8412. Shell Structures. (3.0 cr.; A-F or Audit; prereq CSE grad or #; fall, offered periodically)

CE 8413. Fracture and Scaling. (3.0 cr.; A-F or Audit; prereq 5411; spring, offered periodically)
Linear elastic fracture mechanics, cohesive fracture, scaling, strength statistics.

CE 8421. Structural Dynamics. (3.0 cr.; A-F or Audit; prereq 3401, AEM 2012 or #; & 4411 recommended; fall, every year)

CE 8422. Earthquake Engineering. (3.0 cr.; A-F or Audit; prereq 8421 or #; spring, offered periodically)
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.

CE 8431. Structural Stability. (3.0 cr.; A-F or Audit; prereq CSE grad student or #; fall, spring, offered periodically)
Classification of discrete/continuous conservative/nonconservative systems. Buckling analysis of, e.g., structural members, frameworks, and plates by classical/numerical methods. Offered alternate years.

CE 8432. Analysis of Thin-Walled Members. (3.0 cr.; A-F or Audit; prereq 5411 or #; offered alt yrs; )
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.

CE 8441. Ductile Behavior of Steel Structures. (3.0 cr.; A-F or Audit; prereq 4411 or #; fall; even years)

CE 8442. Nonlinear Analysis of Structural Systems. (3.0 cr.; A-F or Audit; prereq 4411, 4413 or #; offered alt yrs; )
Advanced theory and computational techniques for analyzing complex structural building systems. Using comprehensive geometric and material nonlinear analysis for designing steel and composite structures.

CE 8443. Fracture of Materials and Structures. (3.0 cr.; A-F or Audit; prereq 4401 or #; spring, every year)

CE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

CE 8451. Behavior of Reinforced Concrete Structures. (3.0 cr.; A-F or Audit; prereq 4412 or #; fall, spring, every year)
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.

CE 8461. Structural Reliability. (3.0 cr.; A-F or Audit; prereq [4412, 4413] or #; )

CE 8490. Special Topics. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically)
Topics vary depending on faculty and student interests.

CE 8500. Environmental Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq grad CE major or #; spring, every year)
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.

CE 8501. Environmental Fluid Mechanics I. (4.0 cr.; A-F or Audit; prereq 3502 or equiv or #; fall, every year)
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.

CE 8502. Environmental Fluid Mechanics II. (4.0 cr.; A-F or Audit; prereq 8501 or #; fall, spring, every year)
Principles of intraphase and interfacial chemical transport and flow 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.

CE 8503. Environmental Mass Transport. (4.0 cr.; A-F or Audit; prereq 3502, 3501 or equiv or #; )
Principles of intraphase and interfacial chemical transport and flow 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.

CE 8504. Theory of Unit Operations. (4.0 cr.; A-F or Audit; prereq 5541; fall, spring, offered periodically)
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.

CE 8505. Biological Processes. (3.0 cr.; A-F or Audit; prereq 4502, 4501 or #; spring, every year)
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.

CE 8506. Stochastic Hydrology. (4.0 cr.; A-F or Audit; prereq Stat 3021 or equiv or #; )
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.

CE 8507. Advanced Methods in Hydrology. (4.0 cr.; A-F or Audit; prereq 8506; )
Notions of scale-invariance, scaling, and multiscaling in geophysical processes; methods of multyscale analysis; wavelet transforms; time-frequency-scale analysis and fractal analysis. Applications in atmospheric, hydrologic, and geomorphologic processes.

**CE 8508. Ecological Fluid Mechanics.** (4.0 cr.; A-F or Audit; prereq 3502 or equiv; fall, every year)

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.

**CE 8511. Mechanics of Sediment Transport.** (3.0 cr.; A-F or Audit; [ESCI 5811]; prereq 3502 and 4501 or #; fall, every year)


**CE 8521. The Atmospheric Boundary Layer.** (4.0 cr.; A-F or Audit; prereq CSE or COAFES grad student or #; summer, offered periodically)

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.

**CE 8541. Aquatic Chemistry.** (3.0 cr.; A-F or Audit; prereq 4541 or #; spring, offered periodically)

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.

**CE 8542. Chemistry of Organic Pollutants in Environmental Systems.** (3.0 cr.; A-F or Audit; prereq [4541, 5541] or #; )

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.

**CE 8551. Environmental Microbiology: Molecular Theory and Methods.** (4.0 cr.; A-F or Audit; fall, even years)

Introduction to microbial genetics and molecular phylogeny. Application of nucleic-acid techniques in environmental microbiology and microbial ecology.

**CE 8552. Groundwater Microbiology: Laboratory.** (4.0 cr.; A-F or Audit; prereq grad CE major or #, exposure to basic environ engr and microbiol; )

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.

**CE 8553. Biofilms.** (3.0 cr.; A-F or Audit; prereq 4551 or #; )

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.

**CE 8561. Analysis and Modeling of Aquatic Environments I.** (3.0 cr.; A-F or Audit; prereq One sem grad work or #; spring, every year)


**CE 8562. Analysis and Modeling of Aquatic Environments II.** (3.0 cr.; [max 6.0 cr.]; prereq One sem grad work or #; fall, spring, offered periodically)

Models for transport/transformation of pollutants, nutrients, particulates, ecosystems, etc., from recently completed theses, articles, or research in progress. Students review recent papers, make presentations, and analyze a topic of their choice.

**CE 8563. Industrial Waste Treatment.** (3.0 cr.; A-F or Audit; prereq 3501, 4501, 4502, or equiv or #; )

Introduction to industrial waste treatment. Individual industries, emphasizing constituents of the waste-stream and how best to recycle, recover, or reduce wastes. Cost concerns and regulations. Field trips to various industries to gain first-hand knowledge of processes involved in treatment.

**CE 8571. Hydraulic Measurements.** (3.0 cr.; A-F or Audit; prereq 3502 or #; )

Lab and field methods and instruments for measuring hydraulic pressure, velocity, and discharge.

**CE 8572. Computational Environmental Fluid Dynamics.** (4.0 cr.; A-F or Audit; prereq grad student in CSE or COAFES or #; spring, offered periodically)

Finite difference methods, their application to solution of one-/two-dimensional problems in environmental fluid dynamics. Stability, convergence, consistency, and accuracy of numerical schemes. Navier-Stokes equations, their physical meaning, and their numerical solution. Turbulence modeling: RANS and LES.

**CE 8581. Research and Professional Ethics in Water Resources and Environmental Science.** (0.5 cr.; S-N or Audit; [WRS 8581]; prereq [Environmental engineering or water resource science] grad student or #; spring, every year)

Ethics of water resources science and environmental engineering research/practice. Societal responsibility, plagiarism, recording-keeping, authorship, confidentiality, conflicts of interest, professional relationships, fraud, reporting misconduct. Meets during first eight weeks of spring semester.

**CE 8601. Introduction to Stream Restoration.** (3.0 cr.; A-F or Audit; fall, every year)

Background material required to participate in a stream restoration project. How to assimilate geologic, hydrologic, and ecological data at watershed and reach scales to plan a restoration project and evaluate/ critique existing stream restoration projects.

**CE 8602. Stream Restoration Practice.** (2.0 cr.; S-N only; [ESCI 8602, EEB 8602]; prereq 8601 or Geo 8601; summer, every 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.

**CE 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

TBD

**CE 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

**CE 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

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**Classical and Near Eastern Studies (CNES)**

College of Liberal Arts

**CNES 5013. Introduction to Roman Law.** (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)

Survey of Roman law from social and historical perspectives. Basic concepts of Roman private law and legal procedure.

**CNES 5051. Before Herodotus: History and Historiography of Mesopotamia and the Ancient Near East.** (3.0 cr.; A-F or Audit; [HIST 5051]; prereq Previous coursework in Ancient Near Eastern history recommended; fall, spring, offered periodically)

Seminar. Historical method/sources for Ancient Near Eastern history. Historical tradition and historiographic texts of Mesopotamia and neighboring regions of Ancient Near East/their relationship to the works of classical historians such as Herodotus. Use of these sources in modern historiography of Ancient Near East.
CNE5 5070. Topics in Ancient Religion. (3.0 cr.; max 18.0 cr.; prereq Sr or grad student or #; fall, spring, offered periodically)
Specific aspect of religion in Classical and Near Eastern antiquity, such as healing cults, magic/divination, Gnosticism, or prophecy/authority. Topics specified in Class Schedule.

CNE5 5071. Greek and Hellenistic Religions. (3.0 cr.; =REL5 3071, CNE5 3071, REL5 5071]; spring, offered periodically)

CNE5 5072. The New Testament. (3.0 cr.; fall, spring, offered periodically)

CNE5 5073. Roman Religion and Early Christianity. (3.0 cr.; spring, offered periodically)

CNE5 5076. Apostle Paul: Life, Letters, and Legacy. (3.0 cr.; =CNE5 3076]; fall, spring, odd years)
How/what we can know about Paul. What his message was. How he was later understood by friends/foes.

CNE5 5080. New Testament Proseminar. (3.0 cr. [max 18.0 cr.; prereq 1082 or 3072 or equiv; fall, spring, offered periodically)
Study of some specific aspect of the New Testament and related literature. The class is organized as a discussion seminar. Topics specified in Class Schedule.

CNE5 5081W. Classical Epic in Translation. (3.0 cr.; =CNE5 3081W, CLCV 3081W]; prereq Grad student or #; fall, offered periodically)

CNE5 5083. Ancient Comedy. (3.0 cr.; Greek/Roman comic drama (e.g., Aristophanes, Menander, Plautus, Terence).

CNE5 5108. Greek Architecture. (3.0 cr.; =ARTH 5108]; prereq Jr, Class/Arth 3008 or #; spring, offered periodically)
Geometric through classical examples of religious and secular architecture and their setting at archaeological sites in Greece, Asia Minor and Italy.

CNE5 5115. Midrash: Jewish Biblical Interpretation. (3.0 cr.; =REL5 3115, JWST 3115, REL5 3115, JWST 5115]; fall, spring, offered periodically)
Jewish law studies as mirror of society and as way to actualize its value. Original socioreligious contexts, current applications. Biblical interpretations addressing moral, theological, legal, and literary problems.

CNE5 5172. House, Villa, Tomb: Roman Art in the Private Sphere. (3.0 cr.; =ARTH 5172]; prereq Intro art history course or #; fall, spring, offered periodically)
Architecture, painting, and sculpture of urban houses, country estates, and tombs in Roman world. Relationships between public/private spheres and literary/physical evidence. Usefulness of physical evidence in illuminating gender roles.

CNE5 5185. Hellenistic and Iranian Asia: Art and Archaeology of Hellenistic, Scythian, Kushan, and Sogdian Asia. (3.0 cr.; fall, spring, every year)
Transformations of Greek architecture, sculpture, painting, mosaic, decorative arts beginning of eastern Mediterranean/ Hellenistic Asia. Art/archaeology of post-Hellenistic Iranian world. Religious, political, historical contexts of archaeological sites, monuments, art objects.

CNE5 5188. Art and Archaeology of Early Christianity and the Late Roman Empire. (3.0 cr.; fall, spring, offered periodically)

CNE5 5192. Persia and the Ancient Iranian World: Art and Archaeology of Achaemenid Persia and Sasanian Persia. (3.0 cr.; fall, spring, every year)
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.

CNE5 5204. The Dead Sea Scrolls. (3.0 cr.; =JWST 5204, JWST 3204, RELS 3204, RELS 5204, CNES 3204]; fall, spring, offered periodically)
Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for understanding development of the Bible. Background of Judaism and Christianity. Archaeological site of Qumran.

CNE5 5502. Ancient Israel: From Conquest to Exile. (3.0 cr.; =JWST 5025, RELS 3025, HIST 5302, CNES 3025]; prereq Knowledge of Hebrew not required; 5501 recommended; fall, offered periodically)

CNE5 5535. History and Development of Israelite Religion I. (3.0 cr.; =ANE 5503, CNES 5303, ANE 3503]; fall, offered periodically)
Survey of the evolution of Israelite religion.

CNE5 5535W. Scripture and Interpretation in Israelite Religion and Judaism. (3.0 cr.; A-F or Audit; =JWST 5513W, RELS 5513W, CNES 8513]; prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, even years)

CNE5 5503. Sexuality and Gender in Ancient Greece and Rome. (3.0 cr.; =CNE5 3501]; spring, every years)
What we know (or think we know) about ancient Greek/Roman ideas about sexuality and gender roles. Nature of evidence/methodologies by which it is analyzed.

CNE5 5701. Alphabetic Epigraphy of the Ancient Near East. (3.0 cr.; fall, offered periodically)

CNE5 5713. Introduction to Ugaritic. (3.0 cr.; prereq Adv Hebrew, previous study of biblical texts or #; )
Ugaritic alphabetic cuneiform script, morphology, and syntax. Reading of representative samples of Ugaritic literature. Attenton to linguistic and cultural issues and links to biblical and other Ancient Near Eastern texts.

CNE5 5786. Theorizing City and Space in the Mediterranean and Western Asia. (3.0 cr.; spring, even years)
Development of greatest cities of Eastern Mediterranean/Western Asia from age of Alexander to rise of Islam. Methodological/theoretical approaches to study of cities where as much evidence exists in texts as archaeological form.

CNE5 5794. Introduction to Classical and Near Eastern Studies. (1.0 cr.; S-N or Audit; prereq grad major or minor or #; fall, every year)
Introduction to core research materials and reference materials in the various disciplines which make up classical studies.

CNE5 5796. Classical Texts: Approaches and Methods. (3.0 cr.; prereq CNE5 grad student or #; fall, odd years)
CNS 5940. Topics in Classical Literature. (3.0 cr. [max 9.0 cr.]; prereq Two literature courses or #; ) Additional work for graduate credit. Topics specified in Class Schedule. Meets with 3940.

CNS 5950. Aspects of Classical Culture. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics specified in Class Schedule.

CNS 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

CNS 5994. Directed Research. (1.0-12.0 cr. ; fall, spring, every year) Guided individual research. Prereq-instr consent, dept consent, college consent.

CNS 5996. Directed Instruction. (1.0-12.0 cr. ; fall, spring, every year) Guided individual research. Prereq-instr consent, dept consent, college consent.

CNS 8190. Seminar: Issues in Ancient Art and Archaeology. (3.0 cr. [max 12.0 cr.]; =[ARTH 8190]; fall, spring, offered periodically) Selected issues, with special attention to current scholarly disputes. Topics specified in Class Schedule.

CNS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, every year) (No description)

CNS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year) (No description)

CNS 8513. Scripture and Interpretation. (3.0 cr.; A-F or Audit; =[JWST 5513W, RELS 5513W, CNS 5513W]; prereq Grad student; fall, spring, every year) Ideas of divine revelation. Impact upon religion/literature. How history of Bible's creation, transmission, interpretation helps us think critically about role of revelation in history of religious traditions.

CNS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd year registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 80 combined cr; fall, spring, summer, every year) To be determined

CNS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

CNS 8794. Practicum for Future Faculty in Classics. (1.0 cr.; S-N only; prereq Doctoral [major or minor] in Classical/Near Eastern studies; spring, every year) Workshop in professional development. Developing the dissertation. Preparing a portfolio to document/reflect on teaching the ancient world and its languages. Readings, workshops, peer teaching, reflective writing.

CNS 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year) (No description)

CNS 8950. Topics in Classical & Near Eastern Studies. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics such as slavery, women in antiquity, pagans and Jews, the taboo, and modern study of myth.

Clinical Laboratory Science (CLS)

CLS 5090. Special Laboratory Methods. (1.0-2.0 cr. ; A-F or Audit; prereq #; fall, spring, every year) Assignment on an individual basis to one of a variety of special areas of experience in the clinical lab.

CLS 5100. Virology, Mycology, and Parasitology for Medical Technologists. (2.0 cr.; A-F or Audit; prereq microbiology course with lab, biochem course; spring, every year) Lab diagnosis of viral, fungal, and parasitic infections. Lecture.

CLS 5120. Seminar: Clinical Laboratory Science. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Current literature. Presentation/discussion of research.

CLS 5121. Journal Presentations. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq 1st yr CLS grad student; fall, spring, every year) Critical analysis and evaluation, discussion of current journal articles in student's specialty area.

CLS 5125. Practicum Teaching. (1.0-2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Supervised teaching experience, develop skills using instructional materials, tests, and measurements.

CLS 5129. Elements of Laboratory Administration. (2.0 cr.; A-F or Audit, prereq #; fall, spring, every year) 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.

CLS 5130. Practicum in Laboratory Administration. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Supervised experience and assignment of specific problems related to lab service and management in health care institutions.

CLS 5140. Techniques for Teaching. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Developing objectives, classroom activities, and evaluation criteria for medical technology education.

CLS 5165. Advanced Clinical Immunohematology. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Observation, study, and practice in special problems, advanced techniques, and methodology.

CLS 5402. Molecular Diagnostics. (1.0 cr.; A-F only; prereq #; fall, every year) Basic theory/application of molecular diagnostics in clinical lab. Lecture, lab.

CLS 5768. Advanced Hematology. (5.0-10.0 cr. [max 30.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) 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.

CLS 5864. Research Seminar. (1.0 cr.; [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Departmental research seminar series.

CLS 5865. Departmental Seminar. (1.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Departmental clinical lab research seminar series.

CLS 8193. Advanced Topics in Clinical Chemistry. (2.0 cr.; prereq #; fall, spring, summer, every year) Includes use of molecular approaches to diagnosis and risk assessment of selected diseases.

CLS 8194. Research on Clinical Laboratory Problems. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Individual research project in a selected area.

CLS 8293. Educational Administration in Medical Technology. (2.0 cr.; prereq #; fall, spring, summer, every year) Responsibilities of administration to students, faculty, and educational community. Curriculum planning, accreditation, staffing, student selection, finances. Sample administrative problems and decisions used as practice vehicles.

CLS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CLS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)
CSE 5010. Introduction to Engineering Design for Teachers. (3.0 cr.; Student Option No Audit; summer, every year) 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. (3.0 cr.; Student Option No Audit; summer, every year) Communication/documentation, design process, engineering systems, strength of materials, testing, reliability, statics/dynamics. Part of Project Lead the Way curriculum. Prereq-college consent.

CSE 5103. Digital Electronics for Teachers. (3.0 cr.; Student Option No Audit; summer, every year) Fundamentals of digital electronics, number systems, gates, Boolean algebra, circuit design, adding, flip-flops, shift registers/counters, families/specifications, microprocessors, design topic. Part of Project Lead the Way curriculum. Prereq-college consent.

CSE 5104. Civil Engineering and Architecture. (3.0 cr.; Student Option No Audit; summer, every year) 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. (3.0 cr.; Student Option No Audit; summer, every year) 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.

Communication Studies (COMM) College of Liberal Arts

COMM 5110. Special Topics in Communication Theory. (3.0 cr.; [max 9.0 cr.]; fall, spring, summer, every year) Advanced theoretical problems. See department office for current offering.

COMM 5211. Critical Media Studies: Theory and Methods. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Survey of theories, research methods, and scholars dominating critical media studies since late 1920s.

over time and how society, government regulation, and economics of production influence that historical process.

COMM 5221. Media, Race, and Identity. (3.0 cr.; prerequisite: 3211 or #; fall, offered periodically) Critical media studies perspective on social construction of race and ethnicity. Social representations of race.

COMM 5231. Media Outlaws. (3.0 cr.; fall, every 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. (3.0 cr.; A-F only; spring, every year) 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. (3.0 cr.; prerequisite: 3211 or #; fall, spring, every year) Organizational practices of media communicators. Media content as link between communicators and audiences. How viewers use/process media content.

COMM 5401. Advanced Theories of Communication. (3.0 cr.; prerequisite: 3401 or grad; fall, spring, summer, every year) Survey of major theoretical approaches to communication including, positivism, constructivism, and systems.

COMM 5402. Advanced Interpersonal Communication. (3.0 cr.; prerequisite: 3401 or 3402; spring, every year) Social scientific approaches to interpersonal communication. Theory, research findings.

COMM 5404. Language and Culture. (3.0 cr.; prerequisite: 3401 or #; fall, spring, summer, every year) How language/communication transmit cultural knowledge, attitudes, and beliefs. Connections among language, thought, and culture. Social/ethnic perspectives on study of language/communication.

COMM 5406. Communication and Gender. (3.0 cr.; prerequisite: 5300; prerequisite: One women's studies course; #; fall, spring, offered periodically) How gender affects verbal communication. Development of analytical skills through readings, exercises, research that raise awareness of the power of language and the influence of gender prescriptions. Comparisons across languages where possible.

COMM 5411. Small Group Communication Research. (3.0 cr.; A-F or Audit; prerequisite: 3411 or #; spring, every year) Survey of small group communication research; theory and practice. Group-decision-making and leadership.

COMM 5421. Quantitative Methods in Communication Research. (3.0 cr.; A-F or Audit; prerequisite: 3401 or #; fall, every year) Social scientific methods used in studying human communication. Optional data processing laboratory for additional credit.

COMM 5431. The Process of Persuasion. (3.0 cr.; prerequisite: 3431; spring, fall, every year) Communication campaigns (e.g., advertising, political) illustrating persuasive processes and theories. Research paper required.

COMM 5441. Communication in Human Organizations. (3.0 cr.; fall, spring, summer, every year) Communication in organizational settings. Organizational structure and dynamics and their effect upon the communication process. Individual projects.

COMM 5451W. Intercultural Communication Processes. (3.0 cr.; fall, offered periodically) Theory and research on cultural differences in values, norms, behaviors, and perceptions that affect communication across cultures internationally and domestically.

COMM 5515W. Introduction to Rhetorical Criticism. (3.0 cr.; prerequisite: 1101; recommended: spring, every year) Analysis of public discourse using various theoretical perspectives.

COMM 5517. History and Criticism of U.S. Public Discourse: 1630-1865. (3.0 cr.; prerequisite: Jr; fall, offered periodically) 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.

COMM 5590. Directed Study. (1.0-3.0 cr. [max 15.0 cr.]; prerequisite: S-N or Audit; fall, spring, summer, every year) Guided individual reading or study. Prerequisite: Nine 3xxx-5xxx Spch cr, instr consent, dept consent, college consent.

COMM 5594. Communication Research Practicum. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; prerequisite: #; fall, spring, summer, every year) Students participate in research group.

COMM 8110. Seminar: Advanced Speech Problems. (3.0 cr. [max 15.0 cr.]; prerequisite: undergraduate degree in spch-comm or equiv; fall, spring, summer, every year) Evaluation of research methods in speech-communication.

COMM 8210. Seminar: Selected Topics in U.S. Electronic Media. (3.0 cr. [max 18.0 cr.]; prerequisite: 5210 or #; offered when feasible; fall, spring, offered periodically) Literature survey; evaluating research on topics; conducting independent research project on a particular topic.

COMM 8211. Critical Communication Studies: History, Theory, Method. (3.0 cr.; fall, spring, summer, every year) Qualitative research methods for studying media institutions, texts, audiences, and contexts.


COMM 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prerequisite: 5402 or #; fall, spring, summer, every year) Evaluate and develop new perspectives for analyzing, diagnosing, and managing interpersonal communication problems.

COMM 8403. Seminar: Emotion and Communication. (3.0 cr.; fall, spring, summer, every year) Major theories of emotion and the role of emotion in communication.

COMM 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prerequisite: Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)


COMM 8452. Seminar: Methods of Intercultural/Diversity Facilitation. (3.0 cr.; prerequisite: 4451 or 5452 recommended; fall, spring, summer, every year) Theories and techniques for managing effective intercultural communication and diversity. Intercultural training.

COMM 8502. Seminar: Communication Theory Construction. (3.0 cr.; prerequisite: 5421 or #; fall, spring, offered periodically) Logic of communication theory development and modification from a social scientific perspective. Types of communication theories.

COMM 8504. Seminar: Rhetorical Criticism. (3.0 cr.; prerequisite: 5615 or #; fall, spring, summer, every year) Rhetorical criticism theories and methods. Rhetoric as applied to literary studies and the growth of hermeneutics as vantage points for reassessing rhetorical methods.

COMM 8611. Seminar: Rhetoric. (3.0 cr. [max 6.0 cr.]; prerequisite: 5611 or #; fall, spring, offered periodically) History/criticism of rhetorical theory. Research in rhetoric.

COMM 8625. Seminar: Communication Ethics. (3.0 cr.; A-F or Audit; prerequisite: Ethics course or #; fall, offered periodically) Independent research on communication ethics in interpersonal, group, organizational, intercultural, and media settings. Theories of ethics and methods of analysis.
Comparative Literature (CL)
College of Liberal Arts

CL 5311. Discourse of the Novel. (3.0 cr.; =CSCL 5311; fall, offered periodically)
Comparative study of the novel (eighteenth century to present): its relation to ordinary language practices, emergent reading publics, technologies of cultural dissemination, problems of subjectivity; its role in articulating international cultural relations.

CL 5555. Introduction to Semiotics. (3.0 cr.; =CSCL 5555, CSDS 5555; spring, offered periodically)
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 5910. Topics in Comparative Literature. (3.0-4.0 cr.; max 32.0 cr.; fall, spring, every year)
Topics specified in Class Schedule.

CL 5992. Directed Reading in Comparative Literature. (1.0-3.0 cr.; max 9.0 cr.; prereq #; fall, spring, every year)
Guided individual reading and study.

CL 8001. Basic Research Seminar in Comparative Literature I. (3.0 cr.; =CSDS 8001; fall, every year)
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. (3.0 cr.; =CSDS 8002; spring, every year)
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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CL 8382. Modernity and Its Others. (4.0 cr.; fall, spring, offered periodically)
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. (1.0 cr.; No Grade Associated; prereq Doctoral student; fall, spring, summer, every year)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr; max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
(FILE C8666)

CL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(FILE C8888)

CL 8920. Advanced Topics in Comparative Literature. (3.0 cr.; max 15.0 cr.; fall, spring, offered periodically)
Practical applications of specific methodologies and theories to a determined area. Topics vary by instructor and semester.

CL 8992. Directed Reading in Comparative Literature. (1.0-4.0 cr.; max 12.0 cr.; prereq #; fall, spring, every year)

CL 8994. Directed Research. (1.0-3.0 cr.; max 6.0 cr.; S-N or Audit; fall, spring, summer, every year)
Supervised research project.

COMM 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
(FILE C8666)

COMM 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(FILE C8777)

COMM 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(FILE C8888)

COMM 8994. Directed Research. (1.0-3.0 cr.; max 6.0 cr.; S-N or Audit; fall, spring, summer, every year)
Supervised research project.

CSDS 5301. Society, Ideology, and the Production of Art. (3.0 cr.; =CSCL 5301; )
Recent critical theories of relation of arts to social/ideological forces. Selected artifacts from Western culture (e.g., Renaissance to 20th century; high, popular, mass culture). Music, visual art, literature.

CSDS 5302. Aesthetics and the Valuation of Art. (3.0 cr.; =CSCL 5302; spring, offered periodically)
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 5555. Introduction to Semiotics. (3.0 cr.; =CSCL 5555, CL 5555; spring, offered periodically)
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 5910. Topics in Comparative Studies in Discourse and Society. (3.0-4.0 cr.; max 32.0 cr.; fall, spring, every year)
Themes in comparative, sociohistorical analysis of discursive practices. Individually or team taught. Topics specified in Class Schedule.

CSDS 5993. Directed Study. (1.0-3.0 cr.; max 9.0 cr.; prereq #; fall, spring, every year)
Guided individual reading and study.

CSDS 8001. Basic Research Seminar: Comparative Studies in Discourse and Society I. (3.0 cr.; =CL 8001; fall, every year)
Key texts, positions, problematics 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. (3.0 cr.; =CL 8002; spring, every year)
Key texts, positions, problematics in field of comparative critical theory. Special attention to historical precursors, influential contemporary debates, disciplinary genealogies.

CSDS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(FILE C8333)
CSDS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CSDS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

CSDS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

CSDS 8901. Pedagogy of Cultural Studies and Comparative Literature. (3.0 cr.; prereq Grad CSDS major; spring, every year) Prepare 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.

CSDS 8902. Methodologies Colloquium. (1.0 cr. [max 2.0 cr.]; S-N only; prereq CSDS grad major or #; fall, spring, every year) Presentations by CL/CSDS faculty. Methods in relation to field as a whole. Library component. Meetings with research librarians.

CSDS 8910. Advanced Topics in Comparative Studies in Discourse and Society. (3.0 cr. [max 24.0 cr.]; fall, spring, every year) 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. (3.0 cr. [max 15.0 cr.]; fall, every year) 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. (1.0-4.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) Directed Study in Comparative Studies in Discourse and Society

CSDS 8994. Directed Research in Comparative Studies in Discourse and Society. (1.0-4.0 cr. ; prereq #; fall, spring, every year) Directed Research in Comparative Studies in Discourse and Society

College of Veterinary Medicine

CMB 5200. Statistical Genetics and Genomics. (4.0 cr.; A-F or Audit; fall, every year) Statistical issues in genomics. 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 5355. Molecular Biotechnology Laboratory for the Novice. (2.0 cr.; S-N only; summer, every year) Five day course. Understanding/applying basic concepts of biotechnology. Lectures, hands-on lab experiments.

CMB 5594. Directed Research in Comparative and Molecular Biosciences. (1.0-4.0 cr. [max 8.0 cr.]; prereq Jr, º; fall, spring, summer, every year) Independent study as determined by instructor. Usual activity includes conducting research in instructor's lab.


CMB 8012. Basic Concepts in Skeletal Biology. (2.0 cr.; A-F only; prereq CMB grad student or #; spring, every year) Cells (osteoblasts, osteoclasts, chordrocytes) that make up skeleton. Transcription/signaling networks regulating cell growth/differentiation. Mechanisms of bone remodeling. Regulation of bone by agents such as hormones.

CMB 8100. Research Rotation in Comparative and Molecular Biosciences. (1.0 cr. [max 2.0 cr.]; S-N only; prereq CMB grad student; fall, spring, every year) Current developments in faculty research. Topics specific to research adviser's area of interest. Eight weeks.

CMB 8134. Ethical Conduct of Animal Research. (3.0 cr.; A-F or Audit; = [CMED 8134, ANSC 8134]; prereq [Grad or professional school] student or #; fall, every year) Ethical considerataions in the 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 proper conduct. Societal impact on scientific investigations utilizing animal subjects.


CMB 8202. Mechanisms of Animal Health and Disease II. (3.0 cr.; A-F only; fall, every year) 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) Disease processes in organ systems. Examples of animal models. Comparative medicine. Clinical relevance of problem/disease. Animal models used to study disease process/problem. Lectures.

CMB 8344. Mechanisms of Hormone Action. (2.0 cr.; prereq CMB grad student or #; fall, every 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.

CMB 8361. Neuro-Immune Interactions. (3.0 cr.; prereq [MICB 5218 or equiv], [NSC 5561 or equiv]; fall, odd years) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) laboratory linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation. Offered fall of even-numbered years.
CMB 8371. Mucosal Immunobiology. (3.0 cr.; A-F or Audit; [OBIOL 8371, MICA 8371]; prereq MICA 8001 or equiv or #;) 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.

CMB 8394. Research in Comparative Biomedical Sciences. (1.0-6.0 cr. [max 18.0 cr.]; prereq Grad CMB major; fall, spring, summer, every year) Directed research determined by student’s interests, in consultation with faculty mentor.

CMB 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CMB 8481. Advanced Neuropharmaceutics. (4.0 cr.; A-F or Audit; [NSC 8481, PHM 8481]; prereq #; fall, every years) 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.

CMB 8550. Comparative and Molecular Biosciences Seminar. (1.0 cr. [max 8.0 cr.]; S-N or Audit; prereq Grad CMB major or #; fall, spring, every year) Student/faculty presentations of their own research or a directed topic.

CMB 8560. Research and Literature Reports. (1.0 cr. [max 8.0 cr.]; S-N or Audit; prereq Grad CMB major or #; fall, spring, every year) Current developments in cellular and molecular mechanisms of animal health and disease.

CMB 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

CMB 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

CMB 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Computer Science (CSCI)
Institute of Technology

CSCI 5103. Operating Systems. (3.0 cr.; prereq 4061 or #; fall, every year) Conceptual foundation of operating system designs and implementations. Relationships between operating system structures and machine architectures. UNIX implementation mechanisms as examples.

CSCI 5105. Introduction to Distributed Systems. (3.0 cr.; prereq [5103 or equiv] or #; spring, offered periodically) Distributed system design and implementation. Distributed communication and synchronization, data replication and consistency, distributed file systems, fault tolerance, and distributed scheduling.

CSCI 5106. Programming Languages. (3.0 cr.; prereq 4011 or #; fall, every year) 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.

CSCI 5115. User Interface Design, Implementation and Evaluation. (3.0 cr.; prereq 4041 or #; fall, every year) 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.

CSCI 5117. Developing the Interactive Web. (3.0 cr.; prereq 4131 or 5131 or #; upper div or grad in CSci recommended; spring, odd years) 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.

CSCI 5125. Collaborative and Social Computing. (3.0 cr.; prereq 5115 or #; spring, odd years) Introduction to computer-supported cooperative work, social computing. Technology, research methods, theory, case studies of group computing systems. Readings, hands-on experience.

CSCI 5143. Real-Time and Embedded Systems. (3.0 cr.; A-F or Audit; [prereq 4061 or #]; experience with C language; spring, offered periodically) 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.

CSCI 5161. Introduction to Compilers. (3.0 cr.; prereq [2021, 5106] or #; spring, every year) 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.

CSCI 5204. Advanced Computer Architecture. (3.0 cr.; #; EE 5364; prereq 4203 or EE 4363; fall, every year) Instruction set architecture, processor microarchitecture, memory, I/O systems. Interactions between computer software and hardware. Methodologies of computer design.

CSCI 5211. Data Communications and Computer Networks. (3.0 cr.; #; [CSCI 4211]; prereq [4061 or #], basic knowledge of [computer architecture, operating systems, probability]; grad student; fall, every year) Concepts, principles, protocols, and applications of computer networks. Layered network architectures, data link protocols, local area networks, network layer/routering 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.

CSCI 5221. Foundations of Advanced Networking. (3.0 cr.; prereq 4211 or 5211 or equiv; intro course in computer networks recommended; spring, odd years) Design principles, protocol mechanisms. Network algorithms, implementation techniques. Advanced network architectures, state-of-art/emerging networking technologies/applications, network modeling, Simulation, experiments.

CSCI 5231. Wireless and Sensor Networks. (3.0 cr.; prereq 4211 or 5211 or #; spring, even years) Enabling technologies, including hardware, embedded operating systems, programming environment, communication, networking, and middleware services. Hands-on experience in programming tiny communication devices.

CSCI 5271. Introduction to Computer Security. (3.0 cr.; prereq 4061 or equiv or #; fall, every year) Concepts of computer, network, and information security. Risk analysis, authentication, access control, security evaluation, audit trails, cryptography, network/database/application security, viruses, firewalls.

CSCI 5302. Analysis of Numerical Algorithms. (3.0 cr.; prereq 2031 or 2033 or #; spring, every year) Additional topics in numerical analysis. Interpolation, approximation, extrapolation, numerical integration/differentiation, numerical
solutions of ordinary differential equations. Introduction to optimization techniques.

CSCI 5304. Computational Aspects of Matrix Theory. (3.0 cr.; prereq 2031 or 2033 or #; fall, every year)


CSCI 5421. Advanced Algorithms and Data Structures. (3.0 cr.; prereq 4041 or #; fall, spring, every year)


CSCI 5451. Introduction to Parallel Computing: Architectures, Algorithms, and Programming. (3.0 cr.; prereq 4041 or #; spring, every year)

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.

CSCI 5461. Functional Genomics, Systems Biology, and Bioinformatics. (3.0 cr.; prereq 3003 or 4041 or #; spring, every year)


CSCI 5471. Modern Cryptography. (3.0 cr.; prereq [2011, 4041, [familiarity with number theory or finite fields] or #; fall, spring, offered periodically)

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.

CSCI 5481. Computational Techniques for Genomics. (3.0 cr.; prereq 4041 or #; fall, every year)


CSCI 5511. Artificial Intelligence I. (3.0 cr.; =CSCI 4511W; prereq [2011 or #]; grad student; fall, every year)


CSCI 5512. Artificial Intelligence II. (3.0 cr.; =CSCI 5512W; prereq [STAT 3021, 4041] or #; spring, every year)


CSCI 5521. Introduction to Machine Learning. (3.0 cr.; prereq [(2031 or 2033), STAT 3021] or #; fall, offered periodically)


CSCI 5523. Introduction to Data Mining. (3.0 cr.; prereq 4041 or equiv or #; fall, spring, offered periodically)

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.

CSCI 5525. Machine Learning. (3.0 cr.; prereq Grad student or #; fall, even years)

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. Advanced topics in image synthesis, modeling, rendering. Image processing, image warping, global illumination, non-photorealistic rendering, texture synthesis. Parametric cubic surfaces, subdivision surfaces, acceleration techniques, advanced texture mapping. Programming in C/C++.

CSCI 5569. Visualization. (3.0 cr.; prereq [1913, 4041] or equiv or #; fall, even years)


CSCI 5611. Animation & Planning in Games. (3.0 cr.; prereq 4041 or 4611 or #; fall, odd years)

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.

CSCI 5619. Virtual Reality and 3D Interaction. (3.0 cr.; prereq 4611 or 5607 or 5115 or equiv or #; spring, even years)

Introduction to software, technology/ applications in virtual/augmented reality, 3D user interaction. Overview of current research. Hands-on projects.

CSCI 5707. Principles of Database Systems. (3.0 cr.; =INET 4707, CSCI 4707; prereq 4041 or #; grad student; fall, every year)

Concepts, database architecture, alternative conceptual data models, foundations of data manipulation/analysis, logical data models, database designs, models of database security/integrity, current trends.

CSCI 5708. Architecture and Implementation of Database Management Systems. (3.0 cr.; prereq 4707 or 5707 or #; spring, every year)

CSCI 5715. From GPS and Virtual Globes to Spatial Computing. (3.0 cr.; prereq Familiarity with Java, C++, or Python; spring, odd years) Mathematical concepts, geo-information, representations, algorithms, data-structures/ access methods, analysis, architectures, interfaces, reasoning, time.

CSCI 5801. Software Engineering I. (3.0 cr.; prereq [1902, 2011] or #; fall, every year) Advanced introduction to software engineering. Software life cycle, development models, software requirements analysis, software design, coding, maintenance.

CSCI 5802. Software Engineering II. (3.0 cr.; prereq 5801 or #; spring, offered periodically) 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.

CSCI 5980. Special Topics in Computer Science. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, offered periodically) Lectures and informal discussions on current topics in computer science.

CSCI 5991. Independent Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, summer, every year) Independent study arranged with CS faculty member.

CSCI 5994. Directed Research. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; may be repeated for cr; fall, spring, summer, every year) Directed research arranged with faculty member.

CSCI 5996. Curricular Practical Training. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq [CSCI or CompE] major, #; fall, spring, summer, every year) Industrial work assignment involving advanced computer technology. Reviewed by faculty member. Grade based on final report covering work assignment.

CSCI 8001. Introduction to Research in Computer Science I. (1.0 cr.; A-F only; prereq 1st yr CS PhD student; fall, every year) 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.

CSCI 8002. Introduction to Research in Computer Science, II. (2.0 cr.; A-F only; prereq 8001, 1st yr CS PhD student; spring, every year) 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.

CSCI 8101. Advanced Operating Systems. (3.0 cr.; prereq 5103 or #; fall, offered periodically) 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.

CSCI 8102. Foundations of Distributed Computing. (3.0 cr.; prereq 8101 or #; spring, offered periodically) Fundamental principles underlying design of distributed and multiprocessor operating systems. Foundations of distributed computing systems; shared multiprocessor systems.

CSCI 8115. Human-Computer Interaction and User Interface Technology. (3.0 cr.; prereq 5115 or #; fall, spring, offered periodically) 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.

CSCI 8117. Understanding the Social Web. (3.0 cr.; prereq CS grad or #; fall, spring, offered periodically) 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.

CSCI 8161. Advanced Compiler Techniques. (3.0 cr.; prereq 4061 or #; fall, spring, offered periodically) Techniques for uniprocessors and parallel computers. Fundamental program analysis instruments such as data flow analysis and data dependence analysis. Variety of code generation and transformation techniques.


CSCI 8211. Advanced Computer Networks and Their Applications. (3.0 cr.; prereq 5211 or #; fall, spring, offered periodically) 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.
CSCI 8866. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

CSCI 8701. Overview of Database Research. (3.0 cr.; prereq 5708 or #; fall, spring, offered periodically) 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.

CSCI 8715. Spatial Databases and Applications. (3.0 cr.; prereq 4707 or 5707 or GIS 5571 or GIS 5573; fall, spring, offered periodically) 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).

CSCI 8725. Databases for Bioinformatics. (3.0 cr.; prereq 4707 or 5707 or #; spring, offered periodically) DBMS support for biological databases, data models. Searching integrated public domain databases. Queries/analyses, DBMS extensions, emerging applications.

CSCI 8735. Advanced Database Systems. (3.0 cr.; A-F or Audit; prereq 4707 or 5707 or 5708; fall, offered periodically) Database systems for emerging applications, nontraditional query processors, multi-dimensional data indexing. Current research trends.

CSCI 8760. Plan B Project. (3.0 cr.; S-N or Audit; prereq CSCI MS student, #; fall, spring, every year) Project arranged between student and faculty.

CSCI 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

CSCI 8801. Advanced Software Engineering. (3.0 cr.; prereq 5601 or #; fall, spring, offered periodically) Software reusability, internet/intranet programming, software reengineering, and software safety.

CSCI 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

CSCI 8970. Computer Science Colloquium. (1.0 cr.; S-N or Audit; fall, spring, every year) Recent developments in computer science and related disciplines. Students must attend 13 of the 15 lectures.

CSCI 8980. Special Advanced Topics in Computer Science. (3.0 cr. [max 27.0 cr.]; prereq #; fall, spring, every year) Lectures and informal discussions.

CSCI 8991. Independent Study. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; fall, spring, every year) Independent study with professor.

CSCI 8994. Directed Research in Computer Science. (1.0-3.0 cr. [max 9.0 cr.]; prereq #; fall, spring, every year) Directed research with professor.

Conservation Biology (CBIO) College of Food, Agricultural and Natural Resource Sciences

CBIO 8001. Conservation Biology Seminar. (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Topics vary.


CBIO 8093. Directed Study Experience. (1.0-5.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #) Directed Study Experience

CBIO 8095. Contemporary Problems in Conservation Biology. (1.0 cr.; S-N or Audit; prereq 8004, FW 8452, #; fall, spring, every year) Comprehensive review of conservation biology issue. Written exam.

CBIO 8103. Research in Support of Resource Management: a Dialog With Land Managers. (2.0 cr.; S-N only; fall, odd years) 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.

CBIO 8201. How to Excel in Graduate School. (2.0 cr. [max 8.0 cr.]; S-N only; fall, every year) Overview of history/philosophy of science as framework for writing thesis or dissertation. How to conduct research, Time management.

CBIO 8333A. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CBIO 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year) (No description)

CBIO 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

CBIO 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; 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; fall, spring, summer, every year) Doctoral thesis credit.

Control Sciences and Dynamical Systems (CSDY) College of Science and Engineering

CSDY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

CSDY 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) Doctoral Pre-Thesis Credits

CSDY 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

CSDY 8899. Seminar in Control Science and Dynamical Systems. (1.0-3.0 cr. [max 9.0 cr.]; S-N or Audit; prereq CSDy or IT grad; fall, spring, every year) Current research and advanced topics.

Coptic (COPT) College of Liberal Arts

COPT 5001. Elementary Coptic. (3.0 cr.; ) Introduction to Coptic grammar and vocabulary, chiefly in the Sahidic dialect.

COPT 5002. Elementary Coptic. (3.0 cr.; prereq 5001 or equiv; ) Reading a variety of Coptic literature, such as Gnostic, martyrological, or monastic texts.
Cultural Studies and Comparative Literature (CSCL)

College of Liberal Arts

CSCL 5147. Teaching as Dialogue. (3.0 cr.; fall, offered periodically)
Teaching and the teacher are the subject. Entering into dialogue is the method. Issues with the politics of teaching, the means of entering into dialogue, questions of judgment, and the idea of self-teaching as the goal of teaching.

CSCL 5154W. Theoretical Constructions of Space. (3.0 cr.; spring, odd years)
Inquiry into theories of space drawn from various disciplines including anthropology, architecture, geography, history, landscape design, philosophy, planning, and sociology. Focus on sociopolitical interests that are served and sustained; emphasis on opportunities and implications for personal identity.

CSCL 5256W. Suburbia. (3.0 cr.; fall, offered periodically)
Suburbia from origins in 18th-century England to the present. Historical changes and present challenges, especially in America. Ideology, mythology, planning, development, geography, transportation, the family. Specific sites and designs; representations in film, television, popular literature, and music.

CSCL 5301. Society, Ideology, and the Production of Art. (3.0 cr.; [CSDS 5301]; spring, offered periodically)
Recent critical theories on the relation of the arts to social and ideological forces; selected artifacts from Western culture (Renaissance to 20th century; high, popular, and mass culture). Music, visual art, literature.

CSCL 5302. Aesthetics and the Valuation of Art. (3.0 cr.; [CSDS 5302]; fall, spring, offered periodically)
Society, ideology, and aesthetic value considered in light of recent critical theories of visual art, music, and literature. Meditations of place, social class, gender and ideology on aesthetic judgment in post-Renaissance Western culture.

CSCL 5305. Vision and Visuality: An Intellectual History. (3.0 cr.; A-F only; fall, spring, offered periodically)
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.

CSCL 5331. Discourse of the Novel. (3.0 cr.; [CL 5331]; fall, offered periodically)
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 5411. Avant-Garde Cinema. (4.0 cr.; A-F or Audit; prereq 1921 or ARTH 1921W or equiv; fall, every year)
History/theory of avant-garde cinema, from classical period (1920s) to post-WWII.

CSCL 5501. Origins of Cultural Studies. (3.0 cr.; fall, spring, offered periodically)
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 5555. Introduction to Semiotics. (3.0 cr.; [CL 5555, CSDS 5555]; spring, offered periodically)
Problems of the nature of the sign; sign function; sign production; signifying systems as articulated in philosophy, linguistics, anthropology, psychoanalysis, and art theory. Application of semiotics to various signifying practices (literature, cinema, daily life).

CSCL 5666. Film Music: Theory, History, Practice. (4.0 cr.; A-F only; fall, spring, offered periodically)
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 5711. Sociocriticism. (3.0 cr.; fall, offered periodically)
Sustained consideration of the modern tradition of sociological reflection on literature. Early and late Birmingham School, Frankfurt School, Bakhtin circle, and the various French initiatives associated with both Les Temps Modernes and Tel Quel.

CSCL 5800. Translation Studies. (1.0 cr.; S-N only; prereq CSCL grad student; fall, spring, offered periodically)
Techniques of reading/translating prose texts in fields of cultural studies/comparative literature. Attention to grammar, syntax, lexicon.

CSCL 5810H. Topics in Cultural Studies. (2.0-4.0 cr.; [max 8.0 cr.]; A-F only; prereq Honor student; fall, spring, every year)
Topics on special subjects.

CSCL 5833. Marx, Freud, Nietzsche: Intellectual Foundations. (3.0 cr.; fall, spring, offered periodically)
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. (3.0-4.0 cr. [max 32.0 cr.]; fall, spring, summer, every year)
Topics specified in Class Schedule.

CSCL 5910H. Topics in Cultural Studies. (2.0-4.0 cr.; [max 8.0 cr.]; A-F only; fall, spring, every year)
Topics on special subjects.

CSCL 5993. Directed Study. (1.0-3.0 cr. [max 9.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

Curriculum and Instruction (CI)

CI 5008. Theory and Practice of Teaching Art in Elementary Schools. (1.0-2.0 cr.; A-F only; fall, spring, offered periodically)
Art concepts, skills, processes appropriate for elementary school. Methods of art instruction. Children’s production of responses to art.

CI 5045. Advanced Contemporary Crafts. (2.0 cr.; A-F or Audit; fall, spring, summer, offered periodically)
In-depth experiences in craft techniques, including ceramics, fibers, jewelry, and metal design, with emphasis on design analysis, understanding of materials, and mastery of processes.

CI 5049. Art Media Techniques. (1.0-4.0 cr.; A-F or Audit; summer, every year)
Lectures, demonstrations, studio labs and critique session on creative processes; handling specific media. Topic varies.

CI 5050. Issues in Art Education. (1.0-4.0 cr.; [max 12.0 cr.]; fall, summer, every year)
Issues/trends, current practices, recent research.

CI 5065. Improving Art Programs in the Schools. (3.0 cr.; A-F or Audit; prereq Initial lic students majoring in art ed; fall, every year)
Issues of art instruction, including teaching methods and evaluation, philosophical frameworks of pedagogy, and institutional issues concerning art programs in primary and secondary schools; social and cultural structures of schooling, practical issues of teaching art.

CI 5069. Curriculum Innovations in Art Education. (3.0 cr.; A-F or Audit; fall, every year)
Study and analysis of innovations; evaluation of materials for teaching units and projects.

CI 5075. The Social and Historical Foundations of Art Education. (1.0-3.0 cr.; A-F or Audit; prereq Grad student; fall, offered periodically)
Issues of culture in education; examination of various forms of art as representations of knowledge, belief, and cultural capital. Epistemology, the meaning of function, and the conceptual location of visual culture in education and general culture. Seminar discussions include problems of cross-cultural and multicultural art education.

CI 5078. Application of Aesthetic Theory in Education. (2.0 cr.; A-F or Audit; spring, summer, every year)
Contemporary theories of art; psychological and philosophical foundations. Open to teachers, supervisors, and administrators concerned with art in general education at all levels.

CI 5096. Art Education: Practicum. (1.0-6.0 cr.; A-F or Audit; fall, every year)
Issues of art instruction, including teaching methods and evaluation, philosophical frameworks of pedagogy, and institutional issues concerning art programs in primary and secondary schools. Practicum requiring students to work in a public school setting.
CI 5097. Student Teaching in Art Education. (8.0 cr.; S-N or Audit; prereq Licensure student in art ed; spring, summer, every year) Observation of, participation in, and supervisory experiences with various types and levels of art classes.

CI 5111. Introduction to Elementary School Teaching. (3.0 cr.; A-F or Audit; prereq Foundations of ed major or elem ed initial lic; fall, spring, summer, every year) Curriculum organization, instruction, management, assessment, professional decision making.

CI 5113. Classroom Management in the Elementary School. (3.0 cr.; summer, every year) For teachers, administrators, and support staff working in elementary school programs. Focus on management of student behavior, instruction as it relates to student behavior, and teacher organizational tasks in the classroom.


CI 5137. Multicultural Gender-Fair Curriculum. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Critical examination of diversity/culture in K-12 contexts. Rationale for multicultural/gender-fair curriculum. Impact of curricular change/ conflicts between culture/curriculum, Gender/ expression, sexual identities, social class, language, race, ethnicity.

CI 5138. Multicultural and Moral Perspectives on Classroom Instruction. (3.0 cr.; prereq MEd or PhD student; ) Factors leading to effective communication in ethnically diverse classroom, preschool to adult. Communication techniques and classroom structures that have cultural and moral implications.

CI 5141. Reflective Teaching and Professional Ethics. (3.0-4.0 cr.; prereq Teaching license and one yr teaching exp; ) Students develop their professional identities as educators by considering their world views and values in relation to their professional role and responsibilities in the context of a diverse society. Encourages reflective practice and critical review of research.

CI 5145. Critical Pedagogy. (3.0 cr.; A-F or Audit; spring, every year) 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. (1.0-6.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Special topics, current trends in curriculum. Subject integration, curriculum contexts, development, implementation, evaluation.

CI 5155. Contemporary Approaches to Curriculum: Instruction and Assessment. (3.0 cr.; A-F or Audit; prereq Grad students only; fall, spring, summer, every year) 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.

CI 5156. Popular Culture, Teaching, and Learning. (3.0 cr.; A-F only; prereq Grad student or sr in a program that values teaching as a component of the discipline; fall, every year) 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.

CI 5162. Peer Coaching for Teachers. (1.0-2.0 cr.; A-F or Audit; prereq Teaching experience or #; ) Teachers coaching teachers; acquiring concepts, skills, and dispositions necessary for observing classroom instruction and providing constructive feedback.

CI 5177. Practical Research. (3.0 cr.; A-F or Audit; prereq CI MEd student, or Ci or EdPA Teacher Leadership MEd student; fall, spring, summer, every year) 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.

CI 5178. Project in Teacher Leadership. (3.0-6.0 cr. [max 3.0 cr.]; =[OLPD 5361]; prereq CI or EdPA teacher leadership MEd student; fall, spring, summer, every year) Create, implement, evaluate, and present a leadership project designed to initiate positive change in educational environments. Review related literature, proposal development, project development, implementation/ evaluation, critical reflection. Share learning outcomes.

CI 5181. Clinical Experience in Elementary School Teaching. (2.0-10.0 cr. [max 30.0 cr.]; S-N or Audit; prereq Foundations of education and elem ed initial licensure only; fall, spring, summer, every year) Students spend full days in the elementary classroom, gradually assuming responsibility for teaching, and prepare portfolio based on criteria given. One seminar per week.

CI 5286. Student Teaching Seminar: Elementary Education. (3.0 cr. [max 6.0 cr.]; A-F only; prereq M.Ed./Elementary education initial licensure student; fall, spring, every year) Field-based practicum in elementary school setting. In-class discussions about application of classroom learning to school setting.

CI 5287. Case Studies in Elementary Education. (3.0 cr.; max 6.0 cr.; ) 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.

CI 5300. Teaching Introductory Computer Concepts and Skills. (1.0-3.0 cr.; A-F or Audit; spring, every year) Pedagogical strategies for teaching keyboarding and word processing.

CI 5301. Foundations of Computer Applications for Business and Education. (3.0 cr.; A-F only; fall, spring, summer, every year) 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. (3.0 cr.; spring, every year) Using database software to organize, manage, and display online data, to create content management systems, and to integrate into existing Web sites.

CI 5305. Integrated Computer Applications in Business and Marketing Education. (3.0 cr.; fall, spring, every year) Case-based authentic business computing problems requiring integration of two or more application packages. Pedagogical issues of learning/teaching advanced computer applications.

CI 5321. Foundations of Distance Education. (3.0 cr.; A-F or Audit; summer, every year) History, philosophies, technologies, and best practices related to distance learning environments. Distance education theories. Issues in distance education.

CI 5323. Online Learning Communities. (3.0 cr.; A-F or Audit; spring, every year) 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. (3.0 cr.; A-F or Audit; prereq 5351 or 5362 recommended; fall, every year) Students research, use, and evaluate technologies for distance learning and design their own learning environments.

CI 5327. Designing Online Adventure Learning. (3.0 cr.; A-F or Audit; spring, every year) Designing, developing, and integrating adventure learning environments in K-16. Examples of effective adventure learning environments.

CI 5330. Special Topics in Learning Technologies. (1.0-3.0 cr. [max 12.0 cr.]; fall, summer, every year) Topics related to needs of in-service teachers. Topics, location, credits. Duration flexible.

CI 5331. Introduction to Learning Technologies. (3.0 cr.; fall, every year) Orientation to examination of various issues affecting use of technology. Students identify research topics for investigation in future courses and identify key literature in preparation for masters/doctoral examinations.


CI 5337. Planning for K-12 Technology Design and Integration. (3.0 cr.; A-F or Audit; spring, every year) Developing technology-enhanced learning (TEL) lessons/units for K-12 instructional contexts (e.g., content areas across PK-12 grades). Contemporary perspectives on instruction/learning, TEL lesson categorization techniques.

CI 5344. Facilitating Technology Integration in Classrooms I. (1.0 cr.; A-F or Audit; fall, odd years) Intersection of student learning theories and research base on effective technology practices. Video cases of technology-supported teaching, peer teaching exercise.


CI 5351. Technology Tools for Educators. (3.0 cr.; A-F or Audit; fall, every year) Develops 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. (3.0 cr.; spring, every year) Implications/challenges in using Internet-based technologies in classroom. Pedagogical models.

CI 5362. Foundations of Interactive Design for Web-based Learning. (3.0 cr.; fall, every year) Processes of designing/developing interactive learning media and online applications from ground up. Focuses on usability/aesthetics in online learning.


CI 5364. Computer-Based Instruction: Games and Simulation. (3.0 cr.; A-F or Audit; prereq 5363;) Principles and procedures of computer simulation and game design. Types of computer simulation, the components common to simulation design, and the theory underlying educational simulation design.

CI 5365. Contemporary Software Development Issues and Tools. (3.0 cr.; prereq Familiar with standard computer/Internet operations; summer, every year) Software used in multimedia design/development. Uses of the software, intricacies of interface, relevant programming principles.

Introduction to developing multimedia applications.

CI 5367. Interactive Multimedia Instruction. (3.0 cr.; A-F or Audit; prereq Knowledge of principles and procedures of CBI design and one multimedia authoring system; spring, every year) 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.

CI 5390. Learning Technologies Field Experiences. (2.0 cr.; S-N only; prereq Students in teachers of computers/keyboarding/related technology applications additional licensure program; fall, spring, every year) 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.


CI 5402. Introduction to Special Collections. (3.0 cr.; A-F or Audit; prereq Children's lit course or #; fall, offered periodically) Uses Children’s Literature Research Collection as research material. Study of manuscripts, original art, and letters.

CI 5403. Writing For and By Children . (3.0 cr.; A-F only; prereq Children’s lit course or #; fall, every year) Aspects of writing/illustrating children’s literature or children's own writing. May feature authors/illustrators of children's books.

CI 5404. Culturally Diverse Books for Children and Adolescents. (3.0 cr.; A-F or Audit; prereq MEd, MA, PhD student; fall, odd years) Reading of literature for children/adolescents about diverse cultures. Critique of literary quality and cultural depiction. Development of ways to use culturally diverse literature.

CI 5405. Middle School Language Arts Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, odd years) 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.

CI 5410. Special Topics in the Teaching of Literacy. (1.0-3.0 cr. [max 12.0 cr.]; fall, summer, every year)
Topics related specifically to the needs of inservice teachers. Topics, location, credits, and duration will be highly flexible.

CI 5411. Teaching Reading in the Elementary School. (3.0 cr.; A-F or Audit; fall, offered periodically) Aids the inservice elementary classroom teacher in the development of knowledge of theory and practice in the teaching of reading.

CI 5412. Reading Difficulties: Instruction and Assessment. (3.0 cr.; A-F or Audit; prereq 5411 or 5451; spring, offered periodically) Causes, diagnosis and assessment, prevention and correction; intervention practices useful to the classroom teacher and special teacher of reading.

CI 5413. Foundations of Reading. (3.0 cr.; A-F or Audit; spring, offered periodically) Reading processes, development of readers. Assessment/tutoring of individual children in reading and other literacy practices.

CI 5415. Literacy Development in the Primary Grades. (3.0 cr.; A-F or Audit; prereq Elem teaching exper or #; fall, every year) Theory/practice of integrated teaching of reading, literature, writing, and language in primary classroom settings. Uses national/state language arts standards and assessment protocols to examine primary literacy curricula.

CI 5417. Elementary literacy Instruction for ESL Students. (3.0 cr.; A-F or Audit; prereq Bachelor's degree completed; fall, odd years) 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.

CI 5418. Whole Language Teaching and Learning in the Elementary School. (3.0 cr.; A-F or Audit; prereq MEd or grad student, minimum one yr of teaching exper; ) Theory, research, and politics of whole language teaching. Applications for developing an elementary school whole language curriculum.

CI 5422. Teaching Writing in Schools. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Theory/practice of teaching writing in schools. How race, gender, and social class impact teaching/learning.

CI 5424. Reading, Language Arts, and Literature: Primary. (3.0 cr.; A-F or Audit; prereq Elem ed init lic; fall, spring, every year) Curricular/methodological issues of reading, language arts, and children’s literature. Evaluating children’s literature, emergent literacy, response to literature, reading/writing processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, teaching diverse students.

CI 5425. Reading Instruction in the Elementary Grades. (3.0 cr.; A-F only; prereq [Elementary or early childhood] licensure student; fall, spring, every year) Curricular/methodological issues in teaching of reading. Reading/orthographic processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, and teaching diverse students.


CI 5431. Introduction to Instructional Leadership in K-12 Reading. (3.0 cr.; A-F or Audit; 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]; summer, every year) K-12 curriculum in reading, major theories/research that motivate curriculum. Major instructional principles, alignments needed, resources available.

CI 5432. Instructional Leadership in Reading in Kindergarten and the Elementary Grades. (3.0 cr.; A-F or Audit; prereq 5431; fall, every year) 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.

CI 5433. Instructional Leadership in Reading for the Middle and Secondary Grades. (3.0 cr.; A-F or Audit; prereq 5432; spring, every year) Curriculum/instruction for middle/secondary school students.

CI 5434. Professional Development and Evolving Practice in K-12 Reading. (3.0 cr.; A-F or Audit; prereq 5433; summer, every year) Developing e-portfolio to assess competence in standards for teaching K-12 reading. Evolving teaching practices. Applications of current technologies.

CI 5435. Instructional Leadership in Preventing Reading Difficulties. (3.0 cr.; A-F or Audit; prereq 5434; fall, every year) Research-based reading interventions for struggling readers. How to help other teachers improve their practice. Theory/research behind preventing reading difficulties. Principles/techniques for assessing reading difficulties and students' progress.


CI 5442. Literature for Adolescents. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; fall, every year) Methods of accommodating to students' abilities and facilitating reading in regular content classes.


CI 5463. Minnesota Writing Project Annual Invitational Summer Institute. (3.0 cr.; A-F only; prereq Licensed teacher or administrator or [space available, faculty letter of recommendation]; summer, every year) Workshop. Participants reflect on their own literacy processes, participate in a writing group, discuss current reading texts, and demonstrate best practices in classroom.

CI 5469. Minnesota Writing Project Directed Studies. (1.0-3.0 cr.; A-F only; prereq Teaching license, [CI 5463 or enrolled in the Certificate for Teaching Writing and Critical Literacy]; summer, every year) 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.

CI 5472. Teaching Film, Television, and Media Studies. (3.0 cr.; A-F or Audit; fall, spring, every year) Methods of teaching film, video, and media studies at the secondary and college level; methods for eliciting critical responses; analysis of film/video techniques; analysis of cultural representations and genre characteristics; connecting and comparing film/video and literature; studying documentary and television news; developing media studies units.
CI 5474. New Literacies Frameworks and Instruction: Digital Texts and Digital Reading. (3.0 cr.; A-F only; fall, every year) 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 5482. Reading, Language Arts, and Literature: Intermediate. (3.0 cr.; A-F or Audit; prereq Elem ed initial licensure only; fall, spring, every year) Curricular and methodological issues of reading, language arts, and children’s literature. Evaluating children’s literature, response to literature, reading/writing processes, strategy instruction for word recognition/comprehension, authentic assessment strategies, teaching diverse students in upper elementary grades.

CI 5496. Directed Experiences in Teaching English. (1.0 cr.; S-N or Audit; spring, every year) Current developments in teaching English; students are assigned a practice classroom. Focus on teaching strategies and classroom management.

CI 5502. Science Instruction in the Elementary Grades. (3.0 cr.; A-F or Audit; prereq Early Childhood or Elementary Education ILP; fall, spring, every year) Methods/materials for teaching science/hands-on experience for elementary level.

CI 5504. Elementary School Science: Materials and Resources. (3.0 cr.; prereq Elem tchg exper or #; fall, every year) Examination of the teacher’s role in inquiry teaching; the current science curriculum; and resources for teaching science in the elementary school.

CI 5505. Middle School Science Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, every year) Methods of planning/teaching inquiry-based science. Students observe, analyze, and teach inquiry-based lessons.

CI 5530. Secondary Science Teaching: Laboratory-based Instruction. (3.0 cr.; A-F only; prereq Science ed MEd ILP student; summer, every year) 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. Teaching Middle School Science. (3.0 cr.; A-F or Audit; prereq Initial licensure student in science ed; fall, every year) Methods of planning/teaching science to middle school students.

CI 5532. Teaching Secondary School Science. (3.0 cr.; A-F or Audit; prereq Admission to initial licensure program in science; spring, every year) Methods of planning/teaching science for secondary school students.

CI 5533. Current Developments in Science Teaching. (3.0 cr.; A-F or Audit; prereq [MEd, initial licensure, grad student] or #; fall, every year) Using curriculum standards to design science courses.

CI 5534. Studies in Science Education. (3.0 cr.; A-F or Audit; prereq M.Ed., init lic, or #; fall, every year) Improvement of science teaching through the application of research findings.

CI 5535. Foundations of Science Education. (3.0 cr.; A-F or Audit; prereq M.Ed., grad student, or #; spring, every year) Analysis of present science teaching practices in light of historical and philosophical foundations of science education.

CI 5536. Equity, Policy, and Assessment in Science Education. (3.0 cr.; A-F only; prereq MEd or grad student or #; fall, every year) 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.

CI 5537. Principles of Environmental Education. (3.0 cr.; A-F or Audit; prereq Undergrad in NRES or M.Ed. or grad student in education or #; fall, every year) Critical review of Environmental Education, its history, theories, curricula, teaching methods, and assessment practices. Development of an exemplary unit plan for teaching environmental studies.

CI 5538. Research-based Decision-making in Science Education. (3.0 cr.; A-F only; prereq MEd or grad student or #; spring, every year) Nature of research and data-driven decision-making in science education. Focuses on analysis, interpretation, and impact of research on science education. Developing/conducting research. Students discuss, analyze, and present research.

CI 5539. Improving Secondary Science Instruction: Surviving the First Two Years. (3.0 cr.; A-F only; prereq MEd science education student, in first three years of teaching; fall, every year) 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 5540. Special Topics: Science Education. (1.0-8.0 cr.; max 12.0 cr.; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq MEd ILP or professional studies student in science education or #; fall, every year) Understanding nature of science (NOS). Integrate/reflect on NOS in secondary science classroom. Historical cases/integrating NOS with science content/scientific inquiry.

CI 5596. Clinical Experience in Middle School Science. (4.0 cr.; A-F or Audit; prereq Initial licensure in science ed; fall, every year) Supervised clinical experience in middle school science teaching.

CI 5597. Clinical Experience in Secondary School Science Teaching. (4.0-5.0 cr.; S-N or Audit; prereq Initial licensure or #; spring, every year) Supervised clinical experience in secondary school science teaching.

CI 5619. Teaching World Languages and Cultures in Elementary Settings. (3.0 cr.; summer, every year) 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. (3.0 cr.; max 6.0 cr.; summer, every year) 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. (2.0 cr.; Student Option No Audit; summer, every year) 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. Second Language Acquisition Basics for Teachers. (2.0 cr.; Student Option No Audit; summer, every year)
Participants expand their repertoire of tasks/activities, gather samples of learner language, and practice analyzing those samples to identify language features that learners do/does not know.

CI 5623. Improving Language Learning: A Practical Course in Styles- and Strategies-based Instruction. (2.0 cr.; Student Option No Audit; summer, every year)
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. (2.0 cr.; Student Option No Audit; summer, every year)
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. (2.0 cr.; Student Option No Audit; summer, every year)
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. (2.0 cr.; Student Option No Audit; summer, every year)
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 5628. Analyzing Learner Language in Second Language Acquisition. (3.0 cr.; Student Option No Audit; prereq SLC initial licensure only; fall, every year)
Review broad findings in second language acquisition (SLA) research. Cognitive/social process of becoming multilingual. How to carry out classroom-based research projects focused on learner language development.

CI 5631. Second Language Curriculum Development and Assessment. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; fall, every year)
Instruction/assessment of ESL and World Languages in the modalities of speaking, listening, reading, and writing. Backwards design, proficiency-oriented approach, use of content-based instruction. Planning for the integration of instruction and assessment.

CI 5632. Literacy and Language Development in Second Language Classrooms. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; fall, every year)
Processes/instructional approaches in developing second language proficiency in the modalities of reading, writing, speaking, and listening and communicative modes (interpretive, presentational, interpersonal); development of literacy in a second language; planning L2 literacy instruction based on research on L1 and L2 literacy development; integration of instruction/assessment in language teaching.

CI 5634. Content-Based Instruction in Second Language Settings. (3.0 cr.; A-F or Audit; prereq SLC initial licensure only; spring, every year)
Building on foundation from other courses in the sequence. Instruction/assessment of ESL and World Languages at the secondary level. Prepares students to connect language teaching with other content areas, analyze/address the academic language needs of English learners, and advocate for second language programs and students.

CI 5635. Culture and Diversity in Second Language Classrooms. (3.0 cr.; prereq Initial licensure program only; spring, every year)
Teaching culture as content and including students’ home cultures in the curriculum and diverse student needs. Needs of students of various educational, social, and cultural backgrounds/ways to develop academic success through instruction in learning strategies and other approaches to differentiation.

CI 5641. Language, Culture, and Education. (3.0 cr.; A-F or Audit; prereq MED or grad student; spring, summer, offered periodically)
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. (3.0 cr.; A-F or Audit; prereq MED or grad student; spring, summer, offered periodically)
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 5645. Teaching English Learners in the Elementary Classroom. (3.0 cr.; A-F only; prereq Early Childhood or Elementary Education ILP; fall, spring, summer, every year)

CI 5646. English Grammar for ESL Teachers. (3.0 cr.; prereq LING 5001 or #; fall, every year)
English syntax from pedagogical perspective. Grammatical structures that challenge ESL learners. Analyzing learner errors. Issues/activities related to teaching grammar in ESL contexts.

CI 5647. Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling. (3.0 cr.; fall offered periodically)
Academic/social/political factors that affect students’ success in school. Strategies for teaching. Programmatic choices.

CI 5648. Advanced Practices in Teaching Academic Language. (3.0 cr.; A-F only; prereq 5642; spring, every year)
Prepares K-12 teachers for student development of academic language proficiency. Read/discuss current research. Implement innovative teaching practices.

CI 5649. Language Analysis for ESL Teaching in Higher Ed. (4.0 cr.; Student Option No Audit; prereq 5646; spring, every year)
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.

CI 5651. Foundations of Second Languages and Cultures Education. (3.0 cr.; A-F or Audit; fall, every year)
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. (3.0 cr.; Student Option No Audit; prereq An intro to linguistics course; fall, spring, every year)
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.

CI 5654. Practicum in Teaching English as a Second Language (ESL) in Higher Education. (6.0 cr.; S-N only; prereq 5653; spring, every year)
Practical, hands-on training in teaching of English as Second Language. Applying theoretical/descriptive material studied in 5653. Discuss readings/research articles on ESL in higher ed., applying theoretical/practical principles to specific critical classroom incidents.

CI 5656. Teaching Literacy in Second Language Classrooms. (3.0 cr.; A-F or Audit; fall, every year)
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 5657. Teaching Speaking and Listening in Second Language Classrooms. (3.0 cr.; A-F or Audit; spring, odd years) 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. (3.0 cr.; A-F or Audit; spring, every year) For world language/EFL teachers. Aligning foreign language classroom instruction/assessment; language testing/assessment; classroom-based and large-scale proficiency testing/assessment; assessing proficiency in speaking, listening, reading, writing and communicative modes (interpretive, presentational, interpersonal); creation of formative/summative assessments; critique of contemporary assessment instruments.

CI 5660. Special Topics in the Teaching of Second Languages and Cultures. (1.0-4.0 cr. [max 12.0 cr.]; spring, summer, every year) Topics related specifically to the needs of the in-service teacher. Topics, location, credits, and duration are flexible.

CI 5662. Second Language Curriculum Design. (3.0 cr.; A-F or Audit; spring, every year) 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. (3.0 cr.; prereq Enrollment in certificate program in dual language/immersion educ or #; fall, every year) 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.

CI 5671. Curriculum Development and Assessment in Dual Language/Immersion Classrooms. (3.0 cr.; prereq #; fall, odd years) 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.

CI 5672. Language-Focused Instructional Practices and Strategies for Dual Language/Immersion Classrooms. (3.0 cr.; prereq #; spring, every year) 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.

CI 5673. Immersion 101: An Introduction to Immersion Teaching. (2.0 cr.; Student Option No Audit; [CI 5674]; summer, every year) 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 5674. Immersion 101: An Introduction to Immersion Teaching in Character-based Languages. (2.0 cr.; Student Option No Audit; [CI 5673]; summer, every year) Research-based introduction to issues for teachers, administrators, and district personnel in K-12 immersion education. One-way (foreign language) and two-way (bilingual) programs. Principles/practices that inform language-attentive curriculum development/instruction.

CI 5693. Directed Study in Second Languages and Cultures. (1.0-4.0 cr.; prereq #; fall, spring, summer, every year) Individual or group work on curricular, instructional, or assessment problems.

CI 5696. Practicum: Teaching World Languages and Cultures in Elementary Schools. (2.0-6.0 cr.; prereq 5619, adviser approval; credits cannot be counted on a graduate degree program for endorsement candidates; fall, spring, summer, every year) Teaching and learning experiences in Second Languages and Cultures at the elementary-school level. Requires students to work in a public school setting.

CI 5697. Practicum: ESL in the Elementary School. (2.0-6.0 cr.; prereq Adviser approval; fall, spring, summer, every year) Teaching/learning experiences in an English as a Second Language setting at elementary school level. Requires students to work in a public school setting.

CI 5698. Student Teaching in Second Languages and Cultures. (2.0-6.0 cr. [max 14.0 cr.]; prereq Adviser approval; credits cannot be counted on a graduate degree program; fall, spring, summer, every year) 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.

CI 5699. Clinical Experiences in Second Languages. (3.0-12.0 cr. [max 16.0 cr.]; A-F or Audit; prereq SLC initial licensure program only; fall, spring, every year) Teaching and learning experiences in elementary and secondary second language instructional settings. Includes a seminar held concurrently to support the student teaching experience.

CI 5702. Social Studies Instruction in the Elementary Grades. (3.0 cr.; A-F only; prereq Early Childhood or Elementary Education ILP; fall, spring, every year) Content/organization of elementary social studies programs. Programs of understanding. Improving learning situation.

CI 5705. Middle School Social Studies Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, every year) Introduction to the unique needs of middle school students in the social studies classroom. Social studies content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school social studies classroom.

CI 5731. Social Studies for the In-Service Elementary and Middle School Teacher. (3.0 cr.; A-F only; prereq social studies initial licensure student; summer, every year) Broad issues and themes related to social studies education, including societal context, rationale, and scope and sequence. Analysis and evaluation of selected teaching strategies, methods, and resources.

CI 5742. Advanced Methods of Teaching the Social Studies. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure student; fall, every year) Focus on developing a repertoire of instructional methods that support authentic pedagogy and assessment. Enhancing reading comprehension and writing skills in the social studies.

CI 5743. The Social Sciences and the Social Studies. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure student; fall, every year) Development of instructional strategies and contexts for exploring the social sciences as disciplines at the secondary level; central concepts and generalizations; tools of inquiry; competing structures and theories; and the relative impact of multicultural and gender-fair perspectives on the nature of history and the social sciences.

CI 5744. Seminar: Reflecting on Professional Development in Social Studies Education. (3.0 cr.; A-F only; prereq Secondary social studies initial licensure student; spring, every year) Reflecting on teaching experience, examining social/cultural context of teaching/learning, developing a professional identity. Refining teaching and teacher research skills.

CI 5745. Engaging Youth With Social Studies Texts. (3.0 cr.; A-F only; spring, every year)
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. (3.0 cr.; A-F only; spring, every year) Issues, classroom practices, and controversies surrounding global/multicultural perspectives—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. (3.0 cr.; A-F or Audit; spring, every year) Prepares 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 5761. Social Studies Education for the Inservice Middle/Secondary Teacher. (3.0 cr.; fall, offered periodically) Trends and issues in social studies education. Current developments and controversies in social studies pedagogy, curriculum, and assessment.

CI 5762. Developing Civic Discourse in the Social Studies. (3.0 cr.; A-F or Audit; spring, summer, offered periodically) Philosophies, strategies, and research on developing civic discourse in secondary social studies classroom. Selecting issues. Democratic classroom climate. Relating to social/cultural contexts.

CI 5782. Mathematics Instruction in the Elementary Grades. (3.0 cr.; A-F or Audit; prereq Early Childhood or Elementary Education [LP]; fall, spring, every year) Principles of learning mathematics in elementary grades. Objectives, content, philosophy, instructional materials, methods of instruction/evaluation.

CI 5996. Internship in Family, Youth, and Community. (1.0 cr.; prereq 5926; student teaching student; fall, every year) Full-time supervised teaching experience in family/consumer sciences programs.

CI 6075. Seminar: Art Education. (2.0 cr.; A-F or Audit; prereq Educ grad student or #; fall, spring, offered periodically) Reporting, analysis, and critique of a problem or trend in the field of art education.

CI 6079. Research in Art Education. (3.0 cr.; A-F or Audit; prereq Educ grad student or #; fall, spring, summer, every year) Current research agenda. Helps students identify research questions and choose appropriate methodologies.

CI 8115. Curriculum and Achievement Outcomes in a Diverse Society. (3.0 cr.; A-F or Audit; prereq Doctoral student; ) 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.

CI 8121. Curriculum Change: Perspectives, Processes, and Participants. (3.0 cr.; prereq CI grad student or #; ) 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.

CI 8127. Curriculum Theory and Research: Alternative Paradigms and Research Methods. (3.0 cr.; prereq CI grad student or #; ) 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.

CI 8131. Curriculum and Instruction Core: Critical Examination of Curriculum in Context. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, offered periodically) Central concepts, ideas, and debates in professional field of curriculum. Curriculum in general education.

CI 8132. Curriculum and Instruction Core: Teaching Theory and Research. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, every year) Overview of research on teaching: historical perspective, modern research/findings, implications for practice/research.

CI 8133. Research Methods in Curriculum and Instruction. (3.0 cr.; A-F or Audit; prereq CI PhD or MA student or #; fall, spring, summer, every year) Survey of educational research methods, comparison of underlying assumptions/procedures.

CI 8145. Using Mixed Methods in Educational Research. (3.0 cr.; A-F or Audit; prereq [8133, 8148, OLPD 8812] or equiv. [CI PhD student or #]; additional quantitative/qualitative methodology courses recommended; fall, spring, every year) 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.

CI 8146. Critical Ethnography in Education. (3.0 cr.; A-F or Audit; prereq [8148, EDPA 5061, WOST 5101] or #; spring, even years) Theoretical/methodological foundations. Possibilities and problems for
understanding inequality/disparities in education. Research design, data collection, analysis, writing.

CI 8147. Critical Discourse Analysis in Educational Research. (3.0 cr.; A-F or Audit; prereq [MA or PhD] student; fall, odd years) Students apply CDA methods to analysis of written, visual, and spoken texts in social settings such as schools, families, and communities.

CI 8148. Conducting Qualitative Studies in Educational Contexts. (3.0 cr.; prereq CI 8133 and [CI or OLPD PhD student]; spring, every year) Qualitative research methods. Ethnography, sociolinguistics, symbolic interactionism. Observation.

CI 8149. Qualitative Research: Coding, Analysis, Interpretation, and Writing. (3.0 cr.; A-F or Audit; prereq [MA or Ed.D or Ph.D.] student or #; spring, every year) 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 review of related research/methodology.

CI 8150. Research Topics Curr & Instruc. (1.0-6.0 cr. [max 12.0 cr.]; prereq [M.A. or Ed.D or Ph.D.] student or #; spring, every year) Special topics, current research trends in curriculum/instruction. Research review, subject integration, curriculum contexts, development, implementation, data collection, analysis, evaluation.


CI 8152. Teacher Learning and Professional Development. (3.0 cr.; A-F or Audit; prereq Grad student; fall, odd years) 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.

CI 8154. Culturally Relevant Pedagogy. (3.0 cr.; A-F or Audit; fall, even years) Research on relationship between home and school cultures. Education of students of color. Culture, including experiences/practices of students? homes. Cultural approaches for improving teaching, transforming society.


CI 8159. Culture and Teaching Colloquium. (3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, every year) 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. (3.0 cr.; Student Option No Audit; prereq [8133, 6-12 cr of research methodology, CI PhD student] or #; fall, every year) 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.

CI 8162. Research Experience II: Data Analysis and Manuscript Preparation. (3.0 cr.; Student Option No Audit; prereq 8161; spring, every year) Students complete data collection/analysis, prepare research manuscript. Seminar discussions, critical examination of their own and peers’ work.

CI 8181. Seminar in Teaching in Colleges of Education. (3.0 cr.; prereq CI PhD student or #; ) Goals, instructional strategies, evaluation procedures, and professional considerations.

CI 8185. Problems: Improvement of Instruction. (1.0-6.0 cr.; prereq #; fall, summer, every year) Independent research in curriculum and instruction.

CI 8196. Practicum in Teaching in Colleges of Education. (1.0 cr.; prereq 8181; fall, spring, offered periodically) Supervised teaching in an education course at the University of Minnesota or other college or university.

CI 8197. Problems: Curriculum Studies. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq MA student; fall, every year) Directs students to completing Plan B paper for M.A. degree.

CI 8198. Problems: Teacher Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; spring, every year) Independent research.

CI 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser approval, DGS approval; fall, spring, summer, every year) TBD

CI 8350. Special Topics in Learning Technologies. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, offered periodically) Topics in learning technologies. Topics and credits are flexible.

CI 8361. Advanced Courseware and Design: Issues. (3.0 cr.; A-F or Audit; ) Examination and critique of existing research. Students identify a research topic, write a literature review, plan a study, and present a research proposal.

CI 8391. Learning Technologies Seminar. (1.0-3.0 cr. [max 6.0 cr.]; prereq CI grad student or #; fall, spring, every year) Topics related to needs of the in-service teacher; topics, location, credits, and duration are highly flexible.

CI 8395. Directed Study: Learning Technologies. (1.0-6.0 cr. [max 12.0 cr.]; A-F only; prereq #; fall, spring, summer, every year) Students work with faculty member on a directed project or study focused on exploring literature, organizing and engaging in research, designing and developing projects, etc.

CI 8400. Special Topics in Children’s and Young Adult Literature. (1.0-6.0 cr. ; prereq grad course in children’s or young adult lit; fall, offered periodically) Overview of research and issues. Study of original manuscripts and artwork for children's books; research in child and young adult response to literature. Topics vary by offering.

CI 8410. Special Topics in Reading Research and Instruction. (1.0-6.0 cr. ; prereq [MA or PhD] student; spring, offered periodically) Research at all levels. Topics vary. May include research designs, trends, and specific studies.

CI 8412. Research in Reading. (3.0 cr. [max 6.0 cr.]; prereq [MA or PhD] student; fall, spring, every year) Theory of and research on writing process. Applications to developing writing curriculum/instruction.


CI 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser approval, DGS approval; fall, spring, summer, every year) TBD


CI 8470. Special Topics on Literacy. (1.0-6.0 cr. ; prereq [MA or PhD] student; fall, offered periodically) Current theories/research on literacy and literacy development. Alternative methods of conducting literacy research. Implications for literacy instruction.
CI 8492. Readings in English Education and Reading. (1.0-3.0 cr.; max 10.0 cr.; prereq #; fall, spring, summer, every year) Independent study course.

CI 8495. Problems: Teaching English and Reading. (1.0-6.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Individual research.

CI 8511. Seminar: Research in Science Education. (1.0 cr. [max 6.0 cr.]; prereq CI grad student or #; fall, spring, every year) Students and faculty present research projects for comment and critique. Special topics may also be considered.

CI 8541. History and Philosophy of Engineering and Engineering Education. (3.0 cr.; A-F only; prereq PhD or MA student or #; fall, spring, every year) History and philosophy of engineering/education education. Critical reflection/analysis of philosophical, epistemological, historical arguments.

CI 8542. Modeling and Model-Based Reasoning in STEM Education. (3.0 cr.; A-F or Audit; prereq STEM Education PhD or MA student or #; fall, spring, every year) Models/modeling perspectives for engineering, mathematics, and science education. Theorists/researchers that shaped STEM model-based reasoning. Discussions, individual/group presentations, small-group activities.

CI 8570. Advanced Topics in Science Education. (1.0-4.0 cr. [max 6.0 cr.]; A-F or Audit; prereq CI grad student or #; fall, spring, every year) Examination/critique of current research topics, methods, and issues.

CI 8571. Equity, Policy, and Social Justice in Science Education. (3.0 cr.; Student Option: No Audit; prereq Science ed grad student or #; fall, spring, every year) Interactions of issues of diversity, equity, policy, and social justice as related to science education. Diverse perspectives on purposes/scope of science education. Consequences for diversity, equity, access, social justice, empowerment, and educational policy.

CI 8572. Learning Theory and Classical Research in STEM Education. (3.0 cr.; A-F only; prereq Grad math educ major; fall, spring, odd years) STEM education research. Theorists/classical research. Mathematics, science, engineering education.

CI 8573. Nature of Inquiry in STEM Education. (3.0 cr.; A-F only; prereq MA or PhD student or #; fall, spring, every year) STEM Education. Mathematics, science, engineering. Teaching/learning/teacher education through evaluation of national teaching standards, current research, current cognitive theories of learning.

CI 8594. Conducting Research in Science Education. (3.0 cr.; prereq sci educ research course; ) Application of research methodology to a specific science education issue.

CI 8595. Problems: Science Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq CI grad student or #; fall, spring, every year) Independent research.

CI 8650. Seminar: Special Topics in Second Languages and Cultures Research. (1.0-3.0 cr. [max 6.0 cr.]; prereq CI grad student or #; fall, summer, offered periodically) Research topics vary.

CI 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

CI 8691. Readings in Second Languages and Cultures Education. (1.0-3.0 cr.; prereq #; fall, spring, every year) Independent reading.

CI 8695. Problems: Second Languages and Cultures Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) Independent research.

CI 8741. History and Theory of Social Studies Education. (3.0 cr. [max 6.0 cr.]; A-F or Audit; spring, every year) History/theory of social studies education in United States. Organization, subject matter, methods of instruction.

CI 8742. Seminar: Research in Social Studies Education. (3.0 cr.; A-F or Audit; prereq CI grad student or #; spring, every year) Critical review and analysis of seminal research studies; criteria for appraising research findings; educational implications.

CI 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; fall, spring, summer, every year) TBD

CI 8795. Problems: Social Studies Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq CI grad student or #; fall, spring, summer, every year) Independent research.

CI 8796. Research Internship in Social Studies Education. (1.0-6.0 cr.; A-F or Audit; prereq CI grad student; fall, spring, summer, every year) Internship with social studies education faculty member; experience in collecting and analyzing data; drafting and presenting reports; writing for publication.

CI 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credits: Doctoral

CI 8900. Family, Youth, and Community Colloquium. (1.0-4.0 cr.; S-N only; prereq MA or PhD student; fall, spring, offered periodically) Theories, philosophies, practices, pedagogies, epistemologies, and public policies not dealt with in regular courses. Content varies by offering.

CI 8902. Family, Youth, and Community in Social, Political, and Economic Context. (3.0 cr.; A-F only; fall, odd years) Meanings of and relationships among family, youth, and community in social, political, and economic contexts across cultures/time. Realities/philo/sophies influencing these meanings/relationships. Implications/consequences for professional practice.

CI 8904. Families, Youth, Communities, and Education: Historical and Contemporary Perspectives. (3.0 cr.; A-F only; prereq MEd or MA or PhD student; spring, even years) Teaching/learning in family/community settings and in formal education settings. Interrelationships, implications.

CI 8913. Interpretive Research. (3.0 cr.; A-F only; fall, every year) Hermeneutic, ethnographic, and phenomenological methods. Ethics, evaluation, and usefulness of interpretive research. Practice in conducting interpretive research.

CI 8914. Critical Science Research. (3.0 cr.; A-F only; spring, every year) 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. (1.0-6.0 cr.; A-F only; prereq Family, Youth, and Community student doing Plan B research; fall, spring, summer, every year) TBD

Dakota (DAKO)
College of Liberal Arts

DAKO 5126. Advanced Dakota Language I. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, every year) Focuses on immersion method.

DAKO 5129. Advanced Dakota Language II. (3.0 cr. [max 12.0 cr.]; A-F or Audit; spring, every year) Focuses on immersion method.

Dance (DNCE)
College of Liberal Arts

DNCE 5010. Modern Dance Technique 7. (2.0 cr. [max 4.0 cr.]; prereq %, audition; fall, every year) Continuation of technical development. Performance range/style. Students study with various guest artists.

DNCE 5020. Modern Dance Technique 8. (2.0 cr. [max 4.0 cr.]; prereq 5010, %, audition; spring, every year)
Continuation 5010. Performance range/style. Students study with various guest artists.

DNCE 5110. Ballet Technique 7. (1.0 cr. [max 2.0 cr.]; prereq %, audition; fall, every year) Continuation of ballet technique. Musically, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet.

DNCE 5120. Ballet Technique 8. (1.0 cr. [max 2.0 cr.]; prereq 5110, %, audition; spring, every year) Continuation of 5110. Musically, performance, stylistic differences. Practical work conducted within context of choreographic/aesthetic development of ballet.

DNCE 5334. Introduction to Dance/Movement Therapy. (2.0 cr.; prereq %; spring, every year) 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.

DNCE 5443. Theorizing Dancing Bodies. (3.0 cr.; =DNCE 4443; prereq %; fall, every year) Major developments in Western philosophic thought on dance and dance theory, from its beginnings to present.

DNCE 5454. (Re)Writing the Dancing Body. (3.0 cr.; =DNCE 4454W; prereq Grad student; spring, every year) 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.


DNCE 5495. Dance and Global Tourism. (3.0 cr.; Student Option No Audit; prereq Grad student; fall, every year) 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.

DNCE 5500. Topics in Dance. (1.0-3.0 cr. [max 10.0 cr.]; fall, spring, summer, offered periodically) Topics specified in Class Schedule.

DNCE 5601. Dance Composition 5. (1.0 cr.; prereq 4601, 4602, %; spring, every year) 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 group choreography.

DNCE 5700. Performance. (1.0 cr. [max 4.0 cr.]; prereq & technique course, %; fall, spring, every year) Technique, improvisation, choreography, music, design, and technical production as they relate to dance performance.

DNCE 5858. Teaching Dance. (4.0 cr.; prereq 1020, %, #, fall, every year) Methods, principles, and techniques of teaching dance.

DNCE 5993. Directed Studies. (1.0-4.0 cr.; max 10.0 cr.; fall, spring, every year) Guided individual study. Prereq-instr consent, dept consent, college consent.

Dental Hygiene (DH) School of Dentistry

DH 5201. Management Internship. (5.0 cr.; S-N only; prereq Dental hygiene grad student; fall, spring, summer, every year) Supervised experience in oral health care industry. Experience in corporations, health care management organizations, long-term care facilities, publishing firms, or professional organizations.

DH 5203. Capstone Project. (3.0 cr.; S-N only; prereq Dental hygiene grad student; fall, spring, summer, every year) Formulation of extensive business plan/project related to area of interest based on coursework taken or internship experience.

DH 5401. Research Methods in Health Sciences. (2.0 cr. [max 3.0 cr.]; A-F only; prereq Dental hygiene grad student; summer, every year) 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.

DH 5403. The Discipline of Dental Hygiene. (2.0 cr.; A-F only; prereq Dental hygiene grad student; summer, every year) 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.

DH 5405. Curriculum and Course Development. (2.0 cr. [max 4.0 cr.]; A-F only; prereq Dental hygiene grad student; fall, every year) Curriculum/course development/management, competency-based education/outcomes assessment. Role of accreditation in dental hygiene education. Students develop competency-based dental hygiene curriculum/course.

DH 5407. Instructional Strategies for Effective Teaching. (2.0 cr.; A-F only; prereq Dental hygiene grad student; fall, every year) Application of principles of learning. Learning/teaching styles, student-centered teaching, instructional strategies. Microteaching selected strategies.

DH 5409. Dental Hygiene Clinic Administration. (2.0 cr.; A-F only; prereq Dental hygiene grad student; spring, every year) Theory/practice of dental hygiene preclinical/clinical instruction. Administration of clinic. Developing protocols, coordinating faculty, monitoring student progress. Central Regional Dental Testing Service exam, clinic evaluation mechanisms, quality assurance.

DH 5411. Administrative Leadership and Professional Development. (1.0 cr. [max 2.0 cr.]; A-F only; prereq Dental hygiene grad student; spring, every year) Application of leadership theory. Models of administrative roles in education, health care, research, and corporate health care settings. Education/organization culture, strategic planning, human resource management/budgeting. Professional development/advancement.


DH 5415. Dental Hygiene Supervised Didactic Course Student Teaching. (1.0 cr. [max 2.0 cr.]; A-F only; prereq Dental hygiene grad student; fall, spring, summer, every year) Observation/participation in supervised teaching experience in dental hygiene education under faculty mentorship.

DH 5420. Master of Dental Hygiene Independent Study. (0.0-5.0 cr. [max 10.0 cr.]; S-N or Audit; prereq Enrolled master of dental hygiene student; fall, spring, summer, every year) Directed study with dental hygiene faculty member on selected topic.

DH 5421. Grant Writing for Health Professionals. (1.0 cr.; A-F only; prereq Enrolled in Dental Hygiene grad program; spring, every year) Introduction to grant writing for health care professionals. Grant sourcing, matching goals/objectives to funding sources, developing evaluation plan, writing proposals, responding to critiques. Effect of economic environment/social responsibility of non-profits.

DH 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Dental Therapy (DT) School of Dentistry

DT 5000. Dental Therapy Capstone Project. (0.0-1.0 cr.; S-N only; fall, spring, every year) 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. (1.0 cr.; A-F only; fall, every year) 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. (2.0 cr.; A-F only; prereq Must be in the dental therapy program, passed basic foundation competencies; fall, every year) Early childhood development, dental care for children.

DT 5210. Head and Neck Anatomy. (1.0 cr.; A-F only; prereq Accepted into master's dental therapy program; fall, every year) Anatomical nomenclature in head/neck anatomy as they relate to dental therapy treatment.

DT 5211. Applied Pharmacology for the Dental Therapist. (2.0 cr.; A-F only; summer, every year) Principles of pharmacological drugs used in dentistry, modes of drug administration, therapeutic/adverse effects of drugs. Preparation for pharmacology of local anesthetics. Nitrous oxide sedation, prescription writing.


DT 5230. Oral and Maxillofacial Radiology. (2.0 cr.; A-F only; spring, every year) Production/utilization of radiographs in accordance with good professional judgement, as well as state/federal radiation regulations. Processing radiographs in darkroom. Processing a digital image. Prereq: DT grad program.

DT 5231. Oral and Maxillofacial Radiology II. (1.0 cr.; A-F only; fall, every year) Use of X-rays in accordance with state/federal radiation regulations. Radiographic assessment of developmental and acquired anomalies of teeth, osseous structures, and maxillary sinus.

DT 5232. Oral and Maxillofacial Radiology Preclinical Laboratory. (0.0 cr.; S-N only; summer, every year) Preclinical demonstration-participation phases using mounted human skulls.

DT 5241. Oral Radiology Clinic II. (1.0 cr.; A-F only; prereq Must be in dental therapy masters program; fall, every year) Clinical instruction in oral radiography. Intraoral/extraoral radiographic procedures, evaluations.


DT 5251. General and Oral Pathology. (1.0 cr.; A-F only; summer, every year) Principles of general and oral pathology with focus on etiology, progression, recognition, and treatment. Overview of diagnostic process and normal clinical findings.

DT 5320. Comprehensive Care Clinic. (4.0 cr.; S-N only; fall, every year) 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. (1.0 cr.; S-N only; fall, every year) 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 5330. Clinical Application I. (3.0 cr.; A-F only; prereq Accepted into master's dental therapy program; fall, every year) Assessment principles related to medical/oral health status. Dental therapy clinical procedures, instrumentation skills. Health assessment, parts of periodontium, dental deposits, toothwear, dental disease/prevention, plaque control.


DT 5332. Cariology and Applied Nutrition in Dental Therapy Care. (3.0 cr.; A-F only; spring, every year) Dental caries etiology, pathology/prevention. Applying principles of diet/nutrition to dental therapy patient care/counseling.


DT 5334W. Dental Therapy Care Process: Clinical Application II. (4.0 cr.; A-F only; fall, every year) Providing dental care for gerodontic patients and patients with disabilities.

DT 5335. Dental Practice Management. (2.0 cr.; A-F only; prereq 2nd yr dental therapy student; spring, every year) Interprofessional course. Organizational, managerial, and financial systems that affect successful dental practice.


DT 5337. Dental Public Health and Service Learning II. (2.0 cr.; A-F only; spring, every year) How to assess, plan, implement, obtain funding for, and evaluate a public health program.


DT 5339. Introduction to Outreach Experiences. (0.0 cr.; S-N only; spring, every year) Provide dental care to underserved populations in various clinical settings throughout Minnesota.

DT 5361. Outreach Experiences II. (2.0 cr.; S-N only; fall, every year) 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. (1.0 cr.; A-F only; spring, every year) Application of scientific principles to selection/ utilization of dental materials. Prereq: 2nd yr DT student.

DT 5429. Introduction to Psychomotor Skill Development. (1.0 cr.; S-N only; fall, every year) 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. (2.0 cr.; A-F only; prereq Accepted into dental therapy masters program; fall, every year) Morphological characteristics of human dentition, associated contiguous structures. Foundational knowledge applied to situations encountered in general dental clinical practice.

DT 5431. Oral Anatomy Laboratory. (3.0 cr.; A-F only; prereq Accepted into masters in dental therapy program; fall, every year) Manual dexterity skills, anatomy of human dentition.


DT 5433. Operative Dentistry I Pre-Clinic Laboratory. (2.0 cr.; A-F only; prereq Enrolled in master's in dental therapy student; summer, every year) 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.

DT 5434. Operative Dentistry II Lecture. (1.0 cr.; A-F only; prereq Enrolled in master's in dental therapy program; fall, every year) How to surgically manage more advanced caries lesions. Transition from pre-clinic lab to clinic setting.

DT 5435. Operative Dentistry II for the Dental Therapist, Lab. (1.0 cr.; A-F only; fall, every year) More advanced caries lesions: diagnosis, structural preparation, decay removal and restoration.

DT 5436. Operative Dentistry III. (1.0 cr.; A-F only; fall, every year) Transition of students from the pre-clinic laboratory to the clinic setting. Demonstrate competency in the surgical treatment of dental caries prior to being certified ready for patient care.

DT 5443. Operative Clinic III. (4.0 cr.; A-F only; fall, every year) How to place restorations. Students place single-tooth restorations on patients.

DT 5460. Essentials of Clinical Care I For the Dental Therapist. (1.0-12.0 cr.; S-N only; spring, every year) 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. Prostodontic Topics for Dental Therapy. (2.0 cr.; S-N only; summer, every year) Lectures, lab projects of selected prostodontic techniques to enable the dental therapist to provide/cement quality pre-fabricated metal or resin provisional crowns and other prostodontic procedures in the scope of DT practice.

DT 5521. Foundations of Interprofessional Professionalism, Communication, and Collaboration. (1.0 cr.; S-N only; fall, spring, summer, every year) Professionalism, communication/collaboration across health professions. Online independent/group work followed by facilitated interprofessional small group discussions of case narratives.

DT 5541. Principles of Exodontia and Minor Oral Surgery. (1.0 cr.; S-N only; spring, every year) Knowledge/skill for dental therapy student in exodontia/minor oral surgery.

DT 5960. Essentials of Clinical Care II for the Dental Therapist. (5.0-10.0 cr. [max 20.0 cr.; S-N only; summer, every year) 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.

Dentistry (DENT) School of Dentistry

DENT 8031. Topics and Problems in Dental Education. (1.0-3.0 cr.; spring, summer, every year) 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 Den 7033.

DENT 8090. Evidence-based Clinical Pediatric Dentistry. (2.0 cr.; A-F or Audit; fall, spring, summer, every year) Selected pediatric dentistry topics. In-depth literature review, seminar discussion.

DENT 8091. Interdisciplinary Care of the Cleft Palate Patient. (1.0 cr.; S-N or Audit; summer, every year) 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. (2.0 cr.; fall, spring, summer, every year) 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. (2.0 cr.; fall, summer, every year) Dental implant therapy from perspective of several dental disciplines.

DENT 8120. Advanced Principles and Techniques of Orofacial Pain Disorders. (3.0 cr.; A-F or Audit; prereq Participation in TMJ, orofacial pain advanced education program; fall, spring, every year) Interdisciplinary study of theory, principles, epidemiology, mechanisms associated with TMJ/craniofacial pain disorders. Basis for scientific understanding of diagnostic/management strategies.

DENT 8121. Current Literature in TMD and Orofacial Pain. (1.0 cr.; A-F or Audit; fall, spring, summer, every year) Review of current literature/how it relates to past literature. Theories on pain, philosophies of management.

DENT 8123. Advanced Topics in Orofacial Pain. (3.0 cr.; A-F or Audit; prereq Grad student in dentistry or other health sciences grad student or #; spring, every year) Review of cutting edge research and clinical findings regarding etiology/treatment of acute/chronic orofacial pain conditions and related disorders.

DENT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

DENT 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

Design (DES) College of Design

DES 5160. Topics in Design. (1.0-4.0 cr. [max 24.0 cr.]; A-F only; fall, spring, summer, every year) Topics in design

DES 5165. Design and Globalization. (3.0 cr.; A-F or Audit; =DES 4165; prereq Grad student; fall, every year) Movement of people, products, and ideas. Challenges brought by differences among us.

DES 5168. Evidence-Based Design. (3.0 cr.; A-F or Audit; prereq DES grad student or #; fall, every year) 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, influences, and anticipated outcomes are documented/analyzed as compared to a typical design process approach.

DES 5170. Topics in Design. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; fall, spring, summer, every year) In-depth investigation of single specific topic, announced in advance.

DES 5180. Split Rock Arts Topics. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; summer, every year) In-depth investigation of a specific topic, announced in advance.

DES 5185. Human Factors in Design. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, offered periodically) 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.

**DES 5193. Directed Study in Design.** (1.0-6.0 cr.; [max 36.0 cr.]; A-F only; prereq %; fall, spring, summer, every year)

Directed Study in Design

**DES 5196. Field Study: National/International.** (1.0-10.0 cr.; A-F or Audit; [GDES 5196, APST 5196, HSG 5196, IDES 5196]; fall, spring, summer, every year)

Faculty-directed field study in a national or international setting.

**DES 5201. Career and Job Search Preparation for Graduate Students.** (1.0 cr.; S-N only; prereq Grad student; fall, spring, every year)

Job search/career development tools. Goals, networking, job search, resume/CV, interviewing. Assignments include resume/CV, informational interview, career development plan.

**DES 8101. Philosophical Foundations.** (4.0 cr.; A-F or Audit; fall, every year)

The nature of thought underlying/within professional areas of field.

**DES 8102. Quantitative Research Methods.** (3.0 cr.; A-F only; fall, even years)

Quantitative research methods for issues related to humans, their behaviors, and everyday living in the designed environment.

**DES 8103. Qualitative and Mixed Methods Research.** (3.0 cr.; A-F or Audit; fall, odd years)

A scientific approach to qualitative research. Methodsstrategies combined to explore complex research questions.

**DES 8112. Design Theory.** (3.0 cr.; A-F or Audit; spring, odd years)


**DES 8113. Teaching and Assessment.** (2.0 cr.; A-F or Audit; fall, odd years)


**DES 8114. Design Studio.** (4.0 cr.; A-F or Audit; prereq Design grad student or #; spring, odd years)

Advanced problem analysis, design solution.

**DES 8115. Grant Writing.** (2.0 cr.; A-F or Audit; fall, even years)

Interdisciplinary course.

**DES 8151. Product Development.** (3.0 cr.; A-F only; spring, even years)

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.** (3.0 cr.; A-F or Audit; spring, even years)

Theories and factors that influence adoption and diffusion of designed products. Methodologies used in analysis of diffusion process.

**DES 8166. Material Culture and Design.** (3.0 cr.; A-F or Audit; prereq [DHA or DES] grad student or #; spring, offered periodically)

Research approaches to material culture study using artifacts from Goldstein Museum of Design.

**DES 8167. Aesthetics of Design.** (3.0 cr.; A-F or Audit; spring, offered periodically)

How we perceive, analyze, value, and evaluate design outcomes/results.

**DES 8170. Topics in Design.** (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)

In-depth investigation of topic announced in advance.

**DES 8181. Research Ethics.** (1.0 cr.; S-N or Audit; prereq Grad student or #; spring, every year)

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.

**DES 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**DES 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**DES 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

Doctoral pre-thesis credits.

**DES 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

**DES 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

**Development Studies and Social Change (DSSC)**

**Academic Affairs, Senior Vice President**

**DSSC 8111. Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change.** (2.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; fall, every year)

Approaches practiced by physical, biological, social science, and humanities scholars. "Ways of knowing" in different cultures/groups. Issues/methodological challenges facing interdisciplinary/international studies. Team taught by faculty from biological, social sciences, and humanities.

**DSSC 8112. Scholarship and Public Responsibility.** (2.0 cr.; S-N only; prereq Grad DSSC minor or #; spring, every year)


**DSSC 8211. Doctoral Research Workshop in Development Studies and Social Change.** (2.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; fall, every year)

Identification of potential funding sources for field research and the writing of grant proposals. Preparing for and conducting field research. Taken during the year before undertaking field research, typically the third year of graduate study.

**DSSC 8212. Doctoral Research Workshop in Development Studies and Social Change.** (1.0 cr.; S-N or Audit; prereq Grad DSSC minor or #; spring, every year)

Identification of potential funding sources for field research and the writing of grant proposals. Preparing for and conducting field research. Taken during the year before undertaking field research, typically the third year of graduate study.

**DSSC 8310. Topics in Development Studies and Social Change.** (1.0 cr. [max 3.0 cr.]; S-N only; prereq Grad DSSC minor or #; spring, every year)

Seven-week seminar. Topical issues in development and social change.

**Dutch (DTCH)**

College of Liberal Arts

**DTCH 5993. Directed Studies.** (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)

Guided individual reading or study. Prereq-instr consent, dept consent, college consent.

**Early Modern Studies (EMS)**

College of Liberal Arts

**EMS 5500. Topics in Early Modern Studies.** (3.0 cr. [max 6.0 cr.]; prereq Grad student; fall, spring, every year)

Selected topics in early modern studies from various disciplinary perspectives/world regions.

**EMS 8100. Workshop in Early Modern Studies.** (1.0-3.0 cr.; S-N only; prereq #; fall, spring, every year)

Lectures/workshops offered by various centers, departments, institutes, and libraries across disciplines on Twin Cities campus. Online reports/discussion.

ESCI 5093. Directed Study. (1.0-6.0 cr.; A-F or Audit; prereq Grad student; fall, spring, summer, every year) Students work on tutorial basis. Guided individual reading or study.

Earth Sciences (ESCI) College of Science and Engineering

ESCI 5093. Directed Studies in Earth Sciences. (1.0-4.0 cr.; max 16.0 cr.; fall, spring, every year) Independent, directed study in earth sciences arranged by student/faculty member.

ESCI 5102. Climate Change and Human History. (3.0 cr.; =ESCI 3002; prereq 1001 or equiv or #; spring, odd years) 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.

ESCI 5201. Time-Series Analysis of Geological Phenomena. (3.0 cr.; =ESCI 401; fall, spring, every year) 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.

ESCI 5203. Mineral and Rock Physics. (3.0 cr.; prereq 2201, Phys 1302; spring, offered periodically) Physical properties of minerals and rocks as related to the composition and dynamics of the Earth's crust, mantle, and core.


ESCI 5302. Isotope Geology. (3.0 cr.; =ESCI 402; fall, every year) Theory and uses of radioactive, radiogenic, and stable isotopes in geology. Radioactive dating, geothermometry, and tracer techniques in geologic processes.

ESCI 5351. Geochemical Modeling of Aquifer Systems. (3.0 cr.; prereq 4401; spring, even years) Using mass transfer reaction path models to assess chemical evolution of natural fluids, hydrothermal alteration processes, and formation of hydrothermal ore deposits.

ESCI 5353. Electron Microprobe Theory and Practice. (3.0 cr.; =MATS 5353; prereq [One yr chem, one yr physics] or #; fall, offered periodically) Characterizing solid materials with electron beam instrumentation, including reduction of X-ray data to chemical compositions.


ESCI 5503. Advanced Petrology. (3.0 cr.; prereq 2300, CHEM 1061, CHEM 1065, MATH 1272 or MATH 1572; fall, odd years) Quantitative approach to modern igneous/m metamorphic petrology. Emphasizes thermodynamics of minerals/melts and with applications to phase diagrams, thermobarometry, melting relationships, and energetics of petrologic mass transfer.

ESCI 5504W. Neotectonics. (3.0 cr.; prereq 2201, 4501 or #; fall, even years) 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.

ESCI 5601W. Advanced Sedimentology. (4.0 cr.; prereq 4602 or #; fall, odd years) 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.

ESCI 5705. Limnogeology and Paleoenvironment. (3.0 cr.; prereq #; ) Within-lake, hydrogeologic, and landscape (geologic/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.

ESCI 5713. Tracers and Karst Hydrogeology. (3.0 cr.; prereq 5701; #; ) Karst hydrogeology and application of tracers to determine source, age, and mixing parameters of water in various natural reservoirs. Physical and chemical principles and processes operating in karst geochemistry. Use of natural and synthetic chemical and isotopic labels or tracers to follow movement and mixing of water through hydrologic cycle.


ESCI 5980. Seminar: Current Topics in Earth Sciences. (1.0-4.0 cr.; max 8.0 cr.; S-N or Audit; fall, spring, offered periodically) Topics in earth sciences investigated in a seminar format.

ESCI 8001. Introductory Graduate Seminar. (2.0 cr.; S-N or Audit; prereq Grad student status in earth sci; fall, every year) 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.

ESCI 8204. Geomagnetism and Paleomagnetism. (3.0 cr.; prereq 2201, Phys 1302, [Math 1272 or #]; spring, odd years) 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.

ESCI 8243. Principles of Rock Magnetism. (1.0-3.0 cr.; prereq 4204 or #; ) 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.

ESCI 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
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.

**ESCI 8602. Stream Restoration Practice.** (2.0 cr.; S-N only; = [CE 8602, EEB 8602]; prereq 8601 or CE 8601; summer, every 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.

**ESCI 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) Doctoral pre-thesis credits.

**ESCI 8712. Transport Phenomena and Analytical Hydrogeology.** (3.0-4.0 cr.; prereq 5701 or CE 3502 or #; fall, every year) 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.

**ESCI 8718. Numerical Methods in Hydrogeology.** (4.0 cr.; A-F or Audit; prereq 5701, CS 1107 or #; ) Introduction to finite difference and finite element methods in hydrogeology. Students develop one- and two-dimensional models of diffusion and advection-dispersion equations.

**ESCI 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or 10 cr total required [Plan A only]; fall, spring, summer, every year) (no description)

**ESCI 8801. Geomicrobiology.** (3.0 cr.; prereq One semester college level biology; spring, every year) Geosphere/biosphere interactions over temporal/spatial scales. Global biogeochemical cycling, microbe-metal interactions, microbial paleobiology, environmental geomicrobiology, life detection, habitability of planets.

**ESCI 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (no description)

**ESCI 8970. Seminar: Current Topics in Earth Sciences.** (1.0-4.0 cr. [max 30.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Seminar course.

**ESCI 8980. Seminar: Current Topics in Earth Sciences.** (1.0-4.0 cr. [max 30.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Selected seminar topics.

**ESCI 8994. Research in Earth Sciences.** (1.0-4.0 cr. [max 30.0 cr.]; prereq #; fall, spring, summer, every year) Independent research under faculty supervision.

**Ecology, Evolution, and Behavior (EEB)**

**EEB 5042. Quantitative Genetics.** (3.0 cr.; A-F only; prereq [BIOL 4003 or GCD 3022] or #; a course in statistics is recommended; fall, every year) 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.

**EEB 5053. Ecology: Theory and Concepts.** (4.0 cr.; prereq Biol 3407 or #; fall, odd years) 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.

**EEB 5068. Plant Physiological Ecology.** (3.0 cr.; Student Option No Audit; = [EEB 4068]; prereq BIOL 2022 or BIOL 3002 or BIOL 3407 or BIOL 3408W or #; spring, odd years) Plant function, its plasticity/diversity in ecological context. Impact of environmental stresses on major physiological processes of plants, including photosynthesis, respiration, water uptake/transpiration, and nutrient uptake/assimilation. Lab, field trip to Cedar Creek.


**EEB 5221. Molecular Evolution.** (3.0 cr.; A-F or Audit; prereq [BIOL 4003 or GCD 3022], grad student) or #; fall, offered periodically) 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.

**EEB 5322. Evolution and Animal Cognition.** (3.0 cr.; prereq Biol 3411 or Psy 3061 or #; ) 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."

**EEB 5323. Neural and Endocrine Mechanisms Underlying Vertebrate Behavior.** (2.0 cr.; A-F or Audit; prereq Biol 3411 or Biol 3101 or NSc 3101 or Phsl 3101 or #.;) Selected aspects of the physiological basis of vertebrate behavior with emphasis on neural and endocrine integration and the effects of evolutionary pressures on it. Hormones and sex behavior, sensory perception, neuroethology of communication.

**EEB 5327. Behavioral Ecology.** (3.0 cr.; prereq Biol 3411 or #; spring, even years) 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.

**EEB 5371. Principles of Systematics.** (3.0 cr.; prereq Grad student or #; spring, even years) 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.

**EEB 5601. Limnology.** (3.0 cr.; prereq Grad student or #; fall, every year) 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.

**EEB 5605. Limnology Laboratory.** (2.0 cr.; A-F or Audit; prereq 3603 or #; fall, every year) 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, water chemistry, data analysis.

**EEB 5609. Ecosystem Ecology.** (3.0 cr.; prereq [Biol 3407 or Biol 5407] or #; spring, every year) Regulation of energy and elements cycling through ecosystems. Dependence of cycles on kinds/numbers of species within ecosystems. Effects of human-induced global changes on functioning of ecosystems.

**EEB 5963. Modeling Nature and the Nature of Modeling.** (3.0 cr.; =EEB 3963; prereq [Math 1281, Math 1282] or equiv or #.) Hands-on modeling experiences in context of biological applications. Reviews calculus concepts. Students carry out modeling steps, from developing the model, to analytical analysis, to developing computer code, to running the models.

**EEB 8200. Sustainability Science Distributed Graduate Seminar.** (3.0 cr.; spring, every year) 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.** (4.0 cr.; A-F only; prereq Grad student in Ecology, Evolution and Behavior; fall, every year) Foundational knowledge in ecology, evolution, behavior.

**EEB 8202. Graduate Foundations in Ecology, Evolution and Behavior - Semester 2.** (4.0 cr.; A-F only; prereq 8601, EEB grad student; spring, every year) Foundational knowledge in ecology, evolution, behavior. Second semester of two-semester sequence.

**EEB 8301. Prelim Proposal Writing Seminar.** (1.0 cr.; S-N only; prereq EEB grad Student; fall, every year) 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.

**EEB 8302. EEB Written Prelim Workshop.** (1.0 cr.; S-N only; prereq EEB grad student; spring, every year) Provide time for students to meet/discuss issues associated with written written preliminary exam. Workshop sections of written preliminary exam with peers. Exam should be reviewed informally by committee/revised by student before final submission.

**EEB 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**EEB 8360. Behavioral Biology Seminar.** (1.0 cr. [max 5.0 cr.]; S-N or Audit; prereq #; fall, every year) Research topics in selected areas.

**EEB 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**EEB 8500. NSF GRF Graduate Research Fellowship Proposal Writing Seminar.** (1.0 cr. [max 2.0 cr.]; S-N only; prereq EEB grad student only; fall, every year) 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.

**EEB 8550. Graduate Research Fellowship Proposal Writing Seminar.** (1.0 cr. [max 2.0 cr.]; S-N only; fall, every year) How to submit competitive fellowship proposal to external organization (e.g., NSF Graduate Research Fellowship program). Besides scheduled class, students meet weekly in small groups to discuss proposals/give feedback.

**EEB 8601. Introduction to Stream Restoration.** (3.0 cr.; =[ESCI 8601]; prereq Grad student in [CE or GEO or EEB or WRS or FW or BAE or FR or HORT or ENR or LA or SRSE] or #; fall, even years) Science/policy behind stream restoration. How to evaluating/critical 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.

**EEB 8602. Stream Restoration Practice.** (2.0 cr.; S-N only; =[ESCI 8602, CE 8602]; prereq CE 8601 or GEO 8601; fall, odd years) 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.


**EEB 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

**EEB 8777. Thesis Credits: Master's.** (1.0-18.0 cr.; max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

**EEB 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr.; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

**EEB 8980. Seminar on Current Topics.** (1.0-3.0 cr.; max 30.0 cr.; S-N only; prereq EEB grad student; fall, spring, every year) Current research in ecology, evolution, behavior.
ECON 5109. Game Theory for Engineers. (3.0 cr.; A-F only; =ECON 5109H; prereq [Math 2283, 2373, 2374, 3263] or Math 4606, M.S./Ph.D. student in engineering or comp sci or info tech or operations mgmt] or #; fall, every year) Introduction to game theory. Utility theory, noncooperative/cooperative games, bargaining theory. Games in normal/extentive form. Nash equilibria/refinements.

ECON 5109H. Game Theory for Engineers. (4.0 cr.; A-F or Audit; =ECON 5109; prereq [Math 2283, 2373, 2374, 3263] or Math 4606; M.S./Ph.D. student in engineering or comp sci or info tech or operations mgmt] or #; fall, offered periodically) Introduction to game theory and its applications. Utility theory, noncooperative/cooperative games, bargaining theory. Games in normal/extentive form, Nash equilibria/refinements.

ECON 5890. Economics of the Health-Care System. (3.0 cr.; A-F or Audit; =PUBH 6832; prereq 5101 or #; fall, every year) 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.

ECON 8001. Microeconomic Analysis. (2.0 cr.; prereq 5151 or equiv, Math 2243, Math 2263 or equiv or #; fall, every year) 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 4161.

ECON 8002. Microeconomic Analysis. (2.0 cr.; prereq 8001; fall, every year) 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 4162.

ECON 8003. Microeconomic Analysis. (2.0 cr.; prereq 8002; spring, every year) Theories of consumer demand, producer supply, and market equilibrium; general equilibrium and welfare. Sample topics: 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.

ECON 8004. Microeconomic Analysis. (2.0 cr.; prereq 8003; spring, every year) 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.

ECON 8101. Microeconomic Theory. (2.0 cr.; prereq 5151 or equiv, Math 2243 or equiv, & Math 5615 or concurrent registration in Math 8601, grad econ major or #; fall, every year) 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.

ECON 8102. Microeconomic Theory. (2.0 cr.; prereq 8101, & Math 5615 or & Math 8601, grad econ major or #; fall, every year) 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.

ECON 8103. Microeconomic Theory. (2.0 cr.; prereq 8102, & Math 5616 or & Math 8602 or comparable abstract math course, grad econ major or #; spring, every year) 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.

ECON 8104. Microeconomic Theory. (2.0 cr.; prereq 8103, & Math 5616 or & Math 8602 or comparable abstract math course, grad econ major or #; spring, every year) 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.

ECON 8105. Macroeconomic Theory. (2.0 cr.; prereq 5152 or equiv, Math 2243, Math 2263 or equiv or #; fall, every year) 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.

ECON 8106. Macroeconomic Theory. (2.0 cr.; prereq 8105; fall, every year) 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.

ECON 8107. Macroeconomic Theory. (2.0 cr.; prereq 8106; spring, every year) 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.

ECON 8111. Introduction to Mathematical Economics. (2.0 cr.; prereq Math 2243 or equiv, & Econ 8101, & Math 5615 or equiv or #; Math 4242 recommended; fall, spring, every year) Use of mathematical models in economic theory.

ECON 8112. Introduction to Mathematical Economics. (2.0 cr.; prereq 8111, & 8102, & Math 5615 or comparable abstract math course; ) Use of mathematical models in economic theory. Standard techniques.

ECON 8113. Introduction to Mathematical Economics. (2.0 cr.; prereq 8112, Math 5616 or comparable abstract math course, & 8103; ) Use of mathematical models in economic theory. May include special topics.

ECON 8117. Noncooperative Game Theory. (2.0 cr.; prereq Math 5616 or equiv or #; fall, every year) 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.
ECON 8118. Noncooperative Game Theory. (2.0 cr.; prereq 8117; fall, spring, every year) 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.

ECON 8119. Cooperative Game Theory. (2.0 cr.; prereq 8104, Math 5616 or equiv or #; spring, every year) 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.

ECON 8181. Advanced Topics in Microeconomics. (2.0 cr. [max 4.0 cr.]; prereq 8104 or #; fall, every year) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8182. Advanced Topics in Microeconomics. (2.0 cr. [max 4.0 cr.; prereq 8104 or #; spring, every year) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8185. Advanced Topics in Macroeconomics. (2.0 cr. [max 4.0 cr.; prereq 8108 or #; fall, spring, every year) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8186. Advanced Topics in Macroeconomics. (2.0 cr. [max 4.0 cr.; prereq 8108 or #; spring, offered periodically) Faculty and student presentations based on recent literature. Seven-week course.

ECON 8191. Workshop in Mathematical Economics. (1.0-3.0 cr. [max 10.0 cr.]; prereq 8104 or #; fall, every year) Students conduct research and present papers under faculty supervision.

ECON 8192. Workshop in Mathematical Economics. (1.0-3.0 cr. [max 10.0 cr.]; prereq 8104 or #; spring, every year) Students work on research and present papers under faculty supervision.

ECON 8201. Econometric Analysis. (2.0 cr.; prereq [3101 or equiv.], [Math 1272 or equiv.], Stat 5102) or #; fall, every year) Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

ECON 8203. Econometric Analysis. (2.0 cr.; prereq 8202; spring, every year) Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

ECON 8204. Econometric Analysis. (2.0 cr.; prereq 8203; spring, every year) Basic linear regression model, its variants. Panel data, censored/truncated regression, discrete choice models. Time series, simultaneous equation models.

ECON 8205. Applied Econometrics. (2.0 cr.; prereq Math 4242 or equiv, & Econ 8101, & Econ 8105, & Stat 5101 or #; fall, every year) 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.

ECON 8206. Applied Econometrics. (2.0 cr.; prereq 8205, & 8102, & 8106, & Stat 5101 or #; fall, every year) 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.

ECON 8207. Applied Econometrics. (2.0 cr.; prereq 8206, & 8103, & 8107, & Stat 5102 or #; spring, every year) 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.

ECON 8208. Applied Econometrics. (2.0 cr.; prereq 8207, & 8104, & 8108, & Stat 5102 or #; spring, offered periodically) 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.

ECON 8211. Econometrics. (2.0 cr.; prereq 5151, 5152, Math 4242 or equiv, Stat 5102 or #; fall, every year) 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.

ECON 8212. Econometrics. (2.0 cr.; prereq 8211; fall, every year) 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.

ECON 8213. Econometrics. (2.0 cr.; prereq 8212;) 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.

ECON 8281. Advanced Topics in Econometrics. (2.0 cr. [max 4.0 cr.; prereq 8213 or #; fall, spring, offered periodically) Faculty and student presentations based on recent literature. This is a 7-week course.

ECON 8291. Workshop in Econometrics. (1.0-3.0 cr. [max 10.0 cr.; prereq 8213 or #; fall, spring, offered periodically) Workshop in Econometrics

ECON 8292. Workshop in Econometrics. (1.0-3.0 cr. [max 10.0 cr.; prereq 8213 or #; fall, spring, offered periodically) Workshop in Econometrics

ECON 8311. Economic Growth and Development. (2.0 cr.; prereq 8104, 8106 or #; fall, every year) 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.

ECON 8312. Economic Growth and Development. (2.0 cr.; prereq 8311 or #; fall, spring, every year) 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.

ECON 8313. Economic Growth and Development. (2.0 cr.; prereq 8312 or #; spring, every year) 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.

ECON 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)
ECON 8401. International Trade and Payments Theory. (2.0 cr.; prereq 8103, 8105 or #; fall, every year)

ECON 8402. International Trade and Payments Theory. (2.0 cr.; prereq 8401 or #; fall, spring, every year)
Tariffs, quotas, and other barriers to trade; gains from trade; trading blocs; increasing returns; growth. This is a 7-week course.

ECON 8403. International Trade and Payments Theory. (2.0 cr.; prereq 8402 or #; spring, every year)
International business cycles; exchange rates; capital movements; international liquidity. This is a 7-week course.

ECON 8404. International Trade and Payments Theory. (2.0 cr.; prereq [8402, 8403] or #)
Theoretical models of international trade. Trade data, empirical work on trade. Seven-week course.

ECON 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ECON 8481. Advanced Topics in International Trade. (2.0 cr.; [max 4.0 cr.]; prereq 8403 or #; fall, spring, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8482. Advanced Topics in International Trade. (2.0 cr.; [max 4.0 cr.]; prereq 8403 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8491. Workshop in Trade and Development. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; fall, every year)
Workshop in Trade and Development
tbd

ECON 8492. Workshop in Trade and Development. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)
tbd

ECON 8501. Wages and Employment. (2.0 cr.; prereq 8102, 8106 or #; fall, every year)
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.

ECON 8502. Wages and Employment. (2.0 cr.; prereq 8501 or #; fall, spring, every year)
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.

ECON 8503. Wages and Employment. (2.0 cr.; [max 4.0 cr.]; prereq 8502 or #; spring, every year)

ECON 8581. Advanced Topics in Labor Economics. (2.0 cr.; [max 4.0 cr.]; prereq 8502 or #; fall, spring, summer, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8582. Advanced Topics in Labor Economics. (2.0 cr.; [max 4.0 cr.]; prereq 8502 or #; fall, spring, summer, every year)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8601. Industrial Organization and Government Regulation. (2.0 cr.; prereq 8102 or #; fall, every year)
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.

ECON 8602. Industrial Organization and Government Regulation. (2.0 cr.; prereq 8601 or #; fall, every year)
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.

ECON 8603. Industrial Organization and Government Regulation. (2.0 cr.; prereq 8602 or #; spring, every year)
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.

ECON 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
(No description)

ECON 8681. Advanced Topics in Industrial Organization. (2.0 cr.; [max 4.0 cr.]; prereq 8603 or #; fall, spring, offered periodically)
Faculty and student presentations based on recent literature. Seven-week course.

ECON 8691. Workshop in Applied Microeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)
Workshop in Applied Microeconomics

ECON 8692. Workshop in Applied Microeconomics. (1.0-3.0 cr. [max 10.0 cr.]; prereq #; spring, every year)
tbd

ECON 8701. Monetary Economics. (2.0 cr.; prereq 8103, 8106 or #; fall, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8702. Monetary Economics. (2.0 cr.; prereq 8701 or #; fall, spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8703. Monetary Economics. (2.0 cr.; [max 4.0 cr.]; prereq 8702 or #; spring, every year)
Economic role of principal financial institutions. Determinants of value of money. Principal problems of monetary policy. Seven-week course.

ECON 8704. Financial Economics. (2.0 cr.; prereq 8103, 8106 or #; fall, every year)
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.

ECON 8705. Financial Economics. (2.0 cr.; prereq 8704 or #; fall, spring, every year)
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.

ECON 8706. Financial Economics. (2.0 cr.; prereq 8705 or #; spring, every year)
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.

ECON 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)
EDUC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

EDUC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

EDUC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

EDUC 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

EDUC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

EDHD 5000. Cultures, Schools, and Communities (Human Relations). (1.0 cr.; A-F or Audit; prereq [MED/initial licensure or CLA music ed major or preteaching major or #; fall, spring, summer, every year) 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.

EDHD 5008. Reading in the Content Areas for Initial Licensure Candidates. (1.0-2.0 cr.; A-F only; 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]; fall, spring, offered periodically) Web-based course. Fostering students’ reading related to learning from text.

EDHD 5009. Human Relations: Applied Skills for School and Society. (1.0 cr.; A-F or Audit; prereq [MED/initial licensure or CLA music ed or preteaching or #; fall, spring, summer, every year) 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.

EDHD 5506. Teaching Students With Special Needs in Inclusive Settings. (2.0 cr.; A-F or Audit; prereq Teacher preparation program in [CEHD or music education or agriculture education or DirecTrack] or #; license students must take this course for a grade; fall, spring, summer, every year) Exceptionalities in educational settings as defined in federal/state rules/regulations. Historical perspectives, definitions, etiology, needs, characteristics. Service delivery systems for each exceptionality.

EDHD 5509. School and Society. (2.0 cr.; A-F or Audit; prereq Jr or Sr or MED/initial licensure student or CLA music ed major or preteaching major or #; fall, spring, summer, every year) 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.

EDHD 5512. Child and Adolescent Development for Teaching and Learning. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, spring, summer, every year) Attending to constant transitions/development in which children and adolescents negotiate their road to adulthood. How to foster learning/positive development.
EDHD 5014. Child and Adolescent Development for Teaching and Learning. (2.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, spring, every year) Transitions/development in which children/adolescents negotiate road to adulthood. How to foster learning/positive development.

EDHD 5015. Teaching Students with Special Needs in Inclusive Settings. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; summer, every year) Areas of exceptionality defined in federal/state regulations. Historical perspectives, definitions, etiology, characteristics, needs, and service delivery systems. Collaborating with special education personnel.

EDHD 5016. Teaching Students with Special Needs in Inclusive Settings. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; fall, every year) Attending to constant transitions/development in which children/adolescents negotiate their road to adulthood. How to foster learning/positive development.

EDHD 5017. Academic Language and English Learners. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; summer, every year) Working with English learners and other linguistically diverse students across content areas to develop academic language proficiency.

EDHD 5018. Academic Language and English Learners. (1.0 cr.; A-F only; prereq Enrolled in teacher initial licensure program; spring, every year) Working with English learners and linguistically diverse students across all content areas to develop academic language proficiency.

EDHD 5020. Cultures, Schools, and Communities (Human Relations). (1.0 cr.; A-F only; [EDHD 5000]; prereq Enrolled in teacher initial licensure program; spring, every year) Addressing social/cultural dimensions of education. Challenges/dilemmas facing contemporary educators. Speakers, simulation, presentations, professional learning communities, field assignments.

EDHD 5100. International Topics for Graduate Students. (1.0-12.0 cr.; fall, spring, summer, every year) 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. (1.0-3.0 cr. [max 12.0 cr.]; summer, every year) 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. (1.0-6.0 cr.

[max 12.0 cr.]; A-F only; prereq Practitioners/graduates who have already completed undergraduate coursework; fall, spring, summer, every year) Special topics in education/human development.

**Educational Psychology (EPSY)**

College of Education and Human Development

EPSY 5101. Intelligence and Creativity. (3.0 cr.; A-F or Audit; [EPSY 3101]; fall, spring, summer, every year) Contemporary theories of intelligence and intellectual development and contemporary theories of creativity and their implications for educational practices and psychological research.

EPSY 5112. Knowing, Learning, and Thinking. (1.0 cr.; A-F or Audit; spring, summer, every year) Principles of human information processing, memory, and thought; mental operations in comprehension and problem solving; developing expertise and automaticity; emphasis on applied settings.

EPSY 5113. Psychology of Instruction and Technology. (3.0 cr.; spring, offered periodically) 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. (3.0 cr.; A-F or Audit; [EPSY 3301]; fall, spring, every year) Principles of educational psychology: how learning occurs, why it fails, and implications for instruction. Topics include models of learning, development, creativity, problem-solving, intelligence, character education, motivation, diversity, special populations.

EPSY 5115. Psychology of Adult Learning and Instruction. (3.0 cr.; fall, every year) Survey of adult learning/instruction. Emphasizes instructional design, learning theories, experience, individual differences, evaluation, tests/measurement, technology. Implications for curricular/instructional design in higher education, continuing education, professional/business related training.

EPSY 5119. Mind, Brain, and Education. (3.0 cr.; Student Option No Audit; [EPSY 3301 or equiv]; spring, every year) How educationally relevant skills/concepts develop in both typical/atypical children.

EPSY 5135. Human Relations Workshop. (4.0 cr.; fall, summer, every year) 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. (3.0 cr.; spring, every year) Participation of the practitioner learning in their setting. Topics include theory and research, teacher's role, essential components that make cooperation work, teaching social skills, assessment procedures, and collaborative teaching teams.

EPSY 5157. Social Psychology of Education. (3.0 cr.; A-F or Audit; fall, every year) 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. (3.0 cr.; A-F or Audit; spring, summer, every year) 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. (1.0-4.0 cr. [max 30.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq 5261 or intro statistics course; fall, every year) Designing/conducting a research study. Reviewing literature, formulating research problem, using different approaches to gather data, managing/analyzing data, reporting results.

EPSY 5220. Special Topics: Quantitative Methods. (1.0-4.0 cr. [max 30.0 cr.]; fall, spring, summer, offered periodically) Focus on special topics in methodological concepts involving theory, research, and practice in statistics, measurement, evaluation, and statistics education not covered in other courses.

EPSY 5221. Principles of Educational and Psychological Measurement. (3.0 cr.; fall, every year) 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 exceptional.

EPSY 5243. Principles and Methods of Evaluation. (3.0 cr.; [OLPD 5501]; fall, spring, summer, every year)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

Supervised teaching experience.

**EPSY 5281. Introduction to Computer Operations and Data Analysis in Education and Related Fields.** (3.0 cr.; prereq Statistics course; fall, odd years) How to use the computer to access/analyze information. National, state, local, and specialty Web sites that contain data of interest to social scientists. Using EXCEL, SPSS, SAS, and R for data analysis.

**EPSY 5300. Special Topics in Educational Psychology.** (1.0-0.0 cr.; fall, spring, summer, every year) Current issues in educational psychology or related areas not normally available through regular curriculum offerings.

**EPSY 5435. Introduction to School Counseling.** (3.0 cr.; A-F only; fall, spring, every year) History/evolution of school counselor role in schools. Duties/demands of school counselor. In-depth study of school counseling practices.


**EPSY 5451. College Students Today.** (3.0 cr.; A-F or Audit; fall, spring, summer, every year) Issues involving diverse populations of students in colleges/universities. Students develop program evaluation, counseling, and professional development of undergraduate students.

**EPSY 5461. Cross-Cultural Counseling.** (3.0 cr.; A-F or Audit; fall, every year) 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.** (3.0 cr.; fall, every year) 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.** (3.0 cr.; A-F only; fall, every year) Skills/knowledge required to consult/collaborate with school personnel, families, other professionals to maintain effective educational support.

**EPSY 5609. Family-centered Services.** (2.0 cr.; A-F or Audit; fall, every year) Methods for collaborating with families in education of children with disabilities. Family-centered approach to design of educational plans/procedures. Multicultural perspectives of family life/expectations for children.

**EPSY 5611W. Research-based Practices in Academic and Behavior Disabilities.** (3.0 cr.; A-F only; fall, every year) 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 5612. Understanding of Academic Disabilities.** (3.0 cr.; A-F or Audit; fall, spring, every year) Introduction to issues related to the education of students with academic disabilities (learning disabilities, mild mental intellectual disabilities,
and emotional/behavioral disabilities) including history, definition, assessment, classification, legislation, and intervention approaches.

**EPSY 5613. Foundations of Special Education I.** (3.0 cr.; A-F or Audit; fall, spring, summer, every year)
Organization of educational programs/services for people with disabilities. First course for students seeking to become licensed in special education.

**EPSY 5614. Assessment and Due Process in Special Education.** (4.0 cr.; A-F or Audit; prereq 5613 or equiv or #; fall, spring, summer, every year)
Assessment, planning, implementing educational programs for people with disabilities.

**EPSY 5615. Advanced Academic Interventions.** (3.0 cr.; A-F or Audit; prereq 5612; spring, every year)
Designing, implementing, and evaluating individual educational plans (IEPs) for special education service in learning disabilities, emotional/behavioral disorders, and mild mental/intellectual disabilities.

**EPSY 5616. Classroom Management and Behavior Analytic Problem Solving.** (3.0 cr.; fall, spring, summer, every year)
Assumptions, principles, procedures of problem solving approach to analyzing behaviors for classroom management. Conducting observations, intervening, evaluating behavioral change.

**EPSY 5617. Academic and Social Interventions for Students with Mild to Moderate Disabilities.** (3.0 cr.; A-F only; prereq EPSy 5611 and 5613 or #; fall, every year)
Use problem solving model to make data-based decisions regarding implementation of instruction for students with academic/behavioral difficulties.

**EPSY 5618. Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language.** (3.0 cr.; A-F or Audit; spring, every year)
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 5619. Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities.** (3.0 cr.; A-F only; spring, every year)

**EPSY 5621. Assessment and Instructional Design for Students with Developmental Disabilities.** (3.0 cr.; A-F or Audit; prereq 5613; spring, every year)
Methods/materials course. Functional/standards-based approaches to promoting academic learning in students with developmental disabilities.

**EPSY 5622. Programs and Curricula for Students with Developmental Disabilities.** (3.0 cr.; prereq 5621 or [5661 and 5662]; summer, every year)
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.

**EPSY 5624. Biomedical and Physical Impairments of Students with Developmental Disabilities.** (2.0 cr.; A-F or Audit; fall, summer, every year)

**EPSY 5625. Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction.** (2.0 cr.; A-F or Audit; fall, every year)
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.** (3.0 cr.; prereq [5621, 5622] or #; fall, summer, every year)
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.

**EPSY 5627. Seminar: Advanced issues in Learning Disabilities.** (3.0 cr.; A-F only; prereq Special Education graduate or licensure student or #; fall, summer, every year)
Read, reflect, discuss related to issues in field of LD. Topics examined through relevant research in field of LD.

**EPSY 5628. Characteristics of Moderate to Severe Learning Disabilities.** (3.0 cr.; A-F only; prereq Special Education graduate or licensure student or #; fall, summer, every year)
Characteristics of moderate/severe Learning Disabilities including (but not limited to) cognitive processing, language, attention/memory, co-existing conditions. Dyslexia, dysgraphia, dyscalculia.

**EPSY 5629. Strategic Instructional Methods for Students Academically At-Risk.** (3.0 cr.; A-F only; prereq Special Education graduate or licensure student or #; fall, every year)
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.

**EPSY 5631. Module 1: Introduction to Augmentative and Alternative Communication.** (1.0 cr.; A-F only; fall, spring, summer, every year)
Terms/concepts related to augmentative/alternative communication. Myths/facts regarding AAC.

**EPSY 5632. Module 2: Evidence-based Methods for AAC Assessment and Intervention.** (2.0 cr.; A-F only; prereq 5631 or #; fall, spring, summer, every year)
Evidence-based tools to conduct augmentative/alternative communication (AAC) assessments. AAC intervention plans. Data-driven strategies to evaluate progress.

**EPSY 5633. Module 3: Speech-generating Devices and High-Tech AAC.** (1.0 cr.; A-F only; prereq 5631 or #; fall, spring, summer, every year)
Identifying, funding, customizing high-tech augmentative/alternative communication (AAC) interventions. Manufacturer/community resources. Data-driven strategies to evaluate progress.

**EPSY 5634. Module 4: Assistive technology with Deaf/Hard-of-Hearing Students.** (1.0 cr.; A-F only; prereq Special Education licensure student or #; spring, summer, every year)
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.

**EPSY 5636. Sensory Impairments of Students With Developmental Disabilities.** (2.0 cr.; prereq 5613, 5614; fall, every year)
Characteristics of learners with visual/auditory impairments. Design of instructional programs to remediate or circumvent disabilities, including use of prosthetic devices.

**EPSY 5641. Foundations of Education for Individuals Who Are Deaf/Hard of Hearing.** (2.0 cr. [max 3.0 cr.]; A-F only; fall, every year)

**EPSY 5642. Early Childhood Intervention for Infants, Toddlers, and Preschoolers Who Are Deaf/Hard of Hearing.** (3.0 cr.; prereq Preservice teacher in deaf education licensure program or #; summer, every year)

**EPSY 5644. Language Development and Programming for Deaf/Hard of Hearing Children.** (3.0 cr.; fall, summer, every year)
Comparative study of the development of functional language in communicatively disabled and nondisabled individuals. Philosophies, programs, and practices focusing on the development of language with deaf
EPSY 5646. Reading and Writing Practices with Deaf/Hard of Hearing Children. (2.0 cr.; A-F only; prereq 5644; spring, summer, every year)
Study of the speech and hearing mechanisms, causes of hearing loss, and rehabilitation. Emphasis on instructional practices, aural rehabilitation in the educational setting, adaptive technology, and adaptations to optimize functional skills with individuals who are deaf or hard of hearing.

EPSY 5647. Aural and Speech Programming for Persons Who Are Deaf/Hard of Hearing. (3.0 cr.; fall, summer, every year)
Study of the speech and hearing mechanisms, causes of hearing loss, and rehabilitation. Emphasis on instructional practices, aural rehabilitation in the educational setting, adaptive technology, and adaptations to optimize functional skills with individuals who are deaf or hard of hearing.

EPSY 5648. Communication Systems for Children with Disabilities. (2.0 cr.; spring, summer, every year)

EPSY 5649. Models of Instructional Programming With Deaf and Hard of Hearing Students. (3.0 cr.; prereq [5641, 5644] or #; spring, summer, every year)
Design/development of portfolios for various models of educational service delivery systems for individuals with hearing loss. Emphasizes consultation skills, curriculum management/modifications, material/technology applications, and support service adaptations.

EPSY 5651. Evident-Based Practices in Deaf Education. (2.0 cr.; A-F only; prereq Special Education licensure student or #; fall, spring, every year)
Problem solving related to individual needs of students including educational policies/educational procedures in variety of educational settings.

EPSY 5656. Advanced Issues in Emotional Behavior Disorders. (3.0 cr.; A-F or Audit; fall, summer, every year)

EPSY 5657. Interventions for Behavioral Problems in School Settings. (3.0 cr.; A-F or Audit; prereq 5616, 5611; spring, summer, every year)
Comprehensive behavioral programs for students with social/emotional disabilities. Instructing students with social/emotional disabilities.

EPSY 5658. Characteristics of Moderate to Severe Emotional/Behavioral Disorders. (3.0 cr.; A-F only; prereq Special Education graduate or licensure student; fall, summer, every year)
Applying principles of assessment/individualized intervention for students with severe emotional behavior disorders (EBD).

EPSY 5651. Introduction to Autism Spectrum Disorder. (3.0 cr.; A-F only; fall, every year)

EPSY 5662. Assessment and Identification of Autism Spectrum Disorders. (2.0 cr.; A-F only; prereq 5661, Spec Ed grad or licensure student or #; summer, every year)
Selection/use of assessment procedures that may be used to screen/identify children with autism spectrum disorders.

EPSY 5663. Assessment and Intervention for Individuals with Autism Spectrum Disorders. (3.0 cr.; A-F only; prereq 5661, Spec Ed grad or licensure student or #; spring, every year)
Selection/use of range of procedures, including non-biased, specific assessments to screen/identify children with autism spectrum disorders. Specific intervention strategies designed to teach beginning communication/social skills to children with Autism Spectrum Disorders (ASD).

EPSY 5664. Transitions for Individuals with Autism Spectrum Disorders. (2.0 cr.; A-F only; prereq 5661, Spec Ed grad or licensure student or #; spring, every year)
Legal/practical aspects of transition planning, specifically for students with ASD.

EPSY 5681. Education of Preschool Children With Disabilities: Methods and Materials. (3.0 cr.; A-F only; prereq [5616, 5625] or #; spring, every year)
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.

EPSY 5682. Education of Infants and Toddlers with Disabilities: Methods and Materials. (3.0 cr.; [max 6.0 cr.; A-F only; prereq [5616, 5625] or #; spring, every year)
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.

EPSY 5690. Experimental Teaching Seminar: MED Culminating Project. (2.0 cr.; A-F only; =EPSY 5991; prereq #; fall, spring, every year)
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.

EPSY 5701. Practicum: Field Experience in Special Education. (2.0 cr. [max 24.0 cr.]; A-F or Audit; =EPSY 3701; prereq [5614, [FOE or SpEd grad or licensure student]] or #; fall, spring, summer, every year)
Observations and supervised support of teaching practice in schools or agencies serving children with disabilities in integrated programs.

EPSY 5702. Practicum in Autism Spectrum Disorder. (3.0 cr.; A-F only; prereq 5616, 5661, 5609, one of [5622 or 5644 or SLHS 5606], enrolled in Autism Spectrum Disorder certificate program, #; fall, spring, every year)
Four hundred hours of supervised work in settings where individuals with Autism Spectrum Disorder are served. On-site supervision is provided by qualified professionals. A University supervisor conducts on-site observations. Bi-weekly seminars.

EPSY 5703. Practicum in Applied Behavior Analysis. (3.0 cr.; A-F only; prereq 5616, 5657, Psy 4011, Applied Behavior Analysis Certificate student, #; spring, every year)
Four hundred hours of supervised experience in applied behavior analytic intervention with individuals with significant challenging behavior and learning difficulties. On-site supervision is provided by qualified professionals. A University supervisor conducts on-site observations. Bi-weekly seminars.

EPSY 5704. Practicum in Middle/Secondary Settings. (1.0 cr.; S-N only; fall, every year)
Preparation for practicing principles required for successful inclusion. Address model for best practices/requirements specified by Minnesota Board of Teaching.

EPSY 5705. Practicum in ECSE/Elementary Settings. (1.0 cr.; S-N only; fall, spring, every year)
Principles for successful inclusion of students with moderate disabilities. Address model for best practices.

EPSY 5706. Practicum in Moderate to Severe Developmental Disabilities. (2.0 cr.; S-N only; prereq Special Education licensure program or #; fall, spring, every year)
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. (3.0 cr.; S-N only; prereq [Special Education graduate or licensure student], #; fall, spring, every year)
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. (3.0 cr.; S-N only; prereq [Special Education grad or licensure student], #; fall, spring, every year)
Moderate/severe emotional behavior disorders. Transfer of theoretical knowledge to practical application.
application. Role of EBD teacher in variety of settings.

EPSY 5720. Special Topics: Special Education. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Lab/fieldwork approach. Generating action plan. Creating set of observation field notes. Collecting data. Specific problems/possibilities related to special education.

EPSY 5741. Student Teaching: Academic and Behavioral Strategist. (6.0 cr.; S-N only; spring, every year) Transfer of theoretical knowledge to practical application. Responsibilities of special education teacher in variety of settings.

EPSY 5742. Student Teaching: Autism Spectrum Disorders. (6.0 cr.; S-N only; prereq Special Education licensure program or #: fall, every year) Transfer of theoretical knowledge to practical application. Role/responsibilities of special education teacher in settings of elementary/secondary age.

EPSY 5751. Student Teaching: Deaf and Hard of Hearing. (1.0-6.0 cr. [max 10.0 cr.]; prereq #: fall, spring, every year) 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. (1.0-6.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #: fall, spring, summer, every year) Supervised experience in teaching or related work in schools or other agencies serving children and adolescents with learning disabilities.

EPSY 5753. Student Teaching: Early Childhood Special Education. (1.0-6.0 cr. [max 8.0 cr.]; S-N or Audit; prereq #: completion of all course requirements for license in ECSE; fall, spring, summer, every year) Supervised experience in teaching or related work in schools, agencies, or home settings with infants, toddlers, and preschoolers with disabilities and their families.

EPSY 5754. Student Teaching: Social and Emotional Disabilities. (1.0-6.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Completion of licensure courses for social and emotional disorders; #: fall, spring, summer, every year) Teach students with social and emotional disorders at public schools and other appropriate sites. Attend a weekly seminar on student teaching competencies.

EPSY 5755. Student Teaching: Developmental Disabilities, Mild/Moderate. (1.0-6.0 cr.; A-F or Audit; prereq Completion of all licensure coursework; #: fall, spring, every year) 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.

EPSY 5756. Student Teaching: Developmental Disabilities, Moderate/Severe. (1.0-6.0 cr.; A-F or Audit; prereq Completion of all licensure coursework; #: fall, spring, every year) 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.

EPSY 5761. Student Teaching in Early Childhood Special Education Settings for Children Aged Three to Five Years. (3.0 cr. [max 6.0 cr.]; S-N only; prereq Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE, #: completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible; fall, spring, every year) 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.

EPSY 5762. Student Teaching in Early Childhood Special Education for Children Aged Birth to Three Years. (3.0 cr. [max 6.0 cr.]; S-N only; prereq Licensure candidate in Early Childhood/Early Childhood Licensure Program, completion of all other licensure requirements for ECSE, #: completion of Birth-3 student teaching should be completed after age 3-5 student teaching when possible; fall, spring, every year) 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.

EPSY 5800. Special Topics in School Psychology. (1.0-9.0 cr.; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; fall, spring) Introduction to psychological and educational assessment for individuals who work with children, especially those experiencing academic and behavior problems. Study of standardized group and individual tests of intelligence, achievement, socio-emotional functioning, perception, reading, mathematics, adaptive behavior, and language.

EPSY 5802. Foundations of Developmental Psychology Across the Lifespan. (3.0 cr.; A-F only; fall, every year) Theories/research regarding human development across lifespan focusing on different contexts that shape development. Theoretical frameworks applied to study of human development. Cognitive, social, emotional development. Research methods in developmental psychology.

EPSY 5849. Observation and Assessment of the Preschool Child. (3.0 cr.; spring, summer, every year) Introduction to assessment principles and practices, including observational assessment methods, for children (birth to 5). Intended primarily for teachers in training and others interested in basic information regarding assessment and its relationship to intervention services for young children.

EPSY 5851. Engaging Diverse Students and Families. (3.0 cr.; prereq Honors senior or grad student; fall, spring, every year) Theoretical, practical, scientific issues involved in school psychological practice/training/research. Theoretical/empirical bases for developing appropriate dispositions, practices, strategies, illustrative lectures, discussions, group activities, case studies, presentations.

EPSY 5853. Biological Bases of Behavior. (3.0 cr.; A-F only; fall, every year) Biological basis of behavior with emphasis on relationship between functions/structures of brain.

EPSY 5991. Independent Study in Educational Psychology. (1.0-8.0 cr. [max 20.0 cr.]; A-F or Audit; =[EPSY 5690]; fall, spring, summer, every year) Self-directed study in areas not covered by regular courses. Specific program of study is jointly determined by student and advising faculty member.

EPSY 8112. Mathematical Cognition. (3.0 cr.; prereq 5114 or equiv; fall, even years) Cognitive science research. Papers investigating how adults/children understand fundamental mathematical concepts. Papers drawn from psychology, neuroscience, education literatures.

EPSY 8113. The Psychology of Scientific Reasoning. (3.0 cr.; prereq 5114 or equivalent; spring, odd years) 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.

EPSY 8114. Seminar: Cognition and Learning. (3.0 cr. [max 9.0 cr.]; fall, every year) Advanced study in critical analysis and application of contemporary psychological theory and research in cognition and learning for education.

EPSY 8115. Psychology of Instruction and Technology. (3.0 cr.; spring, odd years) Seminar including, but not limited to, learning and instructional theories, advanced and emerging technologies, and measurement and evaluation.

EPSY 8116. Reading for Meaning: Cognitive Processes in the Comprehension of Texts. (3.0 cr.; prereq #: fall, every year)
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.** (3.0 cr.; prerequisites #; spring, every year)
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.

**EPSY 8132. Personality Development and Socialization.** (3.0 cr.; prerequisites Personality or child psych course; spring, every year)
Major research and theoretical work. Developmental and educational influences on personality.

**EPSY 8215. Advanced Research Methodologies in Education.** (3.0 cr.; prerequisites 5221, 5247, [8252 or equiv]; fall, every year)

**EPSY 8216. Seminar: Research Processes in Psychological Foundations of Education.** (3.0 cr.; prerequisites 5221, 5247, [8252 or equiv]; fall, every 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.

**EPSY 8220. Special Topics: Seminar in Quantitative Methods.** (1.0-6.0 cr.; maximum 15 cr.; fall, spring, summer, offered periodically)
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 8221. Psychological Scaling.** (3.0 cr.; prerequisites 5221 or equiv, [8252 or equiv]; spring, odd years)

**EPSY 8222. Advanced Measurement: Theory and Application.** (4.0 cr.; prerequisites 5865; prerequisites 5221 or PSY 5862 or equiv, [8252 or equiv]; spring, even years)
Generalizability theory, item response theory, factor models for test items, binomial model. Application to problems of designing, linking assessments. Includes computer lab.

**EPSY 8224. Performance Assessment Design and Analysis.** (3.0 cr.; prerequisite 5221, [5262 or 8261 or 8251 or equiv]; spring, odd years)
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.

**EPSY 8225. Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating.** (3.0 cr.; prerequisites 5221, [8252 or equiv]; spring, odd years)
Principles/practices of test score quality assurance, standard setting/equating. Operational testing programs. Focus on achievement tests.

**EPSY 8226. Item Response Models: Theory and Applications.** (3.0 cr.; prerequisites 5221 or PSY 5862 or equiv, [8252 or equiv]; spring, odd years)
Item response theory. Application in education/psychology/social science. 1-, 2-, 3-parameter models for dichotomous/graded response models. Partial credit models for polytomous data.

**EPSY 8247. Advanced Interviewing and NVIVO.** (3.0 cr.; prerequisite 5247 or qualitative course or #; spring, every year)
Practice in designing, conducting, and analyzing interviews. Students design interview protocols, video/audio tape themselves conducting interviews, analyze their techniques, and critique others. Students use NVIVO to analyze data they have collected.

**EPSY 8251. Methods in Data Analysis for Educational Research I.** (3.0 cr.; prerequisite [EPSY 5261 or equiv] or undergrad statistics course; fall, every year)
Entry-level doctoral course. Two-semester sequence. In-depth coverage of widely used statistical methods and models. Prepares students for advanced statistical coursework including HLM and SEM.

**EPSY 8252. Methods in Data Analysis for Educational Research II.** (3.0 cr.; prerequisite [EPSY 8251 or 8262 or equiv]; spring, every year)
Second in two-semester sequence of entry-level doctoral coursework for students in education. In-depth coverage of widely used statistical methods/models. Prepares students for advanced statistical coursework including HLM/SEM.

**EPSY 8261. Statistical Methods I: Probability and Inference.** (3.0 cr.; prerequisite 3264 or 5261 or equiv; fall, spring, summer, every year)
Advanced theory, derivations of quantitative statistics. Descriptive statistics, probability, normal distribution. One- and two-sample hypothesis tests, confidence intervals. One-way analysis of variance, follow up tests.

**EPSY 8262. Statistical Methods II: Regression and the General Linear Model.** (3.0 cr.; prerequisite [EPSY 8261 or equiv]; fall, spring, every year)
Analysis of variance designs (two/three-way), repeated measures, correlation, simple/multiple regression methods, non-parametric procedures, multivariate analyses.

**EPSY 8264. Advanced Multiple Regression Analysis.** (3.0 cr.; prerequisites [8252 or equiv]; regression/ANOVA course, familiarity with statistical analysis package; fall, every year)
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.

**EPSY 8265. Factor Analysis.** (3.0 cr.; prerequisites [8252 or equiv or #]; spring, even years)
Factor analytic techniques/applications. Component, common factor, confirmatory analysis. Factor extraction, estimating number of dimensions. Rotation, factor scores, hierarchical factor analysis.

**EPSY 8266. Statistical Analysis Using Structural Equation Methods.** (3.0 cr.; prerequisite [EPSY 8264, [8252 or equiv]; spring, offered periodically)
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.

**EPSY 8267. Applied Multivariate Analysis.** (3.0 cr.; prerequisite [8252 or equiv]; familiarity with matrix algebra, knowledge of a computerized statistics package; spring, odd years)
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.

**EPSY 8268. Hierarchical Linear Modeling in Educational Research.** (3.0 cr.; prerequisite [8252 or equiv]; fall, every year)
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.

**EPSY 8269. Matrix Algebra for Statistical Modeling.** (2.0 cr.; prerequisites [8252 or 8262 or equiv]; fall, spring, offered periodically)

**EPSY 8271. Statistics Education Research Seminar: Studies on Teaching and Learning Statistics.** (3.0 cr.; maximum 9.0 cr.; fall, spring, offered periodically)
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 8272. Nonparametric Statistics in Education. (3.0 cr.; prereq [8252 or equiv]; spring, odd years) Estimation/inferential techniques outside normal-theory tests. One-, two-, K-sample procedures for between-within-subject differences, including factorial analysis of variance/covariance. Contingency table analysis (tests of independence, homogeneity).

EPSY 8281. Advanced Statistical Computing and Data Analysis. (3.0 cr.; prereq [5261 or equiv]; fall, even years) Cross-disciplinary course. Use SAS statistical package to perform data management, data analysis, report writing.

EPSY 8282. Statistical Analysis of Longitudinal Data. (3.0 cr.; prereq [8252 or equiv]; spring, every year) 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.

EPSY 8290. Special Topics: Seminar in Psychological Foundations. (1.0-6.0 cr. [max 15.0 cr.]; prereq #; fall, spring, summer, offered periodically) Students formulate research designs. Learning and cognition, social psychology, measurement, and statistics.

EPSY 8299. Quantitative Methods in Education Internship. (1.0-3.0 cr.; S-N only; prereq EPsy MA or PhD student, QME track; fall, spring, every year) Practical experience in applying concepts and skills in measurement, statistics, and evaluation in a real-world setting under supervision of a research professional.

EPSY 8300. Special Topics in Educational Psychology. (1.0-4.0 cr. [max 9.0 cr.]; fall, spring, every year) Issues or related coursework in areas not normally available through regular curriculum offerings.


EPSY 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

EPSY 8400. Topics: Counseling and Student Personnel Psychology. (1.0-3.0 cr. [max 9.0 cr.; fall, spring, every year) Current issues in counseling and student personnel psychology, or related coursework in areas not normally available through regular curriculum offerings.

EPSY 8402. Individual Counseling: Theory and Applications. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with CSPP subprog or #; fall, every year) Traditional and contemporary theories of counseling and psychotherapy. Applications to various settings and populations.

EPSY 8403. Social/Cultural Contexts: Counseling and Skills. (3.0 cr.; A-F or Audit; prereq Grad ed psy major with CSPP subprog or #; spring, every year) Broad 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.

EPSY 8404. Group Counseling: Theory, Applications, and Skills. (3.0 cr.; A-F or Audit; prereq Ed psy MA or PhD student with CSPP subprog or #; spring, every year) 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.

EPSY 8405. Career Development: Theory, Skills, and Counseling Applications. (3.0 cr.; A-F or Audit; prereq CSPP grad student; fall, every year) 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.

EPSY 8406. Professional Ethics for Counselors and Psychologists. (3.0 cr.; A-F only; prereq CSPP grad student; fall, every year) 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.

EPSY 8407. Assessing and Counseling Clients With Psychological Disorders. (4.0 cr.; A-F only; prereq CSPP PhD or MA student or #; spring, every year) Etiology, symptom patterns, and assessment/treatment for various psychological disorders. DSM diagnoses. Empirically validated psychological assessment and counseling methods. Field-based enquiry.

EPSY 8411. Advanced Counseling Research. (4.0 cr.; A-F or Audit; prereq Ed psy PhD student with CSPP subprog or #; fall, every year) Focus on critically reviewing counseling research, qualitatively and quantitatively integrating research, and designing valid research.

EPSY 8412. Seminar: Advanced Counseling Theory and Ethics. (4.0 cr.; A-F or Audit; prereq Ed psy PhD student with CSPP subprog or #; spring, every year) Comparative analysis of theoretical models and methods used in contemporary counseling and psychotherapy; ethical standards and models of ethical decision making for professional roles.

EPSY 8413. Personality Assessment of Adolescents and Adults. (3.0 cr.; A-F only; prereq [8407 or PSY 5604H or PSY 8111 or PSY 8112], doctoral student, #; spring, every year) Assessment interviews, objective personality assessments (e.g., MMPI-2), projective tests (e.g., Thematic Apperception Test), and assessment report writing.

EPSY 8431. Master's Research Seminar: CSPP. (3.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5261 or equiv, 5221 or equiv, EPsy MA student with CSPP subprog or #; spring, every year) Survey of research methods, data-based decision making, basic research design skills, and research simulation.

EPSY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

EPSY 8452. Psychological Aspects of Counseling Supervision. (3.0 cr.; prereq Ed psy PhD student with CSPP subprog or #; fall, every year) Theories, review of relevant research, demonstration, and in-class practice of supervision skills.

EPSY 8501. Counseling Pre-Practicum. (3.0 cr.; A-F or Audit; prereq [CSPP or genetic counseling] grad student; fall, every year) Overview of basic helping skills through demonstration, in-class practice.

EPSY 8502. Field Placement in Counseling and Student Personnel Psychology. (2.0 cr.; S-N or Audit; prereq 8501 or #; fall, spring, every year) Students participate under supervision in practitioner activities within a counseling work environment.

EPSY 8503. Counseling Practicum I. (1.0-4.0 cr.; A-F or Audit; prereq 8502 or #; fall, every year) 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.

EPSY 8504. Counseling Practicum II. (1.0-4.0 cr.; A-F or Audit; prereq 8503 or #; spring, every year) 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.

EPSY 8509. Supervision Practicum: CSPP. (1.0-2.0 cr. [max 6.0 cr.]; prereq [Ed psy PhD student with CSPP subprog] or #; fall, spring, every year)
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

**EPSY 8512. Internship: CSPP.** (1.0-12.0 cr.; S-N only; prereq EdPsy PhD student with CSPP subprog; fall, spring, summer, every year)
Supervised internship in counseling psychology.

**EPSY 8521. Practicum in Student Affairs and Student Development.** (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq EdPsy MA or PhD student with CSPP subprog or #; fall, spring, every year)
Supervised practice in university and college student development offices.

**EPSY 8522. Counseling Practicum: Advanced.** (3.0 cr. [max 12.0 cr.]; A-F only; prereq [Grad EdPsy PhD student with CSPP subprog] or #; instructor consent required after 2 repeats; fall, spring, every year)
Advanced skills practicum in counseling, counseling psychology, or student development.

**EPSY 8600. Special Topics: Special Education Issues.** (1.0-3.0 cr. [max 9.0 cr.]; fall, spring, every year)
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 8612. Seminar: Students with Academic Difficulties.** (3.0 cr.; A-F or Audit; fall, spring, every year)
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.** (3.0 cr.; A-F or Audit; fall, spring, every year)
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.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; % 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; fall, spring, summer, every year)
Doctoral Pre-Thesis Credits

**EPSY 8694. Research in Special Education.** (3.0 cr.; fall, spring, every year)
Design and implementation of research related to the unique developmental characteristics of exceptional learners.

**EPSY 8701. Doctoral Core Seminar: Special Education I.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq EdPsy PhD student with spec ed subprog or #; fall, every year)
Required for students with a family/life span focus on social development, behavioral interaction, and cultural interactions.

**EPSY 8702. Doctoral Core Seminar: Special Education II.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq 8701 or #; spring, every year)
Required for students focusing on communication/language/academics.

**EPSY 8706. Single Case Designs in Intervention Research.** (3.0 cr.; spring, offered periodically)
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.** (3.0 cr.; A-F only; prereq [Grad student, foundational course in learning or psychology]] or #; fall, every year)
Historical development of behavioral science. Thinking about learning/behavior, applying principles to common human experiences. Scholarly leadership skills.

**EPSY 8708. Functional Behavior Assessment.** (3.0 cr.; A-F only; prereq [Grad student, one [learning or psychology] course] or #; spring, every year)

**EPSY 8772. Seminar in Early Intervention.** (2.0 cr.; fall, spring, every year)
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.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**EPSY 8800. Special Topics in School Psychology.** (1.0-4.0 cr. [max 9.0 cr.]; spring, summer, every year)
Issues or related coursework in areas not normally available through regular curriculum offerings.

**EPSY 8811. Assessment in School Psychology I: Foundations of Academic Assessment.** (3.0 cr.; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; fall, every year)
Theories and models of psychosocial 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.

**EPSY 8812. Assessment in School Psychology II: Intellectual and Social-Emotional Domains.** (3.0 cr.; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; spring, every year)
Builds on EPSY 8811. Emphasizes gathering data on a child's intellectual and social-emotional functioning and educational progress.

**EPSY 8813. Assessment Practicum in School Psychology.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq EPSY 8801; graduate major with school psy subprog or #, & 8811 or & 8812; fall, spring, every year)
Students administer, score, and interpret standardized tests of intellectual, adaptive, and social-emotional assessment, and assess educational progress using both formal and informal instructional assessment strategies. All measures complement other facets of assessment presented in 8811 and 8812.

**EPSY 8815. Individual and System Socio-Emotional Interventions.** (3.0 cr.; A-F or Audit; prereq EPSY 8811, 8812, 8813; fall, spring, offered periodically)

**EPSY 8816. Individual and Systems Academic Interventions.** (3.0 cr.; A-F or Audit; prereq EPSY 8811, 8812, 8813; fall, spring, every year)
Theories, research, and practice underlying instructional/academic interventions for students. Systems consultation, organizational change.

**EPSY 8817. School Psychological Consultation.** (3.0 cr.; A-F or Audit; prereq EPSY 8811; spring, every year)
Practical application of applied behavioral theory guided by system ecological perspectives in problem-solving with school staff, parents, and students. Theories, stages, and issues of providing indirect services through consultation. Critical analysis of theory and research. Applied project in 8813 practicum placements.

**EPSY 8818. Intervention Practicum in School Psychology.** (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Grad ed psy major with school psy subprog, & 8815 or & 8816; fall, spring, every year)
Students design, implement, and evaluate interventions for individuals or groups of children and for system-level concerns under supervision of practicing school psychologists. Students observe school psychologists collaborate with educators and parents in intervention-related activities.

**EPSY 8821. Issues in School Psychology.** (3.0 cr.; A-F or Audit; prereq EPSY grad student with SchPsy subprog; fall, spring, every year)
School psychology as 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.

**EPSY 8822. Research in School Psychology.** (1.0-3.0 cr. [max 6.0 cr.]; A-F
only; prereq [8860, 8861, 5616] or equiv. [grad ed psy major with school psy subprog] or #; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq 8821; fall, spring, every year) 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.

EPSY 8831. Practicum: School Psychological Services. (1.0-3.0 cr. [max 6.0 cr.]; prereq Grad ed psy major with school psy subprog; fall, spring, every year) Field placements in schools. Experiences may include consultation, assessment, direct service to individuals or groups, and report writing. Supervised on-site as well as by University through required participation in seminar.

EPSY 8832. Clinical/Community Practice in School Psychology. (1.0-3.0 cr. [max 6.0 cr.]; prereq Grad ed psy major with school psy subprog; fall, spring, summer, every year) Supervised experience in assessment and intervention planning of children referred to psychoeducational settings; training in broad range of approaches to problems of adjustment in school-age children and their families, schools, and community settings.

EPSY 8841. Practicum: Instruction and Supervision in School Psychology. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad ed psy major with school psy subprog or #; fall, spring, summer, every year) Didactic training/supervised experience teaching. Knowledge/skills in strategies for effective classroom instruction/supervision in individual/small group instruction. Construct teaching portfolio.

EPSY 8842. Internship: School Psychological Services. (1.0-10.0 cr.; S-N or Audit; prereq Grad ed psy major with school psy subprog or #; fall, spring, summer, every year) Advanced field placement. Full-time supervised experience for one year or part-time for no more than two years.

EPSY 8849. Assessment in Early Childhood. (3.0 cr.; A-F or Audit; prereq [B811, B812] or equivalent in related programs; spring, odd years) 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.

EPSY 8850. Doctoral Seminar in School Psychology: Research, Training, Practice, Policy Issues, and Action Plans. (3.0 cr.; A-F only; prereq [[Grad student in school psychology, coursework in school psychology] or advanced PhD student from related department], #; fall, spring, every year) 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.

EPSY 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]: No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

EPSY 8905. History and Systems of Psychology: Landmark Issues in Educational Psychology. (3.0 cr.; prereq Ed psy PhD student; spring, every year) Critical issues in learning and cognition, statistics and measurement, counseling, school psychology, social psychology of education, and special education.

EPSY 8993. Directed Study: Educational Psychology. (1.0-10.0 cr. [max 20.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Arranged independently with individual faculty members.

EPSY 8994. Research Problems: Educational Psychology. (1.0-6.0 cr. [max 18.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Research methodology, techniques, and literature. Students participate in formulating/executing research proposal.

EE 5121. Transistor Device Modeling for Circuit Simulation. (3.0 cr.; prereq [3115, 3161, CSE grad student] or %; fall, spring, offered periodically) Basics of MOS, bipolar theory. Evolution of popular device models from early SPICE models to current industry standards.

EE 5141. Introduction to Microsystem Technology. (4.0 cr.; prereq [3161, 3601, CSE grad student] or %; spring, every year) Development of control system design ideas; frequency response techniques in design of single-input/single-output (and MI/MO) systems. Robust control concepts. CAD tools.

EE 5235. Robust Control System Design. (3.0 cr.; prereq CSE grad, 3015, 5231 or #; spring, every year) Design, implementation, and computer-aided design of robust control systems. Robust control concepts. CAD tools.


EE 5301. VLSI Design Automation I. (3.0 cr.; prereq [2301, CSE grad student] or %; fall, spring, offered periodically)


EE 5302. VLSI Design Automation II. (3.0 cr.; prereq [5301, CSE grad student] or %; spring, every year)


EE 5323. VLSI Design I. (3.0 cr.; prereq [2301, 3115, CSE grad student] or %; fall, every year)

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.

EE 5324. VLSI Design II. (3.0 cr.; prereq [5323, CSE grad student] or %; spring, every year)

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.

EE 5327. VLSI Design Laboratory. (3.0 cr.; prereq [4301, 5323 or 5323], CSE grad student] or %; spring, every year)

Complete design of an integrated circuit. Designs evaluated by computer simulation.

EE 5329. VLSI Digital Signal Processing Systems. (3.0 cr.; prereq [5323 or 5323], CSE grad student] or %; fall, spring, offered periodically)


EE 5333. Analog Integrated Circuit Design. (3.0 cr.; prereq [3115, CSE grad student] or %; fall, every year)

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).

EE 5351. Applied Parallel Programming. (3.0 cr.; prereq [4363 or equivalent], programming experience (C/C++ preferred); fall, every year)

Parallel programming/architecture. Application development for many-core processors.

EE 5361. Image Processing and Applications. (3.0 cr.; prereq [551, 551], CSE grad student] or %; spring, every year)

Two-dimensional digital filtering/transforms. Application to image enhancement, restoration, compression, and segmentation.

EE 5549. Digital Signal Processing Structures for VLSI. (3.0 cr.; prereq [4541, CSE grad student] or %; fall, spring, offered periodically)

EE 5583. Error Control Coding. (3.0 cr.; prereq [3025, Math 2373] or equiv), [CSE grad student or %]; spring, offered periodically)

EE 5585. Data Compression. (3.0 cr.; prereq CSE grad student or %; fall, spring, offered periodically)

EE 5601. Introduction to RF/Microwave Engineering. (3.0 cr.; prereq [3601, CSE grad student] or %; fall, spring, offered periodically)

EE 5602. RF/Microwave Circuit Design. (3.0 cr.; prereq [5601 or equiv], [CSE grad student or #]; fall, spring, offered periodically)
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).

EE 5611. Plasma-Aided Manufacturing. (4.0 cr.; A-F or Audit; [ME 5361]; prereq [[ME 3321, ME 3322] or equiv], [upper div CSE or grad student] or %; fall, spring, offered periodically)

EE 5613. RF/Microwave Circuit Design Laboratory. (2.0 cr.; A-F only; prereq [5601 or 5601], CSE grad student or %; spring, every year)
Scattering parameters, planar lumped circuits, transmission lines, RF/microwave substrate materials, matching networks/tuning elements, resonators, filters, combiners/dividers, couplers. Integral lab.

EE 5616. Antenna Theory and Design. (3.0 cr.; prereq [5601 or 5601], CSE grad student or %; fall, spring, offered periodically)
Antenna performance parameters, vector potential/radiation integral, wire antenna structures, broadband antenna structures, microstrips/aperture theory, antenna measurements.

EE 5621. Physical Optics. (3.0 cr.; prereq [3015, CSE grad student] or %; spring, every year)
Physical optics principles, including Fourier analysis of optical systems/images, scalar diffraction theory, interferometry, and coherence theory. Diffraction optical elements, holography, astronomical imaging, optical information processing, microoptics.

EE 5622. Physical Optics Laboratory. (1.0 cr.; prereq [[5621 or 5621], CSE grad student] or %; spring, every year)

EE 5624. Optical Electronics. (4.0 cr.; prereq [[3601 or Phys 3002], CSE grad student] or %; fall, every year)
Fundamentals of lasers, including propagation of Gaussian beams, optical resonators, and theory of laser oscillation. Polarization optics, electro-optic, acousto-optic modulation, nonlinear optics, phase conjugation.

EE 5627. Optical Fiber Communication. (3.0 cr.; prereq [3015, 3601, CSE grad student] or %; fall, spring, offered periodically)

EE 5628. Fiber Optics Laboratory. (1.0 cr.; prereq [[5627 or 5627], CSE grad student] or %; spring, every year)
Experiments in fiber optics. Dielectric waveguides, modes in optical fibers, fiber dispersion/attenuation, properties of light sources/detectors, optical communication systems.

EE 5629. Optical System Design. (2.0 cr.; prereq CSE grad student or %; fall, spring, offered periodically)

EE 5653. Physical Principles of Magnetic Materials. (3.0 cr.; prereq CSE grad student or %; fall, every year)

EE 5655. Magnetic Recording. (3.0 cr.; prereq CSE grad student or %; spring, offered periodically)
Magnetic fundamentals, recording materials, idealized models of magnetic records/ reproduction, analytic models of magnetic record heads, sinusoidal magnetic recording, digital magnetic recording, magnetic recording heads/media, digital recording systems.

EE 5657W. Physical Principles of Thin Film Technology. (4.0 cr.; prereq CSE grad student or %; fall, every year)

EE 5705. Electric Drives in Sustainable Energy Systems. (3.0 cr.; prereq [4701, CSE grad student] or %; spring, offered periodically)

EE 5707. Electric Drives in Sustainable Energy Systems Laboratory. (1.0 cr.; prereq 5705 or 5507; spring, offered periodically)
Lab to accompany 5705.

EE 5721. Power Generation Operation and Control. (3.0 cr.; prereq [4721, CSE grad student] or %; spring, every year)
Engineering aspects of power system operation. Economic analysis of generation plants & scheduling to minimize total cost of operation. Scheduling of hydro resources and thermal plants with limited fuel supplies. Loss analysis, secure operation. State estimation, optimal power flow. Power system organizations.

EE 5725. Power Systems Engineering. (3.0 cr.; prereq [4721, CSE grad student] or %; spring, odd years)

EE 5741. Advanced Power Electronics. (3.0 cr.; prereq CSE grad student or %; spring, offered periodically)

EE 5745. Wind Energy Essentials. (2.0 cr.; prereq CSE grad student or %; fall, every year)

EE 5940. Special Topics in Electrical Engineering I. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Special topics in electrical and computer engineering. Topics vary.

EE 5950. Special Topics in Electrical Engineering II. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
Special topics in electrical and computer engineering. Topics vary.

EE 5960. Special Topics in Electrical Engineering III. (1.0-4.0 cr.; [max 12.0 cr.]; fall, spring, every year)

Special topics in electrical and computer engineering. Topics vary.

EE 5970. Special Topics in Electrical Engineering IV. (1.0-4.0 cr.; [max 12.0 cr.]; prereq EE or CompE grad student or #; only available for Rochester Campus; fall, spring, offered periodically)

Special topics in electrical and computer engineering. Topics vary.

EE 5990. Curricular Practical Training. (1.0-2.0 cr. [max 6.0 cr.]; S-N or Audit; prereq Grad student; #; fall, spring, summer, every year)

Industrial work assignment involving advanced electrical engineering technology. Review by faculty member. Final report covering work assignment.

EE 8100. Advanced Topics in Electronics. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; ) Topics vary according to needs and staff availability.

EE 8141. Advanced Heterojunction Transistors. (3.0 cr.; prereq 5664 or #; ) Recent developments in device modeling with emphasis on bipolar junction transistors. High-level effects in base and collector regions and their interrelationship.

EE 8161. Physics of Semiconductors. (3.0 cr.; prereq #; fail, spring, offered periodically)


EE 8163. Quantum Electronics. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)


EE 8190. Electronics Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq #; fall, spring, offered periodically)

Current literature, individual assignments.

EE 8210. System Theory Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, offered periodically)

Current literature, individual assignments.

EE 8213. Advanced System Theory. (3.0 cr.; prereq I T grad student; #; ) Generalized linear systems; applications, structural properties, computational approaches, classification, functional behavior, and synthesis.

EE 8215. Nonlinear Systems. (3.0 cr.; prereq #; fall, spring, offered periodically)

Current topics in stability analysis of nonlinear systems, design of controllers for nonlinear systems, discrete-time and stochastic nonlinear systems.

EE 8230. Control Theory Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, offered periodically)

Current literature, individual assignments.

EE 8231. Optimization Theory. (3.0 cr.; prereq #; fall, offered periodically)

Introduction to optimization in engineering; approximation theory. Least squares estimation, optimal control theory, and computational approaches.

EE 8235. Advanced Control Topics. (3.0 cr.; spring, offered periodically)


EE 8300. Advanced Topics in Computers. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; ) Topics vary according to needs and staff availability.

EE 8310. Advanced Topics in VLSI. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; ) Topics vary according to needs and staff availability.

EE 8320. Advanced Topics in Design Automation. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad student or #; fall, offered periodically)

State-of-the-art automated design tools for electronic system design. Topics vary.

EE 8331. CMOS Data Converters: A/D and D/A. (3.0 cr.; prereq 5333 or #; fall, spring, every year)

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.

EE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

EE 8337. Analog Circuits for Wire/Wireless Communications. (3.0 cr.; A-F or Audit; prereq 5333; spring, every year)

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.

EE 8360. Computer Systems Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)

Current literature, individual assignments.

EE 8367. Parallel Computer Organization. (3.0 cr.; [CSCI 8205]; prereq 5364 or CSci 5204; spring, every year)


EE 8370. Computer Aided Design Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq [EE or ComP E or CSci] grad major; #; fall, spring, every year)

Current literature, individual assignments.

EE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

EE 8500. Seminar: Communications. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)

Current literature, individual assignments.

EE 8510. Advanced Topics in Communications. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; ) Topics vary according to needs and staff availability.

EE 8520. Advanced Topics in Signal Processing. (1.0-3.0 cr. [max 12.0 cr.]; prereq #; spring, every year)

Topics vary according to needs and staff availability.

EE 8581. Detection and Estimation Theory. (3.0 cr.; prereq 5531 or #; spring, offered periodically)

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-sounder signal design and processing.

EE 8591. Predictive Learning from Data. (3.0 cr.; prereq CSE grad student or #; fall, every year)

Basic elements and application areas of artificial intelligence (AI) related to design and implementation of expert systems (ES). Knowledge representation, reasoning under uncertainty, ES and their environment, planning, natural language processing (NLP), intelligent computer-aided instruction (ICAI), and AI tools (software and hardware).


EE 8610. Seminar: Electronics, Fields, and Photonics. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq EE grad major or #; fall, spring, every year)

Students are assigned readings from current literature and make individual presentations.
to class. From time to time outside speakers present research papers.


EE 8620. Advanced Topics in Magnetics. (1.0-3.0 cr. [max 12.0 cr.]; prereq 5653 or #; fall, offered periodically) Topics vary according to needs and staff availability.

EE 8630. Advanced Topics in Electromagnetics. (1.0-3.0 cr. [max 12.0 cr.]; ) Topics vary according to needs and staff availability.

EE 8660. Seminar: Magnetics. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year) Current literature, individual assignments.

EE 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; % 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; fall, spring, summer, every year) TBD

EE 8725. Advanced Power System Analysis and Economics. (3.0 cr.; prereq 4721, CSE grad student or #; fall, offered periodically) 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.


EE 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

EE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year) Thesis credit.

EE 8920. Teaching Experience in Electrical and Computer Engineering. (1.0 cr. [max 3.0 cr.]; S-N only; prereq PhD candidate in electrical engineering, passed written preliminary exam; spring, every year) 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.

EE 8925. Ethics in Electrical and Computer Engineering. (1.0 cr.; S-N only; prereq Grad student in electrical engineering; fall, every year) Topics on issues such as data integrity, professional conduct, authorship, plagiarism, patents, copyrights, conflicts, and disclosures. Students study cases, present findings, and write report.

EE 8940. Special Investigations. (1.0-3.0 cr.; prereq 1-3 cr [may be repeated for cr]; IT grad student or #; fall, spring, summer, every year) Studies of approved theoretical or experimental topics.

EE 8950. Advanced Topics in Electrical and Computer Engineering Spring. (1.0-3.0 cr. [max 12.0 cr.]; prereq Cr ar [may be repeated for cr]; #; fall, spring, summer, every year) Topics vary according to needs and staff availability.

EE 8965. Plan C Project I. (3.0 cr.; prereq Grad EE major; fall, spring, summer, every year) Project topics arranged between student and adviser. Written reports.

EE 8967. Plan C Project II. (1.0-3.0 cr.; prereq EE grad student; fall, spring, summer, every year) Project topics arranged between student and adviser. Written reports.

EE 8970. Graduate Seminar I. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq Grad student; fall, every year) Recent developments in electrical engineering, related disciplines.

EE 8980. Graduate Seminar II. (1.0 cr. [max 3.0 cr.]; S-N or Audit; spring, every year) Recent developments in electrical engineering, related disciplines.

Endodontics (ENDO) School of Dentistry


ENDO 5304. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; fall, summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new/unique techniques.

ENDO 5305. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; prereq 5304; fall, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5306. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; spring, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5307. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; prereq 5306; summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5308. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; prereq 5307; #; fall, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5309. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; prereq 5308; spring, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5310. Advanced Clinical Endodontics. (1.0-6.0 cr.; A-F or Audit; prereq 5309; summer, every year) Diagnosis/treatment of clinical cases. Complex cases, new techniques.

ENDO 5311. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq %; summer, every year) Each student is assigned weekly periods (8 hours/week) and is responsible for all emergencies in the endodontic clinic during this time.

ENDO 5312. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5311; fall, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5313. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5312; spring, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5314. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5313; summer, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5315. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5314; %; fall, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5316. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5315; spring, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.

ENDO 5317. Advanced Endodontic Emergency. (1.0 cr.; S-N or Audit; prereq 5316; summer, every year) Students assigned 8 hrs/wk), are responsible for emergencies in clinic.
ENDO 5329. Review of Cases. (1.0 cr.; A-F or Audit; prereq %; fall, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of surgery cases before surgery.

ENDO 5330. Review of Cases. (1.0-2.0 cr.; A-F or Audit; prereq 5329; spring, summer, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery.

ENDO 5331. Review of Cases. (1.0 cr.; A-F or Audit; prereq 5330; fall, every year) Oral/visual presentation of endodontic cases with follow up. Presentation of cases before surgery.

ENDO 5332. Review of cases. (1.0 cr.; A-F or Audit; prereq %; spring, every year) Oral and visual presentation of endodontic cases with follow up. Presentations of surgery cases before surgeries.

ENDO 5400. Advanced Endodontics for the General Dentist. (1.0 cr.; S-N or Audit; prereq %; fall, spring, offered periodically) Advanced diagnosis/treatment of endodontics in clinic/office setting. Internship.


ENDO 8001. Research in Endodontics. (1.0-2.0 cr.; prereq %; fall, every year) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis.

ENDO 8002. Research in Endodontics. (1.0-2.0 cr.; prereq %; spring, summer, every year) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis.

ENDO 8004. Research in Endodontics. (1.0-2.0 cr.; prereq %; fall, every year) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis.

ENDO 8005. Research in Endodontics. (1.0-2.0 cr.; A-F only; prereq %; spring, every year) Organized literature review in area of student's interest, selection of thesis project, and completion of research and thesis.

ENDO 8310. Literature Review. (2.0 cr.; A-F or Audit; prereq %; fall, every year) Critical review of classic and current endodontic literature.

ENDO 8311. Literature Review. (2.0-3.0 cr.; A-F or Audit; prereq 8310; spring, summer, every year) Critical review of classic and current endodontic literature.

ENDO 8312. Literature Review. (2.0 cr.; A-F or Audit; prereq 8311; fall, every year) Critical review of classic/current endodontic literature.

ENDO 8313. Literature Review. (2.0 cr.; A-F or Audit; prereq 8312; spring, every year) Critical review of classic/current endodontic literature.

ENDO 8320. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq %; fall, every year) Pulpal and periapical pathology, diagnosis, and treatment planning.

ENDO 8321. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq 8320; spring, summer, every year) Pulpal/periapical pathology, diagnosis, treatment planning.

ENDO 8322. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq 8321; fall, every year) Pulpal/periapical pathology, diagnosis, treatment planning.

ENDO 8323. Advanced Endodontic Lecture. (1.0 cr.; A-F or Audit; prereq 8322; spring, every year) Pulpal/periapical pathology, diagnosis, treatment planning.

ENDO 8335. Endodontics/Periodontics Seminar. (1.0 cr.; S-N or Audit; prereq %; spring, every year) Discussions of endo-perio problems.

ENGL 5001. Ph.D. Colloquium: Introduction to Literary Theory and Literary Studies in the Modern University. (3.0 cr.; fall, every year) 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. Readings in Narrative. (3.0 cr. [max 9.0 cr.]; =[ENGL 3020, ENGL 3020H]; prereq Grad student or #; fall, odd years) Issues related to reading/understanding narrative in various interpretive contexts. Topics may include "The 19th-century English (American, Anglophone) Novel," "Introduction to Narrative," or "Techniques of the Novel."

ENGL 5040. Theories of Film. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, offered periodically) 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.

ENGL 5090. Readings in Special Subjects. (1.0-4.0 cr. [max 9.0 cr.]; =[ENGL 5100]; prereq Grad student or #; fall, spring, every year) 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. Readings in Middle English Literature and Culture. (3.0 cr. [max 9.0 cr.]; =[ENGL 3110]; prereq Grad student or #; spring, every year) Wide reading in literature of period. Relevant scholarship/criticism. Topics vary. See Class Schedule.

ENGL 5121. Readings in Early Modern Literature and Culture. (3.0 cr. [max 9.0 cr.]; =[ENGL 3141]; prereq Grad student or #; spring, every year) 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).

ENGL 5150. Readings in 19th-Century Literature and Culture. (3.0 cr. [max 9.0 cr.]; =[ENGL 3141]; prereq Grad student or #; fall, spring, offered periodically) 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 5510. Readings in Criticism and Theory. (3.0 cr. [max 9.0 cr.]; =[AFRO 5627, AFRO 3627, ARTH 3627]; prereq Grad student or #; spring, even years) Major works of classical criticism in the English critical tradition from Renaissance to 1920. Leading theories of criticism from 1920 to present. Theories of fiction, narratology. Feminist criticisms. Marxist criticisms. Psychoanalytic criticisms. Theories of postmodernism.

ENGL 5597. Harlem Renaissance. (3.0 cr.; =[AFRO 5627, AFRO 3627, ARTH 3627]; prereq Grad student or #; fall, spring, every year) Multidisciplinary review of Jazz Age's Harlem Renaissance: literature, popular culture, visual arts, political journalism, major black/white figures.
ENGL 5711. Introduction to Editing. (4.0 cr.; fall, spring, summer, every year) Editor-writer relationship, manuscript reading, author querying, rewriting, style. Some discussion of copy editing. Students develop editing skills by working on varied writing samples.

ENGL 5712. Advanced Editing. (4.0 cr.; prereq [5401, 5711] or grad student in Engl; spring, odd years) Editing long text. Fiction, children’s literature, translations, indexes. Workshop/seminar.

ENGL 5743. History of Rhetoric and Writing. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Assumptions of classical/contemporary rhetorical theory, especially as they influence interdisciplinary field of composition studies.

ENGL 5790. Topics in Rhetoric, Composition, and Language. (3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Topics specified in Class Schedule.

ENGL 5800. Practicum in the Teaching of English. (1.0-3.0 cr.; prereq Grad student or #; fall, every year) 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.

ENGL 5805. Writing for Publication. (3.0 cr.; prereq Grad student or #; fall, even years) Conference presentations, book reviews, revision of seminar papers for journal publication, and preparation of a scholarly monograph. Style, goals, and politics of journal and university press editors/readers. Electronic publication. Professional concerns.

ENGL 5992. Directed Readings, Study, or Research. (1.0-3.0 cr. [max 45.0 cr.]; fall, spring, summer, every year) TBD Prereq-Grad student or instr consent.

ENGL 6090. Seminar in Special Subjects. (3.0 cr. [max 12.0 cr.]; fall, every year) 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. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) 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 8150. Seminar in Shakespeare. (3.0 cr. [max 9.0 cr.]; fall, spring, every year) Perspectives/works vary with offering and instructor. Text, performance, interpretation, criticism, feminism, intellectual history. Recent topics: Shakespeare at comedy, "Elegy by W.S." (Is it Shakespeare’s?), Roman political tragedies. Topics specified in Class Schedule.


ENGL 8180. Seminar in 20th-Century British Literature and Culture. (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, offered periodically) Sample topics: modernism, Bloomsbury Group, working-class/immigrant literature. Topics specified in Class Schedule.

ENGL 8190. Seminar in 20th-Century Anglophone Literatures and Cultures. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) 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 8290. Topics, Figures, and Themes in American Literature. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Sample topics: Dickinson, 19th-century imperialism, Faulkner, San Francisco poets, humor, Chaplin, Hitchcock, and popular culture. Topics specified in Class Schedule.

ENGL 8300. Seminar in American Minority Literature. (3.0 cr. [max 12.0 cr.]; fall, offered periodically) Sample topics: Harlem Renaissance, ethnic autobiographies, Black Arts movement. Topics specified in Class Schedule.

ENGL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ENGL 8400. Seminar in Post-Colonial Literature, Culture, and Theory. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) 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. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ENGL 8510. Studies in Criticism and Theory. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) 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. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Brief history of feminist criticism, in-depth treatment of contemporary perspectives/issues. Topics specified in Class Schedule.

ENGL 8600. Seminar in Language, Rhetoric, Literacy, and Composition. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Students read/conduct research on theories/literature relevant to cross-disciplinary fields committed to writing and to teaching writing.

ENGL 8610. Seminar in Language and Discourse Studies. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Current theoretical/methodological issues in discourse analysis. Social/psychological determinants of language choice (class, ethnicity, gender) in various English-speaking societies. Application to case studies, review of scholarship.

ENGL 8625. Dissertation Seminar: Preparing the Book List and Prospectus. (2.0 cr.; prereq Engl PhD student in [3rd or 4th yf], at least 12 cr completed; spring, every year) 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.


ENGL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer
ENGW 5102. Advanced Fiction Writing. 
(4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, spring, every year)
Advanced workshop for graduate students with considerable experience in writing fiction.

ENGW 5104. Advanced Poetry Writing. 
(4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, every year)
Advanced workshop for graduate students with considerable experience in writing poetry. Explore new poetic possibilities/read contemporary poetry/poetics.

ENGW 5106. Advanced Literary Nonfiction Writing. 
(4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit this course; fall, offered periodically)
Advanced workshop for graduate students with considerable experience in writing literary nonfiction.

ENGW 5110. Topics in Advanced Fiction Writing. 
(4.0 cr. [max 16.0 cr.]; prereq %; fall, spring, offered periodically)
Special topics in fiction writing. Topics specified in Class Schedule.

ENGW 5120. Topics in Advanced Poetry. 
(4.0 cr. [max 16.0 cr.]; prereq %; spring, every year)
Special topics in poetry writing. Topics specified in Class Schedule.

ENGW 5130. Topics in Advanced Creative Writing. 
(4.0 cr. [max 16.0 cr.]; prereq #; fall, spring, every year)
Workshop. Might include work in more than one genre.

ENGW 5202. Journal and Memoir Writing. 
(3.0 cr.; fall, spring, summer, every year)
Using memory in writing, from brainstorming to drafting to revision, in several genres (poems, traditional memoir essays, fiction). How diverse cultures shape memory differently.

ENGW 5205. Screenwriting. 
(4.0 cr.; Student Option No Audit; prereq [JR or sr], one EngW 3xxx course, [permission number available in creative writing office], students may not audit this course.; fall, spring, every year)
Advanced workshop. Contact creative writing program for specific description.

ENGW 5210. Topics in Advanced Literary Nonfiction. 
(4.0 cr. [max 16.0 cr.]; prereq %; fall, spring, offered periodically)
Special topics in essay writing (e.g., arts reviewing, writing about public affairs, writing in personal voice). Topics specified in Class Schedule.

ENGW 5310. Reading as Writers. 
(4.0 cr. [max 8.0 cr.]; Student Option No Audit; prereq Students may not audit course.; fall, every year)
Special topics in reading fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

ENGW 5993. Directed Study in Writing. 
(1.0-4.0 cr. [max 18.0 cr.]; spring, summer, every year)
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. 
(4.0 cr.; Student Option No Audit; prereq Students may not audit this course; fall, every year)
Contemporary writing in fiction, poetry, drama, and nonfiction. Primarily reading course rather than writing course.

ENGW 8120. Seminar: Writing of Poetry. 
(4.0 cr. [max 16.0 cr.]; prereq %; spring, every year)
Focuses on full-length book (e.g., novel, short story collection). Assignments in common, individual project.

ENGW 8120. Seminar: Writing of Poetry. 
(4.0 cr. [max 8.0 cr.]; prereq %; spring, every year)
Focuses on exploration and practice of various styles. Assignments in common and individual project.

ENGW 8130. Seminar: Writing of Literary Nonfiction. 
(4.0 cr. [max 8.0 cr.]; prereq %; fall, spring, every year)
Advanced workshop. Assignments in common and individual projects.

(4.0 cr. [max 8.0 cr.]; prereq Creative writing MFA student, #; fall, every year)
For students working on their creative project.

(4.0 cr. [max 8.0 cr.]; prereq Creative writing MFA student, #; fall, every year)
Students work on creative project.

(4.0 cr. [max 8.0 cr.]; prereq Creative writing MFA student, #; fall, every year)
Students work on their creative project.

ENGW 8170. MFA Practicum: EngW 1101W. 
(3.0 cr.; S-N only; prereq Creative writing MFA student, #; fall, spring, every year)
Teaching Practicum for Teaching Assistants assigned to EngW 1101W.

(4.0 cr.; A-F only; prereq MFA creative writing program grad student; fall, every year)
Thesis preparation course for advanced graduate students in the creative writing MFA program.

ENGW 8310. Topics in Creative Writing. 
(4.0 cr. [max 8.0 cr.]; prereq [English or creative writing] grad major or %; fall, spring, offered periodically)
Special topics in fiction, literary nonfiction, poetry. Topics specified in Class Schedule.

ENT 5009. Pesticides in Horticulture: Their Use and Abuse. 
(3.0 cr.; A-F or Audit; prereq [[4015 or 4251], PIPA 2001] or #; spring, every year)
History of pesticide use. Case studies on specific pesticide issues, such as DDT, atrazine, Temik, and imidacloprid. Pesticides use, application methods, environmental concerns. Training for pesticide certification license for Minnesota. Test given near campus during course.

ENT 5011. Insect Structure and Function. 
(4.0 cr.; A-F or Audit; prereq 3005 or #; fall, spring, every year)
Comparative study of insect structures/functions from evolutionary perspective. Introduction to physiology of digestion, respiration, other organ systems.

ENT 5021. Insect Biodiversity and Evolution. 
(4.0 cr.; fall, every year)

ENT 5025. Field Methods in Insect Taxonomy. 
(1.0 cr.; prereq An undergraduate course in entomology is preferred.; fall, odd years)

ENT 5041. Insect Ecology. 
(3.0 cr.; prereq Biol 5041 or EBB 5122 or #; )
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.
ENT 5045. Insect Population Dynamics. (3.0 cr.; A-F or Audit; prereq 3005 or #; fall, odd years)

ENT 5051. Scientific Illustration of Insects. (3.0 cr.; fall, even years)

ENT 5061. Insects, Aquatic Habitats, and Pollution. (3.0 cr.; A-F or Audit; prereq [3005, Biol 3407, FW 2001, EEB 4601] or #; fall, every year)

ENT 5121. Applied Experimental Design. (4.0 cr.; (AGRO 5121); prereq Stat 5021 or equiv or #; )
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.

ENT 5241. Ecological Risk Assessment. (3.0 cr.; prereq #; spring, every year)
Evaluating current/potential impact of physical, chemical, biological agents on ecosystems. Identifying ecological stressors, assessing level of exposure, measuring ecological responses, communicating/managing risks. Class participation, two reaction papers, final exam, small-group project.

ENT 5275. Medical Entomology. (3.0 cr.; prereq #; fall, even years)
Biological of arthropod vectors of human disease. Emphasizes disease transmission and host, vector, and pathogen interactions.

ENT 5341. Biological Control of Insects and Weeds. (3.0-4.0 cr.; prereq 3001, Biol 1009, EEB 3001 or grad; spring, offered periodically)
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.

ENT 5351. Insect Pathology. (2.0 cr.; prereq 5011; fall, spring, every year)

ENT 5361. Aquatic Insects. (4.0 cr.; A-F or Audit; prereq #; spring, every year)
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.

ENT 5371. Principles of Systematics. (3.0 cr.; prereq #; offered alt yrs; spring, every year)
Theoretical/practical procedures of biological systematics. Phylogeny reconstruction, including computer assisted analyses, morphological/molecular approaches, species concepts, speciation, comparative methods, classification, historical biogeography, nomenclature. Use/value of museums.

ENT 5900. Basic Entomology. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year)
For graduate students who need to make up certain deficiencies in their biological science background.

ENT 5910. Special Problems in Entomology. (1.0-6.0 cr. [max 10.0 cr.]; prereq #; fall, spring, every year)
Individual field, lab, or library studies in various aspects of entomology.

ENT 5920. Special Lectures in Entomology. (2.0-4.0 cr. [max 12.0 cr.]; fall, spring, every year)
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. (1.0-3.0 cr.; A-F or Audit; prereq 3005 or equiv or #; fall, spring, every year)
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.

ENT 8041. Advanced Insect Genetics. (2.0 cr.; A-F or Audit; prereq 3005 or equiv or #; fall, spring, every year)
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.

ENT 8051. Toxicology. (2.0 cr.; prereq [5011, organic, inorganic] chem courses, biochem course) or #; )
Chemistry, mode of action of conventional insecticides. Insect growth regulators, microbial pesticides. Transgenic viruses, genetically modified plants. Offered alternate years.

ENT 8061. Scientific Communication and Ethics. (1.0 cr.; S-N or Audit; )
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. (1.0-3.0 cr.; prereq 3020 or 3200; spring, offered periodically)
Current research on bees, wasps, ants, and termites. Student critiques and research reports.

ENT 8210. Colloquium in Insect Evolution. (1.0-3.0 cr.; prereq 5371 or #; )
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.

ENT 8240. Colloquium in Insect Ecology. (1.0-2.0 cr.; prereq 5041 or 5045 or #; fall, spring, every year)
Advanced topics.

ENT 8300. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq #; fall, spring, every year)
Oral and written reports on and discussion by students of selected topics from current literature.

ENT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ENT 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ENT 8594. Research in Entomology. (1.0-16.0 cr. [max 36.0 cr.]; S-N or Audit; fall, spring, every year)
Directed research.

ENT 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

ENT 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

ENT 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

Environmental Sciences, Policy, and Management (ESPM)
University of Minnesota Twin Cities Graduate Education Catalog

College of Food, Agricultural and Natural Resource Sciences

ESPM 5019. Business, Natural Environment, and Global Economy. (2.0 cr.; A-F only; =MGMT 5019); fall, every year)

Business strategies that affect natural environment. Ways business strategies/practices can produce win-win outcomes for the environment and business.

ESPM 5031. Applied Global Positioning Systems for Geographic Information Systems. (3.0 cr.; A-F or Audit; =ESPM 3031); prereq Grad student or #; spring, every year)

GPS principles, operations, techniques to improve accuracy. Datum, projections, and coordinate systems. Differential correction, accuracy assessments discussed/applied in lab exercises. Code/cARRIER phase GPS used in exercises. GPS handheld units, PDA based ArcPad/GPS equipment. Transferring field data to/from desktop systems, integrating GPS data with GIS.

ESPM 5061. Water Quality and Natural Resources. (3.0 cr.; prereq Grad student or #; fall, spring, every year)

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. (4.0 cr.; prereq [one college course in ecology, one college course in [plant science or botany]] or #; fall, every year)


ESPM 5101. Conservation of Plant Biodiversity. (3.0 cr.; A-F or Audit; =ESPM 3101); prereq Grad student or #; fall, every year)

Introduction to principles underlying assessment/conservation of plant biodiversity at individual, population, and community levels. Case studies in management of biodiversity to restore or maintain ecosystem function. Genetics, timber harvesting, invasive species, plant reproduction.

ESPM 5102. Managing International Natural Resources Programs and Projects: Forests, Water and Land Use. (3.0 cr.; A-F only; fall, every year)

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. (4.0 cr.; A-F or Audit; =ESPM 3108); prereq Sr or grad student; fall, every year)

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 recycling, resilience. Emerging principles for design of sustainable managed ecosystems, provision of ecological services.

ESPM 5111. Hydrology and Water Quality Field Methods. (3.0 cr.; A-F or Audit; =ESPM 3111); prereq Grad student or #; spring, every year)


ESPM 5202. Environmental Conflict Management, Leadership, and Planning. (3.0 cr.; A-F or Audit; =ESPM 3202W); prereq Grad or #; spring, every year)

Negotiation of natural resource management issues. Use of collaborative planning. Case study approach to conflict management, strategic planning, and building leadership qualities. Emphasizes analytical concepts, techniques, and skills.

ESPM 5204. Sustainable Community Based Natural Resource Management. (3.0 cr.; A-F only; spring, every year)

Part of Nepal Semester Abroad Program in spring 2014. Principles of natural resource based sustainable development in developing country setting. International perspectives on sustainable resource use/management in developed/developing countries.

ESPM 5211. Survey, Measurement, and Modeling for Environmental Analysis. (3.0 cr.; =ESPM 3211); prereq Grad student or #; spring, every year)

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. (3.0 cr.; =ESPM 3241W); prereq Grad student or #; spring, every year)

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.

ESPM 5242. Methods for Natural Resource and Environmental Policy. (3.0 cr.; A-F or Audit; =ESPM 3422); prereq [3241 or equiv]; 3261 [or grad student]; fall, every year)

Methods, formal and informal, for analyzing environmental/natural resource policies. How to critically evaluate environmental/natural resources policies using economic/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.

ESPM 5245. Sustainable Land Use Planning and Policy. (3.0 cr.; A-F or Audit; =ESPM 3245); prereq Grad student or #; fall, every year)

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. (3.0 cr.; A-F or Audit; =LAS 3251, ESPM 3251); prereq Grad student or #; fall, every year)

International perspectives on resource use in developing countries. Integration of natural resource issues with social, economic, and policy considerations. Agriculture, forestry, agroforestry, non-timber forest products, water resources, certification, development issues. Latin American case studies.

ESPM 5256. Natural Resource Law and the Management of Public Lands and Waters. (3.0 cr.; A-F or Audit; =ESPM 3256); prereq 3241. [sr or grad student]; spring, every year)


ESPM 5261. Economics and Natural Resources Management. (4.0 cr.; A-F or Audit; =ESPM 3261); prereq Grad student or #; fall, every year)


ESPM 5295. GIS in Environmental Science and Management. (4.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)

Application of spatial data inventory/analysis in complex environmental planning problems. Spatial data collection. Database development methods, including GPS, DLG, TIGER, NWI data, and spatial analysis. Topics identified by non-University partners.

ESPM 5402. Biometeorology. (3.0 cr.; prereq MATH 1271, PHYS 1201, STAT 3011, [Grad or #]; fall, every year)

Calculus-based introduction to atmospheric boundary layer (ABL), interface between earth's surface and the atmosphere. ABL development/turbulence, surface energy.
balance, ABL clouds, air quality, microclimate, observational/modeling methods.

**ESPM 5480. Topics in Natural Resources.**
(1.0-4.0 cr. [max 6.0 cr.; prereq Sr or grad student; fall, spring, summer, every year]) Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.

**ESPM 5555. Wetland Soils.**
(3.0 cr.; A-F or Audit; =SOIL 5555; prereq 1125 or 2125 or equiv or #; & 4511 recommended; fall, every year) 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.

**ESPM 5575. Wetlands.**
(3.0 cr.; =ESPM 3575; prereq 3575, [sr or grad student or #]; spring, every year) 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.

**ESPM 5601. Principles of Waste Management.**
(3.0 cr.; A-F or Audit; prereq 1125 or 2125; Biol 1002/1009 or Chem 1021, Stat 3011, ApEc 1101 or #; spring, every year) Waste and waste management principles. Issues, problems, and solutions in remediating waste stream. MSW and yard waste composting, WTE incineration operation, ash disposal, recycling, land fill requirements, direct land disposal, regulatory trends, and case studies.

**ESPM 5602. Regulations and Corporate Environmental Management.**
(3.0 cr.; A-F only; =MGMT 3602, ESPM 3602; prereq APEC 1101 or ECON 1101; spring, every year) Concepts, major issues relating to industrial ecology and industry as they are influenced by current standards/regulations at local, state, and national levels.

**ESPM 5603. Environmental Life Cycle Analysis.**
(3.0 cr.; A-F only; prereq Math 1142 or [Math 1271, Math 1282], Econ 1101 or ApEc 1101; fall, every year) 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."

**ESPM 5604. Environmental Management Systems and Strategy.**
(3.0 cr.; A-F only; =ESPM 3604); fall, every year) Environmental problems such as climate change, ozone depletion, and loss of biodiversity.

**ESPM 5605. Recycling: Extending Raw Materials Supplies.**
(3.0 cr.; A-F only; =ESPM 3605); spring, every year) Principles of recycling. Role of recycling in raw materials utilization, energy, and the environment. Recycling processes for number of commonly recycled materials/products. Properties, environmental implications of recycling.

**ESPM 5606. Pollution Prevention: Principles, Technologies, and Practices.**
(3.0 cr.; A-F only; =ESPM 3606W; prereq CHEM 1011 or [CHEM 1015, CHEM 1017] or #; fall, every year) Pollution prevention, green chemistry, cleaner production, Design for the Environment (DfE), life cycle management. Pollution prevention practices and technologies that reduce industrial emissions/costs by preventing pollution.

**ESPM 5607. Industrial Biotechnology and the Environment.**
(3.0 cr.; A-F only; =ESPM 4607); prereq BIOL 1009, CHEM 1021, grad student; spring, every year) Biotechnology pertaining to biobased products development and their environmental impact.

**ESPM 5609. Air Pollution Impacts, Management, and Ethical Challenges.**
(3.0 cr.; A-F or Audit; =ESPM 4609); prereq [CHEM 1021 or CHEM 1015], [BIOL 1001 or BIOL 1009 or CHEM 1017]; spring, every year) Air pollutants, sources, and impacts. Humans, plants, animals, soil, water, atmosphere, and planet. Emission rates, measurement, control technologies, air pollution laws/regulations. Perspectives and personal ethics related to air pollution, how they impact professional/civic life.

**ESPM 5703. Agroforestry in Watershed Management.**
(3.0 cr.; =ESPM 3703); prereq Grad student or #; spring, every 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.

**ESPM 5811. Environmental Interpretation.**

**Experimental and Clinical Pharmacology (ECP)**
College of Pharmacy

**ECP 5220. Regulatory Issues in Drug Research.**
(1.0-2.0 cr.; prereq ECP grad student or Pharm.D. professional student or #; fall, every year) Regulatory issues encountered in conducting drug research trials. Performing different aspects of clinical trials. Lectures, readings, small group discussions, homework assignments.

**ECP 5290. Clinical Clerkship.**
(1.0-8.0 cr. [max 16.0 cr.; prereq Grad experimental and clinical pharmacology; fall, every year]) Supervised study of pharmaceutical services at University of Minnesota Medical Center, Fairview or affiliated institutions.

**ECP 5620. Drug Metabolism and Disposition.**
(3.0 cr.; A-F or Audit; prereq Grad student or #; spring, odd years) 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.

**ECP 5993. Directed Study in Experimental and Clinical Pharmacology.**
(1.0-4.0 cr. [max 8.0 cr.]; fall, spring, every year) 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.**
(1.0-4.0 cr.; fall, spring, every year) Student works with faculty adviser to design a scientific research project.

**ECP 8100. Seminar.**
(1.0 cr. [max 8.0 cr.]; prereq ECP grad student or #; fall, spring, every year) Selected topics in experimental/clinical pharmacology.

**ECP 8200. Research Problems.**
(1.0-8.0 cr. [max 16.0 cr.]; prereq Grad SACP major [ECP Track] or #; fall, spring, summer, every year) Individually designed research experience directed at contemporary problems related to drug use.

**ECP 8210. Clinical Therapeutics.**
(3.0 cr.; prereq SACP grad major in ECP track or #) Topics in clinical pharmacology that illustrate continuum of pathophysiology of a disease state, its contemporary treatment, problems or controversial issues with treatment approaches, strategies to advance therapy. Lectures, readings.

**ECP 8220. Experimental and Clinical Pharmacology.**
(3.0 cr.; prereq SACP grad major [ECP track] or #; fall, every year) Theory of advanced methodologies, applications, and evaluation techniques used to determine efficacy/toxicity of new drug therapies. Techniques for collecting/evaluating data.

**ECP 8230. Principles of Clinical Pharmacology.**
(2.0 cr.; A-F only; prereq Grad student in Experimental and Clinical Pharmacology or #; fall, every year) Factors determining drug exposure, drug-receptor pharmacology, drug response. Personalized medicine including drug interactions, obesity, age (geriatrics/pediatrics), critical illness, therapeutic evaluation, drug development.

**ECP 8290. Clinical Clerkship.**
(2.0 cr.; prereq Grad SACP major in ECP track or #; fall, spring, offered periodically)
Supervised study of pharmaceutical services at Fairview-University Medical Center or affiliated institutions.

ECP 8333. FTE: Master's. (1.0 cr.; No Grade Associated; fall, spring, summer, every year) FTE: master's. Prereq-Master's student, adviser and DGS consent.

ECP 8400. Pharmacometrics. (3.0 cr.; prereq ECP grad major or #; fall, every year) Theory/application of contemporary methods for analysis of concentration-time data and exposure-response relationships.

ECP 8410. Population Pharmacokinetic Modeling. (2.0 cr.; A-F or Audit; spring, summer, every year) Theoretical background for using mixed effects model in population analysis. Building fixed/random effects into a pharmacostatistical model. Project allows students to become familiar with a contemporary population pharmacokinetic analysis program.

ECP 8420. Clinical Trial Simulation. (2.0 cr.; prereq ECP grad or #; spring, every year) Theory/application of contemporary methods of using simulations to design more efficient/informative clinical trials.

ECP 8430. Advances in Pharmacometrics Modeling and Simulation. (1.0 cr. [max 6.0 cr.]; S-N only; prereq Grad student in ECP or PHM or #; fall, spring, every year) Modeling/simulation at interface between physiological/pharmacological processes. Current literature, discussion groups. Computer applications using relevant software programs.

ECP 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; fall, spring, summer, every year) FTE: doctoral. Prereq-Doctoral student, adviser and DGS consent.

ECP 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) Doctoral pre-thesis credits.

ECP 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer, 10 cr total required [Plan A only]; fall, spring, summer, every year) Thesis credits: master's.

ECP 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer, 24 cr required; fall, spring, summer, every year) Thesis credit: doctoral.

ECP 8900. Advanced Topics in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; max 8.0 cr.; prereq ECP grad program or #; fall, spring, every year) Topic varies depending on faculty teaching course.

ECP 8992. Directed Readings in Experimental and Clinical Pharmacology. (1.0-2.0 cr. [max 4.0 cr.]; fall, spring, every year) TBD

ECP 8993. Directed Study in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; fall, spring, every year)

ECP 8994. Directed Research in Experimental and Clinical Pharmacology. (1.0-4.0 cr.; max 8.0 cr.; prereq [Grad ECP, adviser, DGS] consent; fall, spring, summer, every year) Directed research in experimental and clinical pharmacology.

Family Medicine and Community Health (FMCH) Medical School

FMCH 5345. Curriculum Design and Teaching Strategies for Medical Education I. (3.0 cr.; A-F or Audit; prereq concurrent enrollment in 5346, #; spring, every year) Identifying/developing course goals. Developing course, teacher, learner evaluations. Students must also take 5346, which follows immediately after 5345.

FMCH 5346. Curriculum Design and Teaching Strategies for Medical Education II. (1.0 cr.; A-F or Audit; prereq 5345, #; summer, odd years) 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.

FMCH 5564. Family Practice Seminar. (1.0 cr. [max 9.0 cr.]; O-N or Audit; prereq MD or DO degree; fall, spring, every year) 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 pharmacy, human sexuality.

FMCH 5560. Principles of Geriatrics I. (1.0 cr. [max 5.0 cr.]; P-N or Audit; prereq Medical School or dental school or GNP School graduate; fall, every year) First in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5561. Principles of Geriatrics II. (1.0 cr. [max 5.0 cr.]; P-N or Audit; prereq Medical School or dental school or GNP School graduate; ) Second in two-course sequence. Survey of major topics in geriatric medicine. Epidemiology, etiology, diagnosis, and treatment of major geriatric syndromes and illnesses.

FMCH 5950. Clinical Issues in Human Sexuality. (2.0 cr.; O-N or Audit; prereq Enrollment in health sci grad programs in CSPP, Psy, SW or FSOS or #; fall, spring, every year) Assessment and treatment techniques pertaining to common sexual problems.

FMCH 5955. Directed Study. (1.0-10.0 cr.; O-N or Audit; #; qualified students may arrange for work on a tutorial basis; fall, spring, summer, every year) Studies on special topics as arranged between student and faculty.

Family Policy Minor (FPOL) College of Education and Human Development

FPOL 8000. Family Policy Perspectives. (3.0 cr.; A-F or Audit; spring, every year) Policies that effect families, from perspective of several academic disciplines. Faculty from academic units across the University teach theory/policy analysis skills from their disciplines. How to analyze public/private policies for their impact on families. Advocacy. Current policy making activities at the legislature, county boards, and other public sector policymaking bodies.

Family Social Science (FSOS) College of Education and Human Development

FSOS 5014. Quantitative Family Research Methods I. (3.0 cr.; prereq Grad student or #; fall, every year) Family research methods, issues associated with multiple levels of analysis. Conducting family-focused data analyses using basic/intermediate methods (through ANOVA and multiple regression), including power analysis. Ethical issues involved in family research such as IRB/HIPAA regulations.

FSOS 5015. Family Research Laboratory. (1.0 cr.; S-N or Audit; prereq Grad student or #; fall, every year) Application of basic family research methods into experiential learning using statistical software. Analyses that correspond with problem situations in 5014 that involve secondary data analyses. Using statistical software for basic family research preparation. To work with quantitative family data sets.

FSOS 5032. Family Systems Theories and Interventions. (3.0 cr.; prereq Grad student or #; fall, offered periodically) Systemic/cybernetic frameworks as they apply to diverse families. Thinking systemically about families across multiple ecological systems. How to identify crucial epistemological issues in theoretical/applied areas of family science. Theoretical frameworks. Experiential role-playing, guest presenters, videos, field work, research projects, reading clubs, class discussion.

FSOS 5101. Family Systems. (3.0 cr.; =[FSOS 3102]; prereq grad student; ) Family systems and other family theories focusing on the dynamics and processes relevant to family life. Diversity issues related to gender, ethnicity, sexual orientation, and disability. Issues related to divorce, single parenthood, and remarriage are covered. Family strengths and family problems are integrated.
FSOS 5150. Special Topics in Family Social Science. (1.0-4.0 cr.; [max 24.0 cr.]; prereq #; fall, summer, every year) Review of research/scholarly thought. Topics specified in Class Schedule.

FSOS 5193. Directed Study in Family Social Science. (1.0-6.0 cr.; prereq FSOS or grad student in related field; fall, spring, summer, every year) TBD

FSOS 5426. Alcohol and Drugs: Families and Culture. (3.0 cr.; [FSOS 3428]; fall, spring, summer, offered periodically) 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. (3.0 cr.; [FSOS 3429]; fall, spring, summer, offered periodically) 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 5900. Special Topics in Family, Youth, and Community. (1.0-4.0 cr.; [max 20.0 cr.]; fall, spring, summer, every year) Topics not dealt with in regular courses. Topics vary by offering.

FSOS 5902. Family Education Perspectives. (3.0 cr.; A-F or Audit; fall, summer, every year) Origins, evolution, and critique of alternative perspectives on family education. Implications for educators, programs, and participants.

FSOS 5904. Contemporary Family Education. (3.0 cr.; A-F or Audit; fall, offered periodically) Contemporary conditions of and transitions in family life. Emphasizes implications for educators and educational programs.

FSOS 5906. Program Planning in Family Education. (3.0 cr.; A-F or Audit; spring, every year) Curriculum research/theory. Alternative perspectives, their concomitant implications for families. Development of and evaluation of family education curriculum/programs.

FSOS 5908. Family and Work Relationships. (3.0 cr.; A-F only; summer, every year) Interactions of work/family roles, responsibilities, and aspirations. Resources, legal aspects, gender.

FSOS 5912. Sexuality Education. (3.0 cr.; A-F only; fall, offered periodically) Development, delivery, and evaluation of sexuality education curriculum/programs.

FSOS 5914. Education for Family Communication. (3.0 cr.; A-F only; spring, every year) Development, delivery, and evaluation of curriculum/programs related to family communication.

FSOS 5932. Introduction to Parent Education. (1.0 cr.; A-F only; fall, summer, every year) Philosophy, history, and models of parent education. Ethical, critically reflective professional practice.

FSOS 5936. Advanced Practice of Parent Education. (3.0 cr.; prereq 5935 or FE 5702 or #; fall, offered periodically) Evolving perspectives of parent education. Emphasizes psycho-dynamic, conceptual-change approaches. Reflective/dialogic approaches for working with parents in understanding beliefs and examining their origins/consequences. Issues related to diversity, self-awareness, ethics, and evaluation.


FSOS 5942. Everyday Experiences of Families. (2.0 cr.; A-F or Audit; fall, every year) 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 5943. Parent Learning and Development: Implications for Parent Education. (2.0 cr.; A-F only; fall, every year) Research/theoretical perspectives critiqued. Challenging assumptions, examining competencies.

FSOS 5944. Parent Education Curriculum. (2.0 cr.; A-F only; prereq 5943 or #; fall, every year) How parent learning/development, child development, and family systems theories influence curriculum approaches/materials in parent education. Student develop construct, critique, and select curriculum.

FSOS 5945. Teaching and Learning in Parent Education. (2.0 cr.; A-F only; prereq 5943 or #; spring, every year) Students select/use parent education teaching strategies/processes to meet needs of various populations of adult learners. Critical reflection, ethical practices, parent educator competencies.

FSOS 5946. Assessment and Evaluation in Parent Education. (2.0 cr.; A-F only; prereq 5943 or #; spring, every year) Theory, terminology, issues, and approaches in assessment/evaluation. Application to monitoring parent education program performance, assessing program quality, and measuring parent learning/development.

FSOS 5949. Student Teaching in Parent Education. (2.0 cr.; A-F only; prereq #; spring, every year) Supervised parent education practice to meet individual student needs/interests. Online discussion, reflection, cooperative learning.

FSOS 8001. Conceptual Frameworks in the Family. (3.0 cr.; A-F only; fall, every year) Major theoretical models about families, emphasizing sociohistorical context.

FSOS 8002. Advanced Family Conceptual Frameworks. (3.0 cr.; A-F or Audit; spring, every year) 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.

FSOS 8003. Current Issues in Family Science. (3.0 cr.; spring, every year) 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. (3.0 cr.; fall, offered periodically) 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. (3.0 cr.; A-F only; fall, spring, offered periodically) Approaches to qualitative family research evaluation. Phenomenological, feminist, grounded theory, content analytic, ethnomet hodological, ethnographic, program evaluation. Theory, research examples, student projects.

FSOS 8014. Quantitative Family Research Methods II. (3.0 cr.; A-F only; prereq [5014 or equiv], [8001 or equiv], [two stat courses or #]; spring, every year) 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.

FSOS 8015. Advanced Qualitative Family Research Methods. (3.0 cr.; A-F only; prereq 8013 or #; fall, every year) Applying qualitative research methods to understand individual/collective meaning, experience within/across diverse family systems.

FSOS 8031. Family of Origin. (3.0 cr.; S-N or Audit; prereq Preference given to marriage and family therapy students; fall, spring, offered periodically) In-depth study of each student's family of origin in a group of other students and a clinical faculty therapy supervisor.

FSOS 8033. Problems in Families. (3.0 cr.; prereq [8032 or equiv], #; spring, offered periodically) 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.

FSOS 8034. Marriage and Family Therapy Supervision. (3.0 cr.; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, offered periodically) Theories of supervision, structures for supervision, methods of supervision, evaluation process, legal/ethical issues. Therapist-client-supervisor relationships, potential problems, contextual issues.

FSOS 8035. Assessment of Couples and Families. (3.0 cr.; A-F or Audit; prereq 8014 or equiv or #; ) Issues in research and clinical assessment. Assumptions and values underlying assessment approaches. Specific assessment techniques discussed, evaluated, and administered. Ethical, legal, and practical issues.

FSOS 8036. Couple/Marriage and Family Therapy Research. (3.0 cr.; A-F only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, offered periodically) Historic/contemporary approaches to C/MFT research with emphasis on prevention, intervention, dissemination from variety of perspectives.

FSOS 8037. Ethical, Legal, and Professional Issues in Mental Health Practice: Issues with Couples and Families. (2.0-10.0 cr.; A-F or Audit; prereq [8032, practicum or internship exper] or [grad student in cooperating mental health practice prog who has completed 1 course on therapy with children; fall, spring, offered periodically) Boundaries and triangles, gender inequities, family law, confidentiality and reporting requirements, dual roles, client diversity, and value clashes.

FSOS 8039. Clinical Interventions for Couples. (3.0 cr.; A-F or Audit; prereq 8032 or equiv or #; fall, offered periodically) 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.

FSOS 8043. Family Theory Development: A Systemic Perspective. (3.0 cr.; prereq 8001 or equiv or #, FSOS PhD student beyond 1st yr; fall, spring, offered periodically) Concepts and principles of systems and ecosystems and their applications in family science; emphasizes theoretical integration and development of research models with appropriate methodologies.

FSOS 8047. Integrative Research Seminar. (3.0 cr.; prereq 8001 or equiv, 8013 or equiv, 8014 or equiv; spring, every year) 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.

FSOS 8101. Family Stress, Coping, and Adaptation. (3.0 cr.; prereq 8001 or equiv, research methods course; fall, spring, offered periodically) 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.

FSOS 8104. Family Policy Seminar. (3.0 cr.; spring, offered periodically) 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 8105. Family Gerontology. (3.0 cr.; prereq 4154 or equiv or #; spring, offered periodically) 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.


FSOS 8107. Family Values Research: Theories and Critical Methods. (3.0 cr.; prereq 8013 or equiv, 8014 or equiv or #; WCFE 8920 recommended;) 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.

FSOS 8150. Topics in Family Social Science. (1.0-6.0 cr.; prereq FSOS grad student or #; fall, spring, summer, every year) Special seminars on timely topics.

FSOS 8151. Preparation for Independent Teaching in Family Studies. (1.0 cr. [max 3.0 cr.; S-N only; prereq #; spring, every year) Practicum. Skills to independently teach family sciences courses to undergrads.

FSOS 8160. Topics in Marriage and Family Therapy. (1.0-6.0 cr.; prereq MFT grad student or #; fall, offered periodically) Special seminars on timely topics.

FSOS 8193. Directed Study in Family Social Science. (1.0-6.0 cr. [max 12.0 cr.; prereq Doctoral student in FSOS or related field; fall, spring, summer, every year) Directed study.

FSOS 8200. Orientation for Family Social Science. (1.0 cr.; S-N or Audit; fall, every year) TBD

FSOS 8201. Teaching Family Courses in Higher Education I. (3.0 cr.; S-N or Audit; prereq 12 FSOS grad cr; teaching assistant exper recommended; fall, spring, offered periodically) 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.

FSOS 8202. Teaching Family Courses in Higher Education II. (3.0 cr.; S-N or Audit; prereq 8201 or equiv; fall, spring, offered periodically) Under faculty supervision, students teach an undergraduate course in family social science for which they have appropriate academic preparation and professional experience.

FSOS 8275. Clinical Consultation with Couples and Families. (3.0 cr.; S-N or Audit; prereq #; required for grad FSOS majors in marriage and family therapy prog; fall, spring, offered periodically) Supervised services serve as a consultation group working with community clinicians and their clients, utilizing a one-way window and observation room; opportunities for cotherapy.

FSOS 8295. Couple/Marriage Family Therapy Practicum. (1.5-12.0 cr.; S-N only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, summer, every year) Clinical placement doing marriage/family clinical practice. Supervision of couple/marriage. Family therapy in community setting.

FSOS 8296. Couple/ Marriage Family Therapy Internship. (1.0-12.0 cr.; S-N only; prereq FSOS doctoral student enrolled in Couple Family Therapy (CFT) or #; fall, spring, summer, every year)
Supervised clinical/other professional practical experiences in couple/marriage, family therapy.

FSOS 8297. Supervision of Supervision. (1.0-3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq MFT student; #; fall, spring, summer, every year)
Hands-on practicum to gain AAMFT-approved supervisor status.

FSOS 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

FSOS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

FSOS 8550. Advanced Topics in Family Social Science. (1.0-6.0 cr.; : A-F or Audit; prereq FSoS PhD student; fall, spring, every year)
Special seminars on topics suited to student needs.

FSOS 8560. Advanced Clinical Topics in Marriage and Family Therapy. (1.0-6.0 cr.; [max 36.0 cr.]; A-F or Audit; prereq FSoS PhD student or #; spring, offered periodically)
Special advanced topics or seminars.

FSOS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
(tbd)

FSOS 8755. Master’s Paper: Plan B Project. (1.0-6.0 cr.; S-N or Audit; prereq FSoS MA student; fall, spring, summer, every year)
Graduate faculty work with students on research for Plan B paper.

FSOS 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

FSOS 8794. Directed Research in Family Social Science. (1.0-6.0 cr.; [max 12.0 cr.]; prereq Grad FSoS major; fall, spring, summer, every year)
TBD

FSOS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**Finance (FINA)**

Curtis L. Carlson School of Management

**FINA 8802. Theory of Capital Markets I: Discrete Time.** (2.0 cr.; prereq [Econ 8101, Econ 8102, business admin PhD student] or #; spring, every year)
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.

**FINA 8803. Theory of Capital Markets II: Continuous Time.** (2.0 cr.; prereq [Econ 8101, Econ 8102, Business admin PhD student] or #; spring, every year)
Continuous-time financial economics. Emphasizes mathematical/statistical tools. Ito processes, Girsanov’s theorem, risk-neutral pricing. How to formulate/analyze continuous-time models.

**FINA 8804. Advanced Continuous Time Finance.** (2.0 cr.; prereq 8802, 8803; fall, every year)
Pricing of fixed income securities, optimal capital structure, general equilibrium. Classic/current papers in continuous-time literature.

**FINA 8810. Topics in Asset Pricing.** (2.0 cr.; [max 4.0 cr.;]: A-F or Audit; prereq Business admin PhD student or #; fall, even years)
Current topics in asset pricing literature. Students read papers on these topics, derive the main results, identify the main assumptions and thus identify ideas on how to improve upon the current literature.

**FINA 8812. Corporate Finance I.** (2.0 cr.; prereq [Econ 8103, Econ 8104, Business admin PhD student] or #; fall, spring, every year)

**FINA 8813. Corporate Finance II.** (2.0 cr.; prereq [8812, business admin PhD student] or #; fall, spring, every year)

**FINA 8820. Topics in Corporate Finance.** (2.0 cr.; [max 4.0 cr.;]: A-F or Audit; prereq Business admin PhD student or #; fall, odd years)
Current topics in corporate finance literature. Students read current papers, derive the main results, identify the main assumptions and thus identify ideas on how to improve on the current literature.

**FINA 8822. Empirical Methods in Finance.** (2.0 cr.; prereq 8802, 8803; spring, every year)
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).

**FINA 8823. Empirical Corporate Finance.** (2.0 cr.; prereq 8802, 8803; spring, every year)
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.

**FINA 8890. Seminar: Finance Topics.** (2.0-4.0 cr. [max 16.0 cr.;]: A-F only; fall, spring, every year)
Current topics/problems of interest considered in depth. Topics vary. Prereq-[[8802, 8812, 8822, 8823] or equiv], business admin student], infr instruct.

**FINA 8892. Independent Study in Finance.** (1.0-8.0 cr.; [max 16.0 cr.;]: prereq Business admin PhD student or #; fall, spring, summer, every year)
Problems or developments of special interest to the student.

**FINA 8894. Directed Research in Finance.** (1.0-8.0 cr.; [max 16.0 cr.;]: prereq Business admin PhD student specializing in finance or #; fall, spring, every year)
Individualized directed research on a project of interest to the student, approved and advised by faculty.

**Financial Mathematics (FM)**

Institute of Technology

**FM 5001. Preparation for Financial Mathematics I.** (3.0 cr.; prereq Grad MFM major or MFM program director approval; fall, every year)
Mathematics needed for MFM program.

**FM 5002. Preparation for Financial Mathematics II.** (3.0 cr.; prereq 5001, program director approval; spring, every year)
Mathematics needed for MFM program.

**FM 5011. Mathematical Background for Finance I.** (4.0 cr.; prereq [5001, 5002] with grade of at least B or [MFM program director approval, grad MFM major]; fall, every year)
Mathematics needed for MFM program. Focuses on finance.

**FM 5012. Mathematical Background for Finance II.** (4.0 cr.; prereq 5011, grad MFM major, program director approval; spring, every year)
Mathematics needed for MFM program. Focuses on finance.

**FM 5021. Mathematical Theory Applied to Finance I.** (4.0 cr.; prereq [5011 or &5011], grad MFM major, program director approval; fall, every year)
Bridge between theory and application.

**FM 5022. Mathematical Theory Applied to Finance II.** (4.0 cr.; prereq 5021, [5012 or &5012], grad MFM major, program director approval; spring, every year)
Bridge between theory and application.
**Finland (FIN) College of Liberal Arts**

**FIN 5670. Topics in Finnish Studies.** (3.0 cr. [max 9.0 cr.];) Interdisciplinary social science topics on Finnish people, culture, and society. Taught in English.

**Fisheries and Wildlife (FW) College of Food, Agricultural and Natural Resource Sciences**

**FW 5003. Human Dimensions of Biological Conservation.** (3.0 cr.; prereq [Biol 1001 or Biol 1009], Biol 3407; fall, every year) Survey of social, psychological, economic, policy aspects of managing/conerving wildlife, fisheries, and related resources.

**FW 5051. Analysis of Populations.** (4.0 cr.; prereq [4001 or STAT 3011 or ESPM 3012], [Biol 3407 or Biol 3408W or Biol 3807]. Senior or grad student; spring, every year) Regulation, growth, general dynamics of populations. Data needed to describe populations, population growth, population models, regulatory mechanisms.

**FW 5292. Special Lectures: Fisheries.** (1.0-5.0 cr. [max 15.0 cr.;] =FW 4292; prereq Grad student or #; fall, spring, every year) Lectures in special fields of fisheries given by visiting scholar or regular staff member.

**FW 5392. Special Lectures: Wildlife.** (1.0-5.0 cr. [max 15.0 cr.;] =FW 4392; prereq Grad student or #; fall, spring, every year) Lectures given by visiting scholar or staff member.

**FW 5401. Fish Physiology and Behavior.** (3.0 cr.; prereq &FW 4136, CHEM 1021, BIOL 2012; fall, odd years) Fish physiology/behavior. Links between fish biology, fisheries ecology, management, aquaculture. How to write a research proposal. Homeostasis, neurobiology, bioenergetics, reproduction, movement.

**FW 5601. Fisheries Population Analysis.** (3.0 cr.; A-F or Audit; prereq [4001 or Stat 5021], Biol 3407, [Math 1142 or Math 1271]; fall, every year) Introduction to theory/methods for estimating vital statistics of fish populations. Using microcomputers/statistical software to describe, analyze, model attributes of fish populations. Case studies from literature of marine/freshwater fisheries management.

**FW 5603W. Habitats and Regulation of Wildlife.** (3.0 cr.; A-F or Audit; prereq [4102 or 4103], [Biol 3407 or Biol 3408 or Biol 3807]; fall, every year) Environmental interactions of wildlife at population/community levels. Environmental threats from human activities. Habitat management practices. Objectives, polices, regulations in population management.

**FW 5604W. Fisheries Ecology and Management.** (3.0 cr.; prereq EEB 3603 or EEB 4601 or EEB 5601; spring, every year) Managed species/systems. Applied aquatic/fish ecology related to fisheries. Role of planning in fisheries management. Application of management tools, assessment of their efficacy.

**FW 5625. Wildlife Handling and Immunization for Research and Management.** (2.0 cr.; S-N or Audit; prereq General biology, [grad student or vet med student or FW sr]; spring, every year) 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.

**FW 8051. Statistical Modeling of Ecological Data using R and WinBugs/JAGS.** (4.0 cr.; A-F only; prereq Graduate-level statistics class, [working knowledge of program R or #]; spring, every year) Regression methods for modeling ecological data. Real world examples from ecology, as well as environmental/natural resources management. Computer-based solutions using R/Bayesian modeling software.

**FW 8200. Seminar.** (1.0-4.0 cr. [max 8.0 cr.]; S-N or Audit; fall, spring, every year) Ooral 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.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**FW 8394. Research in Fisheries.** (1.0-4.0 cr.; fall, spring, summer, every year) Directed research.

**FW 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**FW 8448. Fishery Science.** (3.0 cr.; prereq Grad student [in fisheries or wildlife conserv or conserv biol or ecology] or #) Applying ecological theory to study/management of fish populations. Dynamics of growth, mortality, and yield of fish stocks. Field assessment methodology. Simulation applied to management problems. Web-assisted course. Students produce a publishable (print or electronic) project.

**FW 8450. Data Analysis.** (4.0 cr.; A-F or Audit; prereq 5xxx statistics course;) Advanced statistical methods are used to teach exploration/analysis of univariate/multivariate data. Descriptive statistics, estimation and inference, regression and smoothing, multivariate techniques, resampling.

**FW 8452. Conservation Biology.** (3.0 cr.; A-F or Audit; fall, every year) 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.** (3.0 cr.; prereq Limnology course or #; fall, even years) 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.

**FW 8461. Advanced Topics in Fish Physiology.** (1.0 cr.; prereq Vertebrate physiology course or #;) Lectures, discussion, current literature. Complements 5459.

**FW 8462. Advanced Topics in Fish Behavior.** (1.0 cr.; prereq 5459 or behavior course or #; fall, spring, offered periodically) Current literature. Complements 5459.

**FW 8465. Fish Habitats and Restoration.** (3.0 cr.; prereq Intro ecology course or #; fall, odd years) Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams.

**FW 8494. Research in Wildlife.** (1.0-4.0 cr.; prereq #; fall, every year) Directed research.

**FW 8576. Biology and Management of Large Mammals.** (2.0 cr.; A-F or Audit; prereq
[Ecology course, [wildlife, forestry, and ecology grad student]] or #; fall, every year)


**FW 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr.; max 12.0 cr.;) No Grade Associated; prerequisite Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

FW 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]) No Grade Associated; prerequisite Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

FW 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]) No Grade Associated; prerequisite Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

### Food Science and Nutrition (FSCN)

**College of Food, Agricultural and Natural Resource Sciences**

**FSCN 5101. Food Regulation in the United States.** (2.0 cr.; A-F or Audit; prerequisite [[Grad or sr] food science or nutrition major] or #; spring, every year)

U.S. system of regulation of food product formulation, manufacturing, labeling and advertising, including insight into the manner in which regulation and the underlying food laws are affected by scientific developments and changing societal values and concerns.

**FSCN 5122. Food Fermentations and Biotechnology.** (2.0 cr.; A-F only; prerequisite MCB 3301, BIOL 4003; fall, every year)

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.

**FSCN 5123. Molecular Biology for Applied Scientists.** (1.0 cr.; A-F only; prerequisite MCB 3301 or FSCN 2021 or #; fall, every year)

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.

**FSCN 5131. Food Quality for Graduate Credit.** (3.0 cr.; A-F only; prerequisite Food Science grad student; fall, every year)

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.

**FSCN 5312. Food Analysis.** (4.0 cr.; A-F only; prerequisite 4112, STAT 3011; fall, every year)

Analytical tools needed for investigation in Food Science/Technology, whether by food industry, governmental agencies, or universities. Application of qualitative/quantitative physical, chemical/instrumental methods used for analysis/examination of food constituents. Sensory evaluation techniques, evaluation of methods/interpretation of results.

**FSCN 5441. Introduction to New Product Development.** (2.0 cr.; prerequisite 4111, 4331; fall, spring, every years)

Interactive course that introduces students to the principles of new product development, from identification and testing of new product concepts, through prototype testing, to basic process design using examples from industry.

**FSCN 5461. Food Packaging.** (2.0 cr.; prerequisite 1102, 5102, Phys 1102 or Phys 1302; fall, odd years)

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.

**FSCN 5481. Sensory Evaluation of Food Quality.** (2.0 cr.; prerequisite 3102, STAT 3011; spring, offered periodically)


**FSCN 5521. Flavor Technology.** (2.0 cr.; prerequisite 4112; spring, odd years)

Overview of flavor chemistry/related technology. Analytical techniques, mechanisms of flavor development (chemical/biogenesis), off-flavors, industrial production/application of food flavorings.

**FSCN 5531. Grains: Introduction to Cereal Chemistry and Technology.** (2.0 cr.; prerequisite Biol 1009, Chem 1022;)

Origins, structure, biochemistry, and cellular properties of major cereal grains as they relate to primary processing (milling) and secondary processing (production of cereal products).

**FSCN 5541. Dairy Product Chemistry and Technology.** (2.0 cr.; prerequisite 3102, 4112, Food Science major, upper division undergraduate or graduate student; fall, odd years)

Designed for upper division Food Science undergraduate/graduate students. Physiology of milk production in ruminants. Resulting composition, Chemical, physical, microbiological properties of milk components. How milk products are manufactured.

**FSCN 5601. Management of Eating Disorders.** (3.0 cr.; prerequisite Sr or grad student in Nutrition or health related program or #; fall, spring, every year)

Etiology, occurrence, course, treatment, prevention of eating disorders from multidisciplinary perspective. Roles/ responsibilities of eating disorder treatment team members of varying types across various treatment milieus.

**FSCN 8310. General Seminar.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; prerequisite #; fall, spring, every year)

Presentations by faculty, graduate students, and outside speakers.

**FSCN 8318. Current Issues in Food Science.** (2.0 cr. [max 4.0 cr.;] A-F or Audit; prerequisite 4111, 4121, %; spring, every year)

Current issues, how they impact food industry.

**FSCN 8320. Advanced Topics in Food Science.** (1.0-3.0 cr. [max 6.0 cr.;] fall, spring, offered periodically)

Recent research or special topics.

**FSCN 8330. Research Topics.** (1.0 cr. [max 6.0 cr.;] fall, spring, every year)

Seminar in which faculty member or group of faculty/graduate students discuss research progress or review/discuss current research literature.

**FSCN 8331. Food Proteins.** (2.0 cr.; prerequisite 4112, 4312; spring, odd years)

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.

**FSCN 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prerequisite Master’s student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**FSCN 8334. Reaction Kinetics of Food Deterioration.** (2.0 cr.; prerequisite Chem 3501;)

Basis for use of applied chemical kinetics to deteriorative reactions occurring in processing and storage of foods and drugs. Systems include enzymatic reactions, lipid oxidation, nonenzymatic browning, acid base catalysis, and microbial growth and death. Application of these kinetics to study of accelerated shelf-life testing of foods, drugs, and biologics.

**FSCN 8335. Carbohydrate Chemistry in Food and Nutrition.** (2.0 cr.; prerequisite 4112; spring, every year)

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.

**FSCN 8336. Lipid Chemistry and Rancidity of Foods.** (2.0 cr.; prerequisite 4112; fall, offered periodically)

Chemistry of food lipid oxidation/rancification. Protective functions of antioxidants.

**FSCN 8337. Flavor Chemistry.** (2.0 cr.; prerequisite 4111;)

Chemistry involved in formation, analysis, and release of flavoring materials in foods.

**FSCN 8338. Antioxidants in Food: Practical Applications.** (2.0 cr.; prerequisite 4111, Bioc 3021, food chemistry, organic chemistry, biochemistry; spring, every year)
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.

FSCN 9391. Independent Study: Food Science. (1.0-4.0 cr.; max 6.0 cr.; prereq #; fall, spring, summer, every year) Includes written reports.

FSCN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

FSCN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

FSCN 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

FSCN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

FNRM 5413. Managing Forest Ecosystems: Silviculture Lab. (1.0 cr.; prereq FNRM major or minor or grad student; spring, every year) 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.

FNRM 5431. Timber Harvesting and Road Planning. (2.0 cr.; =FNRM 4343; prereq Grad student or #; spring, every year) 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 method/equipment choices. Selling timber. Sale design, layout, and administration. Two all-day field trips.

FNRM 5471. Forest Planning and Management. (3.0 cr.; =FNRM 4711; prereq Grad student or #; fall, spring, every year) Processes/techniques for scheduling forest management. Goals of landowners, industry, government, and society. Issues/policies/ regulations that influence management. Predicting outcomes, financial analysis, regulation, mathematical models, linear programming, economic analysis. Landscape-level management, historical range of variability, wildlife management, carbon sequestration, resource monitoring, certification, adaptive management.

FNRM 5480. Topics in Natural Resources. (1.0-3.0 cr.; =FNRM 3480; prereq Sr or grad student; fall, spring, offered periodically) 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 Green Spaces for People. (3.0 cr.; =FNRM 4501; prereq Grad student or #; spring, every year) Management concepts for green infrastructure of cities, towns, and communities. Urban forest as social/biological 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. (1.0 cr.; prereq Grad student; summer, every year) 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. (1.0 cr.; prereq Grad student; summer, every year) Field applications of remote sensing, sampling/measurement methods to inventory/mapping of forest and other natural resources. Offered at Cloquet Forestry Center.

FNRM 5621. Field Timber Harvesting and Road Planning. (1.0 cr.; prereq Grad student; summer, every year) Design, layout, and administration of timber sales. Forest road planning and design. Protecting residual trees during harvesting operations. Timber appraisal, forest management guidelines. Road location and profiling. Planning/layout considerations. Field trips to visit timber harvesting and road planning sites with public and private organizations. Taught at Cloquet Forestry Center.

FNRM 8101. Research Problems: Physiological Ecology. (1.0-5.0 cr.; max 10.0 cr.; prereq #; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8102. Research Problems: Forest-Tree Genetics. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8103. Research Problems: Forest Hydrology. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8104. Research Problems: Forest Ecology. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8105. Research Problems: Silviculture. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8106. Research Problems: Urban Forestry—Biology and Management. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8107. Seminar: Forest Resources. (1.0 cr.; fall, spring, every year) Assigned topics, problem analyses, and research reports.

FNRM 8201. Research Problems: Forest Economics. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8202. Research Problems: Forest Biometry and Measurements. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FNRM 8203. Research Problems: Forest Recreation. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.
FREN 5204. Research Problems: Forest Policy. (1.0-5.0 cr. [max 10.0 cr.]; fall, spring, summer, every year) Independent research under faculty guidance.

FREN 5205. Research Problems: Spatial Data Analysis. (1.0-5.0 cr. [max 10.0 cr.]; prereq #; fall, spring, summer, every year) Independent research under faculty guidance.

FREN 5206. Research Problems: Forest Management. (1.0-5.0 cr.; fall, spring, summer, every year) Independent research under faculty guidance.

FREN 5207. Economic Analysis of Natural Resource Projects. (2.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Economics of public/private forestry/watershed management projects. Commercial profitability analysis, cost-benefit analysis, preparing feasibility studies. Case studies developed/presented.

FREN 5208. Research Problems: Environmental Learning and Leadership. (1.0-5.0 cr.; prereq #; fall, spring, summer, every year) Independent research under faculty guidance.

French (FREN)
College of Liberal Arts

FREN 5250. Promenades Poetiques: The Subject in Motion. (3.0 cr. [max 9.0 cr.]; prereq 3111 or above) The search for the subject in poetry and poetic prose as revealed through the motif of the "promenade" and experimentation with literary forms.

FREN 5260. The Returns of Tragedy. (3.0 cr. [max 9.0 cr.]; prereq 3111 or above; fall, spring, offered periodically) Tragedy as dynamic form in relation to social order, myth and history, and theatre.

FREN 5301. Critical Issues in French Studies. (3.0 cr.; prereq Grad or #; spring, odd years) 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.

FREN 5350. Topics in Literature and Culture. (3.0 cr. [max 12.0 cr.]; prereq 3101 or equiv; fall, spring, every year) Problem, period, author, or topic of interest. See Class Schedule.

FREN 5470. Post/Colonial Francophone Literatures. (3.0 cr. [max 9.0 cr.]; prereq 3111 or above; fall, offered periodically) 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.

FREN 5501. Structure of French: Phonology. (3.0 cr.; [FREN 3501]; prereq [Ling 3001 or Ling 5001], grad student) Advanced study of sound system of contemporary French.

FREN 5531. Sociolinguistics of French. (3.0 cr.; [FREN 3531]; prereq = 3531; Ling 3001 or 5001, grad) Explores variation in the use of French associated with factors such as medium (oral/written), style (formal/informal), region, social and economic groups.

FREN 5541. Oral Discourse of French. (3.0 cr.; prereq 3151, grad student; Ling 5001 recommended) 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. Review of various linguistic approaches to such discourse and conversation analysis.

FREN 5595. Directed Teaching. (1.0-6.0 cr. [max 24.0 cr.]; S-N only; prereq #; fall, every year) Directed teaching.

FREN 8110. Topics in Early Medieval French Literature. (3.0 cr. [max 9.0 cr.]; spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) 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. Old Provençal Language and Literature. (3.0 cr.; fall, spring, offered periodically) Language and literature of Old Occitan (Old Provençal), chiefly troubadours' poems. Some language instruction, reading of poems and other works, and consideration of nature and origins of "courtly love." Knowledge of French, Spanish, or Italian desirable. Taught in English.

FREN 8120. Topics in Later Medieval French Literature. (3.0 cr. [max 9.0 cr.; prereq 8110 or #; fall, odd years) 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. (3.0 cr.; A-F only; prereq grad student; fall, odd years) Short forms of medieval narrative. Examples from French literary production within context of socioeconomic history from ca. 1100 to ca. 1550.

FREN 8190. Old French Workshop. (1.0 cr. [max 2.0 cr.]; S-N only; prereq [[&8110 or &8250 or &8260 or &8270 or &8290] if section's material is in Old French] or [MEST 8110 if section is crosslisted with one of the above French seminars], reading knowledge of modern French; fall, offered periodically) Old French language. Runs concurrently with seminars on Old French literature. Basics of Old French syntax, semantics and phonetics. Students read portions of texts and prepare an original translation.

FREN 8210. Narrative, History, and Memory: Topics. (3.0 cr. [max 9.0 cr.]; fall, offered periodically) Significance of narrative paradigm in literature, history, and cultural memory. Specific topics/texts treated vary. Taught in French.


FREN 8230. Critical Issues: Criticism and Thought. (3.0-9.0 cr.; A-F only; fall, odd years) Critical issues relating to works in criticism/thought related to French/Francophone literature, philosophy or culture.


FREN 8250. Critical Issues: Poetry. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Significant critical issues relating to poetic writing of selected authors or periods.

FREN 8260. Critical Issues: Theatre. (3.0 cr. [max 12.0 cr.]; spring, offered periodically) Significant critical issues relating to dramatic writing of selected authors or periods.

FREN 8270. Critical Issues: Prose. (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Significant critical issues relating to prose writing of selected authors or periods.

FREN 8271. The Novel of the Ancien Regime. (3.0 cr.; fall, spring, offered periodically) 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 8290. Critical Issues: Perspectives on an Author. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr.; fall, spring, offered periodically) 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. (1.0 cr.; No Grade Associated; prereq Master's student,
adviser and DGS consent; fall, spring, summer, every year)  
(No description)

FREN 8371. The Rule of Reason, The Reign of Madness: Readings in Early Modern France. (3.0 cr.; fall, spring, offered periodically)  
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.  
(3.0 cr. [max 9.0 cr.]; spring, offered periodically)  
Quebecois in relation to other North American literatures and to Francophone literature produced elsewhere in the world. Specific topics/texts vary. Taught in French.

(3.0 cr. [max 9.0 cr.]; fall, offered periodically)  
Critical issues relating to literature of Francophone world. Specific topics/texts vary. Taught in French.

FREN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)  
(No description)

FREN 8521. History of the French Language. (3.0 cr.; fall, spring, offered periodically)  
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.  
(1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)  
tbd

FREN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)  
(No description)

FREN 8812. Seminar: Dissertation Preparation and Writing. (3.0 cr.; prereq Completion of doctoral prelims; fall, spring, every year)  

FREN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq max 18 cr per semester or summer, 24 cr required; fall, spring, every year)  
(No description)

FREN 8888W. Thesis Credit Dissertation Seminar. (1.0-3.0 cr. [max 24.0 cr.]; No Grade Associated; prereq Doctoral student who has passed oral prelims; fall, spring, every year)  
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.

FREN 8890. Directed Teaching. (1.0-5.0 cr. [max 25.0 cr.]; fall, spring, every year)  
tbd

FREN 8992. Directed Readings for Graduate Students. (1.0-5.0 cr. [max 25.0 cr.]; prereq #; fall, spring, every year)  
tbd

FREN 8994. Directed Research. (1.0-5.0 cr. [max 25.0 cr.]; prereq #; may be taken as tutorial with #; fall, spring, every year)  
tbd

French and Italian (FRIT)

FRIT 5257. Passionate Beings: Literary and Medical Problematics in Italy and France from 1800 to the Present. (4.0 cr.; )  
Literary and medical representations of the passions in France and in Italy from 1800 to the present. Texts range from theatrical works to medical treatises on the passions as ways for exploring notions of subjectivity, responsibility, order. Taught in English.

FRIT 5850. Topics in French and Italian Cinema. (3.0 cr.; prereq Knowledge of [French or Italian] helpful but not required; fall, offered periodically)  
Focuses on a theme, problem, period, filmmaker, or other topic of interest in French or Italian cinema. See Class Schedule. Taught in English.

FRIT 5999. Teaching of French and Italian: Theory and Practice. (3.0 cr.; fall, every year)  
Theoretical and practical aspects of language learning and teaching applied to French and Italian. Includes history of foreign language teaching in 20th-century United States. Taught in English.

Gay, Lesbian, Bisexual, and Transgender Studies (GLBT)

College of Liberal Arts

GLBT 5993. Directed Study. (1.0-12.0 cr. ; fall, spring, every year)  
Directed Study

Gender, Women, and Sexuality Studies (GWSS)

GWSS 5101. Feminist Approaches to Ethnography. (3.0 cr.; )  
Preparation for feminist ethnographic research in the social sciences. Using recent works by feminist ethnographers, focuses on the methods, politics, and ethics, as well as gender, race, class, and cross-cultural issues pertaining to fieldwork.

GWSS 5102. Feminist Approaches to History. (3.0 cr.; prereq 8 cr WoSt or grad or #; )  
Analysis and practice of feminist history. Theories, methods, and sources that address the interrelationship of gender, race, class, and sexuality.

GWSS 5103. Feminist Pedagogies. (3.0 cr.; prereq grad or #; fall, spring, every year)  
Theory and practice of feminist pedagogies by comparing and evaluating various multicultural feminist theories of education/teaching and the application of specific theories, techniques, and teaching strategies.

GWSS 5104. Transnational Feminist Theory. (3.0 cr.; fall, odd years)  
Third World and transnational feminisms. Interrogating the categories of "women," "feminism," and "Third World." Varieties of power/oppression that women have endured/ resisted, including colonization, nationalism, globalization, and capitalism. Concentrates on postcolonial context.

GWSS 5107. Gender, Culture, and Science. (3.0 cr.; fall, spring, offered periodically)  
Critical study of some of the major papers concerning the relations of gender and scientific inquiry produced in the past 20 years.

GWSS 5122. Philosophy and Feminist Theory. (3.0 cr.; )  
Encounters between philosophy/feminism. Gender's influence in traditional philosophical problems/methods. Social role of theorist/theorizing as they relate to politics of feminism.

GWSS 5190. Topics: Theory, Knowledge, and Power. (3.0 cr.; fall, spring, odd years)  
Topics specified in Class Schedule.

GWSS 5201. Global Processes and the Politics of Sexuality. (3.0 cr.; prereq 12 cr WoSt or feminist studies grad student or #; )  
Comparative examination of the social construction of sexuality. Formal/informal norms/regulations, categories of deviance, representation of sex in the media/arts, role of sexuality in relation to agency/subjectivity.

GWSS 5290. Topics: Biology, Health, and Environmental Studies. (3.0 cr.; fall, spring, offered periodically)  
Topics specified in Class Schedule.

GWSS 5300. Communication and Gender. (3.0 cr.; A-F or Audit; )  
How gender affects verbal communication. Development of analytical skills through readings, exercises, research that raise awareness of the power of language and the influence of gender prescriptions.
GWSS 5390. Topics: Visual, Cultural, and Literary Studies. (3.0 cr. [max 6.0 cr.]; fall, odd years)
Topics specified in Class Schedule.

GWSS 5404. Working Class Women’s Cultures. (3.0 cr.; prereq 12 cr WoSt or #)
Myths and realities surrounding working class women and their cultures. Use sociological and
literary material in an effort to learn about working class women and to hear their own voices.

GWSS 5405. Chicanas: Women and Work. (3.0 cr.; prereq #)
Chicanas, their various relationships to family/ community. Local, national, and global work forces. Questions/issues related to growing integration of world.s systems of production.

GWSS 5406. Black Feminist Thought in the American and African Diasporas. (3.0 cr.
[TBD] spring, offered periodically)
Critically examines spatiality of African descendant women in America/larger black diaspora. Writings from black feminist/queer geographies, history, contemporary cultural criticism. Recent black feminist theorizing.

GWSS 5490. Topics: Political Economy and Global Studies. (3.0 cr. [max 12.0 cr.]; spring, every year)
Topics specified in Class Schedule.

TBD fall, spring, every year)
Topics specified in Class Schedule.

GWSS 5690. Topics: Women, Society, and Race in the United States. (3.0 cr. [max 6.0 cr.]; spring, odd years)
Topics specified in Class Schedule.

GWSS 5790. Topics: Sexuality Studies. (3.0 cr. [max 6.0 cr.]; spring, odd years)
Topics specified in Class Schedule.

GWSS 5993. Directed Study. (1.0-12.0 cr.; fall, spring, summer, every year)
TBD

GWSS 5994. Directed Instruction. (1.0-12.0 cr. [max 36.0 cr.]; fall, spring, summer, every year)
TBD

GWSS 5995. Directed Research. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, every year)
TBD

GWSS 8101. Intellectual History of Feminism. (3.0 cr.; fall, spring, offered periodically)
Major trends in feminist intellectual history from 14th century to the present, especially in the United States and Europe.

GWSS 8102. Advanced Studies in Sexuality. (3.0 cr.; prereq Priority given to feminist studies grad students; fall, odd years)
Contemporary theoretical scholarship/research on selected issues related to sexuality, gender, and the body.

GWSS 8103. Feminist Theories of Knowledge. (3.0 cr.; fall, offered periodically)
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. (3.0 cr.; prereq Feminist Studies grad student [Ma or Minor] or #; spring, even years)
Explore feminist theories/critical approaches to pedagogy. Develop teaching philosophy statement, design syllabus, practice teach/learn problem-solving strategies for classroom.

GWSS 8108. Genealogies of Feminist Theory. (3.0 cr.; prereq Feminist studies PhD or grad minor student or #; fall, every year)
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.

GWSS 8109. Feminist Knowledge Production. (3.0 cr.; prereq Feminist studies PhD or grad minor student or #; spring, every year)

GWSS 8201. Feminist Theory and Methods in the Social Sciences. (3.0 cr.; fall, spring, offered periodically)
Seminar on recent theories, including feminist versions of positivist, interpretivist, critical theoretical, and postmodernist 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 & Praxis. (3.0 cr. [max 9.0 cr.]; fall, spring, every year)
Topics in feminist theory.

GWSS 8220. Seminar: Science, Technology & Environmental Justice. (3.0 cr. [max 6.0 cr.]; spring, offered periodically)
Topics related to science, technology, environmental justice.

GWSS 8230. Seminar: Cultural Criticism and Media Studies. (3.0 cr. [max 6.0 cr.]; spring, offered periodically)
Topics in literature, film, art.

GWSS 8250. Seminar: Nation, State, and Citizenship. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Topics related to nation, state, citizenship.

GWSS 8260. Seminar: Race, Representation and Resistance. (3.0 cr. [max 6.0 cr.]; prereq Grad student; spring, every year)
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.

GWSS 8270. Seminar: Theories of Body. (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
How body is configured in many social arenas. Legal decisions, public policy, medical research, cultural customs. Examine how attitudes toward male/female bodies influence social myths/discourses about social policy/ change.

GWSS 8301. Feminist Literary Criticism. (3.0 cr.; fall, spring, offered periodically)
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. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

GWSS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year)
(No description)

GWSS 8490. Seminar: Transnational, Postcolonial, Diaspora. (3.0 cr. [max 6.0 cr.]; fall, spring, every year)
Graduate topics in comparative/global studies.

GWSS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
TBD

GWSS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

GWSS 8993. Directed Study. (1.0-6.0 cr. [max 9.0 cr.]; fall, spring, summer, every year)
TBD

GWSS 8994. Directed Instruction. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, summer, every year)
TBD

GWSS 8995. Directed Research. (1.0-8.0 cr. [max 36.0 cr.]; fall, spring, every year)
TBD

GWSS 8996. Feminist Studies Colloquium. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad major or minor in feminist studies; fall, spring, every year)
TBD
GWSS 8997. Feminist Research and Writing. (1.0-3.0 cr. [max 9.0 cr.]; prereq 8109, passed written prelims in degree granting program; fall, spring, every year) Develops interdisciplinary feminist components of Ph.D. thesis or major piece of writing. Facilitates research/writing.

GWSS 8998. Professional Development . (1.0-3.0 cr. [max 6.0 cr.]; S-N only; spring, every year) 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.

General Dentistry (GEND)
School of Dentistry

GEND 5151. Advanced General Dentistry Seminar I. (5.0-10.0 cr. ; S-N or Audit; fall, summer, every year) 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.

GEND 5152. Advanced General Dentistry Seminar II. (5.0-10.0 cr. ; S-N or Audit; fall, every year) 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.

GEND 5153. Advanced General Dentistry Seminar III. (2.0-10.0 cr. ; S-N or Audit; fall, spring, every year) 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.

GEND 5254. Advanced General Dentistry Clinic I. (5.0-15.0 cr. ; S-N or Audit; fall, summer, every year) 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 5255. Advanced General Dentistry Clinic II. (5.0-15.0 cr. ; S-N or Audit; fall, every year) 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. (5.0-15.0 cr. ; S-N or Audit; fall, spring, every year) 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 5261. Advanced General Dentistry Clinical Administration I. (5.0-10.0 cr. ; S-N or Audit; fall, spring, offered periodically) Field experience in community dental clinic practice and administration.

GEND 5262. Advanced General Dentistry Clinical Administration II. (5.0-10.0 cr. ; S-N or Audit; fall, every year) Field experience in community dental clinic practice and administration.

GEND 5263. Advanced General Dentistry Clinical Administration III. (1.0-10.0 cr. ; S-N or Audit; fall, spring, every year) Field experience in community dental clinic practice and administration.

GEND 5264. Advanced General Dentistry Clinic IV. (1.0-15.0 cr. ; S-N or Audit; summer, every year) 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. (1.0-15.0 cr. ; S-N or Audit; fall, every year) 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. (1.0-15.0 cr. ; S-N or Audit; fall, spring, every year) 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.

GCD 5005. Computer Programming for Cell Biology. (3.0 cr.; prereq [Biol 4003, Biol4004 (4004 may be taken concurrently or may be waived with #)]; statistical, one semester of calculus; fall, every year) 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.

GCD 5036. Molecular Cell Biology. (3.0 cr.; prereq Biol 4004 or #; [sr or grad student] recommended; fall, every year) Modern, integrative approaches combining cell/molecular biology, biochemistry, and genetics to investigate cell organization/function. Membranes, signaling, extracellular matrix, secretion, endocytosis, cytoskeleton, nucleus. Analysis of scientific papers to illustrate new concepts in and experimental approaches to cell organization/function.

GCD 8008. Mammalian Gene Transfer and Expression. (2.0 cr.; A-F or Audit; prereq #; spring, every year) Current gene transfer technology. Applications of genetic modifications in animals, particularly transgenic animals and human gene therapy.

GCD 8014. Small RNA Biology. (2.0 cr.; A-F or Audit; prereq MICA 8004 or BIOC 8002 or equiv or #; spring, every year) 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.

GCD 8073. Advanced Human Genetics. (3.0 cr.; prereq 8131 or BIOL 4003 or #; spring, every year) 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.

GCD 8103. Human Histology. (5.0 cr.; =GCD 8103), prereq Undergraduate biology, chemistry, math, and physics course; fall, every year) 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.

GCD 8131. Advanced Genetics and Genomics. (3.0 cr.; prereq [3022 or BIOL 4003], [BIOC 3021 or BIOC 4331] or #; fall, spring, every year) Literature-based. Modern genetic/genomic analysis, including mutant screens; characterization of multiple alleles, gene mapping/cloning, genome sequencing, intergenic interactions, transposable elements, genetic mosaics, epigenetics, molecular mechanisms of recombination.


GCD 8151. Cell Structure and Function. (3.0 cr.; prereq [[4034 or 8121 or BioC 8002], Biol 4004] or BMBB or MCDB&B grad student or #; fall, every year) Structure, function, and biochemistry of cellular organelles. Cellular interactions in eukaryotes. Emphasizes membranes, secretion, trafficking, cytoskeleton, cell motility, nucleus, cell cycle, apoptosis, cell signaling, and signal transduction mechanisms.

GCD 8161. Advanced Developmental Biology. (3.0 cr.; prereq [BMBB or MCDB&B grad student or GCD4161] or [GCD 8131 or
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GCD 8171. Literature Analysis. (2.0 cr.; A-F or Audit; prereq Grad MCDG major; fall, spring, every year) 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.

GCD 8212. Selected Topics in Cell and Developmental Biology. (3.0 cr.; prereq [8121 or BioC 8002], 8151, [4161 or 8161 or #]; spring, offered periodically) Reading and discussion of papers from current literature. Topics selected from research areas of cell biology and developmental biology and experimental approaches taken in these fields. Topics vary annually.

GCD 8213. Selected Topics in Molecular Biology. (4.0 cr.; = [BIOC 8213]; prereq 8121 or BioC 8002 or #; fall, every year) Sample topics: DNA replication, recombination and gene conversion, regulation of gene expression in procaryotes, regulation of gene expression in eucaryotes, chromatin structure and transcription, organelar gene expression. Lectures, readings, discussions.

GCD 8900. Seminar. (1.0-2.0 cr. [max 8.0 cr.]; S-N or Audit; prereq Grad MCDG major or #; fall, spring, every year) Current scientific research.

GCD 8910. Journal Club. (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad MCDG major or #; fall, spring, offered periodically) Critical evaluation of selected current literature.

GCD 8911. Introduction to Genetic Counseling Skills and Practice. (3.0 cr.; A-F only; prereq This class is intended for Molecular, Cellular, Biology and Genetics M.S. students with genetic counseling specialization.; fall, every year) 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 perinatal 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.

GCD 8912. Genetic Counseling in Practice. (4.0 cr.; A-F or Audit; prereq MCDG MS student with genetic counseling specialization or #; spring, every year) Practical genetic counseling, communicating genetics and medical information to the family, helping families with decision making.

GCD 8913. Psychosocial Issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCDG MS student with genetic counseling specialization or #; fall, every year) Interviewing skills, supportive counseling, and case-study analysis specific to genetic counseling.

GCD 8914. Ethical and Legal Issues in Genetic Counseling. (3.0 cr.; A-F or Audit; prereq MCDG MS student with genetic counseling specialization or #; spring, every year) Professional ethics; ethical and legal concerns with new genetic technologies.

GCD 8920. Special Topics: Introduction to topics in genetic counseling. (2.0 cr.; A-F only; prereq Grad student or #; fall, spring, every year) Special topics. Introduction to topics in genetic counseling.

GCD 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; prereq MCDG MS student with genetic counseling specialization or #; fall, spring, summer, every year) Independent research determined by student's interests, in consultation with faculty mentor.

GIS 5530. GIS Internship. (1.0-3.0 cr. [max 6.0 cr.]; S-N only; prereq #, strong GIS/ mapping skills; fall, spring, every year) Practical hands-on experience using GIS to solve problems in a real-world work environment.

GIS 5555. Basic Spatial Analysis. (3.0 cr.; prereq [STAT 3001 or equiv, MGIS student] or #; fall, every year) 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.

GIS 5571. ArcGIS I. (3.0 cr.; prereq [GEOG 5561 or equiv, status in MGIS program, familiarity with computer operating systems] or #; fall, every year) 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.

GIS 5572. ArcGIS II. (3.0 cr.; prereq [GEOG 5561 or equiv], in MGIS program] or #; spring, every year) Continues GIS 5571. Raster analysis, dynamic segmentation, geometric networks, geocoding, Python scripting, and data interoperability. Substantial projects include map and poster design and production.

GIS 5573. Introduction to Digital Mapping: ArcGIS Basics. (1.5 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year) Desktop mapping functions using ArcGIS software. Application of systems to display/ analysis of geographical data.

GIS 5574. Web GIS and Services. (3.0 cr.; prereq [GEOG 5561 or equiv, in MGIS program] or #; fall, every year) 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.

GIS 5575. Practical Surveying for GIS. (2.0 cr.; prereq GEOG 5561 or equiv in MGIS program or #; spring, every year) Surveying techniques/relationship of GPS to GIS professionals. Geodesy, data adjustment, datums, ellipsoids, coordinate systems, transformations.

GIS 5577. Spatial Database Design and Administration. (3.0 cr.; prereq MGIS student or #; spring, every year) Spatial database design, development planning/management, maintenance, security, access/distribution, and documentation.

GIS 5578. GIS Programming. (3.0 cr.; prereq MGIS student or #; spring, every year) Programming techniques using Python and other languages specifically relating to GIS technologies.

GIS 5590. Special Topics in GIS. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, summer, every year) Topics vary according to curricular needs, technological developments in field.

GIS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, every year) (No description)

GIS 8501. GIS Project Management and Professional Development. (3.0 cr.; A-F only; prereq MGIS student or #; fall, every year) Project management/professional development. Portfolio creation, career exploration, degree program planning. GIS project management through lectures, class exercises, guest speakers.

GIS 8990. Research Problems in GIS. (1.0-6.0 cr.; A-F only; prereq MGIS student, #; fall, spring, summer, every year) 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.

Geography (GEOG) College of Liberal Arts

GEOG 5361. Geography and Real Estate. (4.0 cr.; spring, every year) Origins and evolution of land ownership in the United States.

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GEOG 5374W. The City in Film. (4.0 cr.; =GEOG 3374W, GEOG 3374V; prereq grad student or #; spring, every year) 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.

GEOG 5385. Globalization and Development: Political Economy. (4.0 cr.; prereq Sr or grad or #; fall, spring, offered periodically) Nature/scope of modern world system (capitalism), its impact on regional development processes. Roles of state and of international financial institutions.

GEOG 5393. Rural Landscapes and Environments. (4.0 cr.; spring, every year) 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. (4.0 cr.; =GEOG 3401; prereq grad student or #) 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.

GEOG 5411. Geography of Health and Health Care. (4.0 cr.; =GEOG 3411W; fall, every year) Application of human ecology, spatial analysis, political economy, and other geographical approaches to analyze problems of health and health care. Topics include distribution and diffusion of disease; impact of environmental, demographic, and social change on health; distribution, accessibility, and utilization of health practitioners and facilities.

GEOG 5421. Introduction to Atmospheric Science. (3.0 cr.; =ES 5421; prereq Familiarity with fundamentals of physics, calculus, and statistics, including differential and integral calculus and basic differential equations and basic thermodynamics, mechanics, and the electromagnetic spectrum;) Calculus-based introduction to atmospheric dynamics, radiation, thermodynamics, chemical composition, and cloud processes. Applications to climate, meteorology, the hydrologic cycle, air quality, and biogeochemical cycles.

GEOG 5423. Climate Models and Modeling. (3.0 cr.; prereq 3401 or #;) Survey of development and research with simple and complex (three-dimensional) climate models. Environmental processes and their numerical representation in climate models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, hydrosphere, and cryosphere; assessment of model predictions for climate change.

GEOG 5426. Climatic Variations. (3.0 cr.; prereq 1425 or 3401 or #;) 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.

GEOG 5431. Plant and Animal Geography. (3.0 cr.; =GEOG 3431; fall, offered periodically) Introduction to biogeography. Focuses on patterns of plant/animal distributions at different scales over time/space. Evolutionary, ecological, and applied biogeography. Paleobiogeography, vegetation-environment relationships, vegetation dynamics/disturbance ecology, human impact on plants/animals, nature conservation. Discussions, group/individual projects, local field trips.


GEOG 5512. Cartography: Topics. (3.0 cr.; prereq 3511 or 5531 or #;) Selected topics include the system of cartographic communication, map design, map reading, map analysis, history of cartography.

GEOG 5530. Cartography Internship. (2.0-7.0 cr. [max 10.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Provides intensive hands-on experience in contemporary map production and design, ranging from GIS applications to digital prepress. Strong computer skills essential.


GEOG 5561. Principles of Geographic Information Science. (4.0 cr.; prereq grad; fall, spring, every year) 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.


GEOG 5563. Advanced Geographic Information Science. (3.0 cr.; prereq B or better in 5561 or 5561 or #; fall, every year) 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.

GEOG 5564. Urban Geographic Information Science and Analysis. (3.0 cr.; prereq 3561 or 5561; ) 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.

GEOG 5565. Geographical Analysis of Human-Environment Systems. (3.0 cr.; prereq 3561 or 5561 or FR 4131 or LA 5573 or one intro GIS course or grad student or #; spring, offered periodically) Applications of geographic information systems and other spatial analysis tools to analysis of environmental systems patterns, dynamics, and interactions. Focuses on global to landscape databases developed to analyze atmospheric, hydroospheric, geomorphic, pedologic, biologic, and human landuse systems.

GEOG 5589. Introduction to Dendrochronology. (3.0 cr.; prereq [1403, [BIOL 1001 or BIOL 1009 or equiv]] or #; fall, every year) Historical development, operational techniques, biological background, and principles of tree ring analysis. Applications of tree-ring data to investigate environmental change and past cultures.

GEOG 5900. Topics in Geography. (3.0 cr. [max 9.0 cr.]; prereq sr or grad, #; fall, spring, every year) Special topics and regions. Course offered by visiting professors in their research fields.

GEOG 8001. Problems in Geographic Thought. (3.0 cr.; A-F or Audit; fall, offered periodically) Currents of geographic thought in biophysical, GIS, human, cultural, and human-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 8005. Proseminar: Population Geography. (3.0 cr.; prereq #; fall, spring, offered periodically)
Conceptual literature and empirical studies on fertility, mortality, and migrations in different parts of the world.

GEOG 8006. Proseminar: Research Methods in Geography. (3.0 cr.; prereq #; fall, spring, offered periodically)
Introduction to research design, strategies, methods of data collection, analysis, interpretation, and representation in contemporary geographic research.

GEOG 8007. Proseminar: Theories of Development and Change. (3.0 cr.; prereq #; fall, spring, offered periodically)
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.

GEOG 8200. Seminar: Urban Geography. (2.0-3.0 cr.; A-F or Audit; spring, offered periodically)
Contemporary research. Topics vary with the interests of faculty.

GEOG 8201. Explorations in the Geography of Minnesota. (3.0 cr.; S-N or Audit; prereq #; fall, spring, offered periodically)

GEOG 8211. Environmental Policy. (3.0 cr.; prereq #; fall, every year)
U.S. environmental policies at federal/state level. Policy formulation, implementation, and evaluation.

GEOG 8212. Africa. (3.0 cr.; prereq #; fall, spring, offered periodically)
Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8213. East Asia and China. (3.0 cr.; prereq #; fall, spring, offered periodically)
Contemporary research, advanced topics. Topics vary with interests of faculty offering course.

GEOG 8214. South Asia. (3.0 cr.;)
Advanced topics. Topics vary with interests of faculty offering course.

GEOG 8220. Agrarian Change and Rural Development. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)

GEOG 8230. Theoretical Geography. (3.0 cr.; prereq #; fall, spring, offered periodically)
Advanced topics. Topics vary with interests of faculty offering course. Contemporary theoretical/philosophical themes transcending subdisciplines of human/physical geography.

GEOG 8240. Medical Geography. (3.0 cr.; prereq #; spring, offered periodically)
Geographic inquiry concerning selected problems of health and health care.

GEOG 8260. Seminar: Physical Geography. (2.0 cr. [max 3.0 cr.]; prereq #; spring, every year)
Topics of contemporary research. Topics vary with interests of faculty offering course.

GEOG 8270. Seminar: Climatology. (3.0 cr.; Student Option No Audit; prereq #; fall, odd years)
Sample topics: climate modeling; climatic variability; climate change and predictability; severe local storms; drought; energy balance; urban climate; statistical climatology.

GEOG 8280. Biogeography. (3.0 cr. [max 9.0 cr.]; prereq #; fall, every year)
Forest dynamics, dendrochronology, tree rings and climate, environmental disturbance, paleobiogeography, field/lab methods in biogeography.

GEOG 8290. Seminar in GIS and Cartography. (3.0 cr.; prereq #; fall, spring, offered periodically)
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.

GEOG 8291. Seminar in GIS, Technology, and Society. (3.0 cr.; prereq #; fall, spring, offered periodically)

GEOG 8292. Seminar in GIS: Spatial Analysis and Modeling. (3.0 cr.; prereq 3511 [or equiv statistics course], [3561 or 5561 or equiv intro GIS course] or #; spring, odd years)

GEOG 8301. Advanced Qualitative Methods. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)

GEOG 8302. Research Development. (3.0 cr.; S-N or Audit; prereq #; fall, offered periodically)
Students in geography and related social sciences are guided in key steps to effective research proposal writing.

GEOG 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

GEOG 8336. Development Theory and the State. (3.0 cr.; A-F or Audit; spring, every year)
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. (3.0 cr.; prereq #: fall, spring, offered periodically) Contemporary research in world population development and problems. Topics vary with interests of faculty offering course.

GEOG 8405. Seminar: Graduate Student Professional Development. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Geography grad student; fall, spring, offered periodically) 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.

GEOG 8420. Teaching Practicum. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq [Geog or MGIS] grad student or #: fall, spring, every year) Teaching methodologies, learning objectives, course content, classroom techniques, student/ course evaluation. Specific application to instruction in Geography.

GEOG 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

GEOG 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

GEOG 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

GEOG 8800. Seminar: Development of Geographic Thought. (3.0 cr.; prereq #: fall, spring, offered periodically) Topics vary with interests of faculty offering course.

GEOG 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

GEOG 8970. Directed Readings. (1.0-5.0 cr. [max 10.0 cr.]; prereq #: fall, spring, summer, every year) tbd

GEOG 8980. Topics in Geography. (1.0-3.0 cr. [max 15.0 cr.]; prereq #: fall, spring, every year) Seminar offered by visiting or regular faculty. Topics vary with interests of faculty.

GEOG 8990. Research Problems in Geography. (1.0-5.0 cr. [max 10.0 cr.]; prereq #: fall, spring, summer, every year) Individual research projects.

Geological Engineering (GEOE) College of Science and Engineering

GEOE 5321. Geomechanics. (3.0 cr.; A-F or Audit; prereq CSE upper division or grad student, 4301, GE 4301 or #: summer, offered periodically) Review of elasticity theory and solution of some elastic boundary value problems relevant to geomechanics. Wave propagation in unbounded elastic media. Elements of fracture mechanics and applications. Elements of poroelasticity and applications.

GEOE 5331. Geomechanics Modeling. (3.0 cr.; A-F or Audit; prereq CSE upper division or grad student, 4301 or GE 4301; summer, offered periodically) Soil and rock response in triaxial testing; drained and undrained behavior; elastic and plastic properties. Modeling stresses, strains, and failure in geomechanics problems.

GEOE 5341. Wave Methods for Nondestructive Testing. (4.0 cr.; A-F or Audit; prereq [AEM 2021, AEM 3031] or #: ) Introduction to contemporary methods for nondestructive characterization of objects of civil infrastructure (e.g., highways, bridges, geotechnical sites). Imaging technologies based on propagation of elastic waves: ultrasonic and resonant frequency methods, seismic surveys, acoustic emission monitoring. Lecture, lab.

GEOE 5300. Seminar: Geomechanics. (1.0-3.0 cr. [max 4.0 cr.]; S-N or Audit; =[CE 8300]; fall, spring, every year) Presentations on various topics.


GEOE 8311. Advanced Rock Mechanics. (3.0 cr.; A-F or Audit; = [CE 8311]; prerequisite 5331, CE 5331 or #: CSE grad student; fall, offered periodically) 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.


GEOE 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

GEOE 8336. Boundary Element Methods I. (3.0 cr.; A-F or Audit; = [CE 8336]; prerequisite CSE grad student or #: fall, even years) Introduction to boundary element methods for elastostatics; stress discontinuity method; displacement discontinuity method; direct boundary integral method. Derivation of basic mathematical solutions from the theory of elasticity. Applications of boundary element methods in geomechanics.

GEOE 8337. Boundary Element Methods II. (3.0 cr.; A-F or Audit; = [CE 8337]; prerequisite 8336, CE 8336 or #: fall, offered periodically) Transient and nonlinear problems.


GER 5011. Advanced Conversation and Composition. (3.0 cr.; prereq 3012; [grad student or adv undergrad]; fall, odd years) Achieving high proficiency in writing/speaking professional/academic German.

GER 5016. Advanced Translation: Theory and Practice. (3.0 cr.; prereq 3012 or #; [grad student or adv undergrad]; spring, offered periodically) Translation theory. Related issues in stylistics, philosophy of language. Sample translations. Student production of translations, with methodological commentary.

GER 5410. Topics in German Literature. (3.0 cr. [max 9.0 cr.]; prereq 3011; fall, spring, every year) Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule.

GER 5510. Topics in Contemporary German Culture. (3.0 cr. [max 9.0 cr.]; prereq 3011; fall, spring, offered periodically) A topic of contemporary German culture explored in depth.

GER 5610. German Literature in Translation. (3.0 cr. [max 9.0 cr.]; prereq No knowledge of German required; cr toward major or minor requires reading in German; fall, spring, offered periodically) Study in depth of authors or topics from various periods in German literature. Requires no knowledge of German.

GER 5630. Topics in German Cinema. (3.0 cr. [max 9.0 cr.]; prereq 3xxx film course or #; spring, offered periodically) Topics chosen may focus on specific directors, genres, film production or reception, and/or other formal, theoretical, historical, or political issues.

GER 5711. History of the German Language I. (3.0 cr.; prereq 3011; fall, even years) Historical development of German, from beginnings to 1450.

GER 5712. History of the German Language II. (3.0 cr.; prereq 5711; spring, even years) Historical development of German from 1450 to 2000.

GER 5721. Introduction to Middle High German. (3.0 cr.; fall, odd years) 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. (3.0 cr.; prereq 5721; spring, odd years) Acquisition of fluency in reading Middle High German normalized as well as non-normalized texts, both poetry and prose.

GER 5731. Old High German I. (3.0 cr.; fall, offered periodically) Study of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Germanic languages.

GER 5732. Old High German II. (3.0 cr.; prereq 5731; spring, offered periodically) Study of the monuments of Old High German. Detailed investigation of Old High German in comparison with the other Germanic languages.

GER 5734. Old Saxon. (3.0 cr.; fall, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; spring, offered periodically) Topics specified in Class Schedule.

GER 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prereq instr consent, dept consent, college consent.

GER 8010. Current Debates in Literary and Cultural Theory. (3.0 cr. [max 12.0 cr.]; spring, every year) 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. (3.0 cr. [max 12.0 cr.]; spring, every year) 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. (3.0 cr. [max 9.0 cr.]; prereq 5721; spring, odd years) Topics on specific author, group of authors, genre, or subject matter in German literature, ca. 800-1450.

GER 8210. Seminar in Early Modern German Literature and Culture. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) 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. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Examination of an author, issue, or movement, using a variety of critical approaches.

GER 8240. Seminar in 20th-Century German Literature and Culture. (3.0 cr. [max 9.0 cr.]; A-F or Audit; fall, spring, offered periodically) Topics on literature, film, or other forms of "high" and popular culture.

GER 8300. Topics in Literature and Cultural Theory. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Authors, themes, movements, and social issues from 1700 to present. Focus varies each semester.

GER 8741. Gothic and Methods of Comparative Reconstruction I. (3.0 cr.; ) The oldest extant Germanic language and the prehistory of Germanic group of languages.

GER 8742. Gothic and Methods of Comparative Reconstruction II. (3.0 cr.; prereq 8741; ) Continuation of study of the oldest extant Germanic language and the prehistory of Germanic group of languages.

GER 8751. Paleography: Medieval Manuscript Readings. (3.0 cr.; A-F or Audit; spring, offered periodically) Introduction to techniques of reading and transcribing medieval German and Latin manuscripts.

GER 8752. Medieval Text Editing. (3.0 cr.; spring, offered periodically) Introduction to techniques of historical text-critical editing of medieval Germanic and Latin manuscripts.

GER 8820. Seminar: Advanced Theory. (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Topic in critical thought, e.g., the Frankfurt School, hermeneutics, reception theory.

GER 8994. Directed Research. (1.0-3.0 cr. [max 12.0 cr.]; prereq #, %; may be taken as tutorial with #; fall, spring, summer, every year) tbd
GERO 5100. Topics in Gerontology. (0.5-4.0 cr.; fall, spring, summer, offered periodically)
Timely topics related to the biology, sociology, and psychology of aging and applied aging services.

GERO 5101. Milestones in the Biology of Aging. (1.0 cr.; prereq NIA training grant Functional Proteomics of Aging [grad student or postdoc fellow] or biology research grad student; #; spring, every year)
Biological research in aging. Original literature, including seminal, historical background papers. Progress in field of biogerontology research.

GERO 5105. Multidisciplinary Perspectives on Aging. (3.0 cr.; fall, every year)

GERO 5110. Biology of Aging. (3.0 cr.; spring, every year)
Biological changes that occur with aging. Methods for studying aging, descriptions of population aging, theories on how/why we age. Process of aging in each body system, variation between individuals/populations. Clinical implications of biological changes with age. Guest lecturers from different disciplines.

GERO 5111. Studying Aging and Chronic Illness. (2.0 cr.; prereq Introductory course in epidemiology or #; fall, every year)
Methodological issues unique to studies of older populations. Focuses on measurement of epidemiological characteristics. Health conditions/disorders of older Americans.

GERO 5115. Introduction to Geriatrics. (2.0 cr.; S-N only; fall, spring, summer, every year)
Online course. Major topics in geriatrics. How to diagnose/treat conditions common in caring for older people.

GERO 5125. Gerontology Service Learning. (3.0 cr.; fall, spring, summer, every year)
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.

GERO 5191. Independent Study: Gerontology. (1.0-4.0 cr.; max 16.0 cr.;) Student Option No Audit; prereq Approval of [adviser, DGS] for gerontology minor; fall, spring, summer, every year) Independent study; gerontology.

GERO 8020. Seminar in Gerontology. (2.0 cr.; prereq #; fall, spring, every year)
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.

GERO 8021. Application of Proteomics to Aging. (1.0 cr.; S-N only; 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 #; fall, odd years)
Proteomic technology in aging research. Faculty/student led discussions on topics relevant proteomic research. Overview of special techniques/analytical approaches complementary to proteomics, hands-on experience with data analysis, discussion of literature.

GERO 8022. Fostering a Career in Aging Research. (1.0 cr.; S-N only; 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 #; spring, even years)
Prepare pre-doctoral students/post-doctoral fellows for next step in academic career. Student/faculty led discussions on preparing for job interviews, including composing CV/cover letter, preparing grant applications/manuscripts, developing course syllabus based on biology of aging.

GERO 8023. Aging Policy Seminar. (2.0 cr.; S-N only; prereq Grad student or # [recommended to have taken GERO 5105]; fall, every year)
Topics chosen to match student interest. Potential issues include Medicare, Medicaid, Social Security, policies about long-term care, preventive care for older people, employment discrimination, ethical topics. Run seminar on topic of choice, write follow-up paper.

Global Studies (GLOS)
College of Liberal Arts


GLOS 5403. Human Rights Advocacy. (3.0 cr.; prereq Grad student; fall, every year)
GRAD 5102. Preparation for University Teaching for Nonnative English Speakers. (2.0 cr.; S-N only; prereq English Language Proficiency Rating of 4, current or anticipated TA assignment; fall, spring, every year) Theor/Practice of teaching in higher education in the U.S. Emphasizes awareness of cross-cultural communication issues. Students practice in a simulated instructional setting.

GRAD 5105. Practicum in University Teaching for Nonnative English Speakers. (2.0 cr.; S-N or Audit; prereq [5102 or English Language Proficiency Rating of 2 or 3], current or anticipated TA assignment; fall, spring, every year)

Theory, advanced practice in teaching in higher education for nonnative speakers of English. Emphasizes interactive teaching strategies, oral presentation skills, legal/policy issues.

GRAD 8101. Teaching in Higher Education. (3.0 cr.; Student Option No Audit; prereq Non-Degree students: contact pfif@umn.edu with questions about registration. Adding a section after the first class meeting? Contact your instructors as soon as you enroll.; fall, spring, summer, every year) 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.

GRAD 8102. Practicum for Future Faculty. (3.0 cr.; Student Option No Audit; prereq [8101 or equiv]., native English speaker or [IBTOEFL score of 27-30] or [ELP score of 1 from CTL]; fall, spring, every year) Collegial support for teaching, faculty mentorship at regional college or university. Faculty role at various institutions. Classroom observation/feedback, preparation for academic job search.

GRAD 8200. Teaching and Learning Topics in Higher Education. (1.0 cr. [max 4.0 cr.]; A-F only; fall, spring, every year) 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. (1.0-3.0 cr. [max 6.0 cr.]; prereq PhD student, #; fall, spring, every year) Led by graduate faculty. For course description, see sponsoring program(s).

GDES 5311. Illustration. (3.0 cr.; A-F only; prereq 1311 or ArtS 1101 or PDes 3702 or LA 1301 or Arch 3250 or Arch 2301 or #; spring, every year) Image making by hand or digitally for use in design projects. Design development. Mapping out ideas/expressing thoughts visually. Not observational drawing course.

GDES 5341. Interactive Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor] or graphic design major or grad student or #; fall, spring, every year) Design of interactive multimedia projects. Interactive presentations and electronic publishing. Software includes hypermedia, scripting, digital output.

GDES 5342. Web and Interface Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor] or graphic design major or grad student or #; spring, every year) Internet-based design. Static Web pages, embedded media, cascading style sheets. Design/usability of interface between humans and technology. Evaluation of visual elements that control/organize dealings with computers to direct work. Students develop designs, do usability testing.

GDES 5343. Data Visualization II: Interactive Information. (3.0 cr.; A-F only; prereq [2342, 4343] or #; spring, every year) Skills/tools necessary to process large quantities of information/present them through interactive mediums. Create data visualizations for web utilizing Javascript libraries. Linear/non-linear data-driven narratives.

GDES 5383. Digital Illustration and Animation. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor] or [4384 or DHA 4384 or 5341 or DHA 5341], [graphic design major or [grad student, experience with computer illustration]] or #; fall, spring, offered periodically) Advanced computer design. Integration of design knowledge with Macintosh computer applications. Students use software to create digital illustration and animations. Adobe Illustrator, After Effects, Flash.

GDES 5386. Fundamentals of Game Design. (3.0 cr.; A-F or Audit; prereq [2334 or 2342], design minor] or [4384 or DHA 4384 or 5341 or DHA 5341], [graphic design major or [grad student, experience with computer illustration]] or #; fall, spring, offered periodically) Games of all kinds. Theoretical/practical aspects of making games. Investigation of design process. Rules, strategies, methodologies. Interactivity, choice, action, outcome, rules in game design. Social interaction, story telling, meaning/ideology, semiotics. Signs, cultural meaning.

GDES 5388. Graphic Design Research. (3.0 cr.; A-F or Audit; prereq Graphic design major or grad student or #; spring, offered periodically) Experience in Graphic Design research strategies and methods. Applied, theoretical, and human-centered aspects directed at project development. Design prototyping, testing, analysis.
Theories, methodologies, histories of electronic design, its impact on visual communications. Digital artifacts, processes, paradigms.

**GDES 8170. Topics in Graphic Design.**
(1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)
In-depth investigation of topic, announced in advance.

**GDES 8180. Professional Seminar.**
(1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year)
Professional development issues/trends.

**GDES 8192. Readings in Graphic Design.**
(1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #: fall, spring, summer, every year)
Independent study, review of books/periodicals under tutorial guidance.

**GDES 8193. Directed Study.**
(1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #: fall, spring, summer, every year)
Directed study in graphic design.  

**GDES 8222. Plan B Master's Project.**
(3.0 cr.; S-N or Audit; prereq [Design or DHA master's student]; #: fall, spring, every year)
Plan B master's project.

**GDES 8361. Color, Design, and Human Perception.**
(3.0 cr.; A-F or Audit; prereq Basic color theory course or #: spring, even years)
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.

**GDES 8362. The Nature of Representation in Visual Communication.**
(3.0 cr.; A-F or Audit; spring, odd years)
Theories of representation and studio production (digital, non-digital) centered around representation in culture.

**GDES 8990. MFA Creative Thesis.**
(6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Completed coursework requirements for MFA in DHA w/ multimedia emphasis; #: fall, spring, summer, every year)
MFA project.

**Greek (GRK)**
College of Liberal Arts

**GRK 5003. Intermediate Greek Prose: Graduate Student Enrollment.**
(3.0 cr.; [GRK 3003]; prereq Grade of at least [C- or S] in [1002 or 5001] or [#; grad student]; fall, every year)
Readings in Classical Greek prose texts by one or more authors (e.g., Plato, Lysias, Xenophon, Herodotus). Review of grammar/morphology. Meets with 3003.

**GRK 5004. Intermediate Greek Poetry: Graduate Student Enrollment.**
(3.0 cr.; [GRK 3004]; prereq [5003 or equiv], grad student or #: spring, every year)

**GRK 5100. Advanced Reading.**
(3.0 cr. [max 18.0 cr.]; 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.; fall, spring, every year)
Reading in Greek texts/authors. Texts/authors vary.

**GRK 5200. Biblical Greek.**
(3.0 cr. [max 6.0 cr.; 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.; fall, every year)

**GRK 5701. Prose Composition.**
(3.0 cr.; prereq Grad student or #: spring, even years)
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.

**GRK 5702. Text Criticism.**
(3.0 cr.; prereq Grad student or #: fall, spring, offered periodically)

**GRK 5704. Greek Paleography.**
(3.0 cr.; prereq Grad student or #: fall, spring, offered periodically)
Analysis of various hands used in Greek manuscripts with attention to date/provenance.
History of transmission of Greek literature.

**GRK 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin.**
(3.0 cr.; )
Historical/comparative grammar of Greek/ Latin, from their Proto-Indo-European origins to classical norms.

**GRK 5706. History of Greek.**
(3.0 cr.; prereq Grad student or #: fall, spring, offered periodically)
Reading and formal analysis of documents illustrating evolution of Greek language from Mycenaean to modern times.

**GRK 5800. Sight Reading for Graduate Students.**
(1.0 cr. [max 6.0 cr.]; S-N only; prereq Enrollment in a grad program in Department of Classical/Near Eastern Studies; fall, spring, every year)
Practice in reading Greek texts at sight.

**GRK 5993. Directed Studies.**
(1.0-4.0 cr. [max 18.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq Grad student or instr consent.

**GRK 5994. Directed Research.**
(1.0-12.0 cr. [max 18.0 cr.; fall, spring, every year])
Supervised original research on topic chosen by student. Prereq Grad student or instr consent.

**GRK 5996. Directed Instruction.**
(1.0-12.0 cr. [max 20.0 cr.; fall, spring, every year]
Supervised teaching internship. Prereq Grad student or instr consent.

**GRK 8100. Readings in Greek Prose.**
(3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year)
Reading and discussion of ancient Greek prose texts.

**GRK 8120. Greek Text Course.**
(3.0 cr. [max 15.0 cr.; prereq 3111 or #: for students in dept of Classical and Near East Studies; fall, spring, every year)
Students attend 3xxx Greek courses. Supplementary work at discretion of instructor.

**GRK 8200. Readings in Greek Verse.**
(3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year)
Reading/discussion of ancient Greek poetic texts.

**GRK 8262. Survey of Greek Literature I.**
(3.0 cr.; )
Extensive selections from all genres of Greek literature of archaic and early classical periods.

**GRK 8263. Survey of Greek Literature II.**
(3.0 cr.; )
Extensive selections from Greek authors of the classical and Hellenistic eras.

**GRK 8300. Readings in Greek Texts.**
(3.0 cr. [max 18.0 cr.; prereq Advanced grad student; fall, spring, every year)
Reading/discussion of literary or documentary texts from Greek antiquity. Topics may include subjects that draw on various sources, genres, or methods.

**GRK 8400. Readings in Patristic Greek.**
(3.0 cr. [max 6.0 cr.]; prereq Advanced grad student; fall, odd years)
Reading/discussion of early Christian texts in Greek.

**GRK 8910. Seminar.**
(3.0 cr. [max 30.0 cr.; fall, spring, offered periodically)
Various topics in Greek literature examined in depth with emphasis on current scholarship and original student research.

**Health Informatics (HINF)**
Academic Health Center Shared

**HINF 5115. Interprofessional Healthcare Informatics .**
(3.0 cr.; prereq Grad student or professional student or #: fall, spring, summer, every year)
Implications of informatics for practice, including nursing, public health, and healthcare in general. Electronic health record issues.
Relates ethical, legislative and political issues informatics. Global and future informatics issues.

**HINF 5430. Health Informatics I.**
(3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #: fall, every year)
Introductory survey of health informatics, focusing on foundational concepts.
Conceptualizations of data, information, knowledge. Current terminologies, coding, classification systems for medical information.
HINF 5431. Health Informatics II. (3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; spring, every year) Introductory survey of health informatics, focusing on applications of informatics concepts/technologies. Health informatics research, literature, evaluation, decision models. Computerized decision support systems. Data mining, natural language processing, other emerging technologies. Security for health care information handling.

HINF 5436. AHC Informatics Grand Rounds. (1.0 cr. [max 10.0 cr.]; S-N or Audit; fall, spring, every year) Presentation/discussion of research problems, current literature/topics of interest in Health Informatics.

HINF 5496. Internship in Health Informatics. (1.0-6.0 cr. [max 18.0 cr.]; S-N or Audit; prereq HINF student or #; fall, spring, summer, every year) Practical industrial experience not directly related to student's normal academic experience.

HINF 5499. Capstone Project for the Masters of Health Informatics. (3.0 cr.; A-F only; prereq second semester MHI student or #; fall, spring, summer, every year) 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.

HINF 5501. US Health Care System: Information Challenges in Clinical Care. (1.0 cr.; S-N or Audit; prereq Junior or senior or professional student or grad student or #; fall, spring, every year) 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.

HINF 5502. Programming Essentials Python 3. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Junior or senior or grad student or professional student or #; fall, spring, every year) 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.

HINF 5510. Applied Health Care Databases: Database Principles and Data Evaluation. (3.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; fall, every year) Principles of database theory, modeling, design, manipulation of databases. Taught with health care applications emphasis. Using relational database management system (RDBMS). Database manipulation. Structured Query Language (SQL) to compose/execute queries.

HINF 5520. Clinical Informatics and Patient Safety. (2.0 cr.; A-F or Audit; prereq Junior or senior or grad student or professional student or #; fall, spring, every year) 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.

HINF 5530. Health Care Software Management. (2.0 cr.; A-F or Audit; prereq HINF student or #; spring, every year) 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.

HINF 5531. Health Data Analytics and Data Science. (2.0 cr.; A-F or Audit; prereq Junior or senior or professional student or grad student or #; spring, every year) Data science methods/techniques for extraction, preparation, use of health data in decision-making.

HINF 5540. Interprofessional Health Informatics. (2.0 cr.; A-F only; spring, every year) Informatics applications in various healthcare professions. Clinical specialties. Informatics tools to improve healthcare services/outcomes through lectures/presentations.

HINF 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HINF 8405. Advanced Topics in Health Informatics I. (1.0-4.0 cr. [max 12.0 cr.]; prereq Professional student or grad student or #; fall, every year) 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.

HINF 8406. Advanced Topics in Health Informatics II. (1.0-4.0 cr. [max 12.0 cr.]; prereq Professional student or graduate student or #; spring, every year) Computer systems design for health sciences, small computer concepts/use, computers for clinical services, computer-aided medical decision making, biomedical image processing, pattern recognition. Case studies from health sciences.

HINF 8434. Medical Decision Support Techniques. (3.0 cr.; A-F or Audit; prereq 5432 or #; fall, spring, every year) 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.

HINF 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HINF 8446. Professional Studies in Health Informatics. (1.0-2.0 cr.; A-F or Audit; prereq 5431, PubH 5452 or #, graduate inf major; fall, spring, every year) Health informatics as a profession, including discipline, responsibilities, resources, and job opportunities. Directed experiences in consulting, teaching, writing, conducting research, and managing facilities.

HINF 8492. Advanced Readings or Research in Health Informatics. (1.0-6.0 cr. [max 24.0 cr.]; Student Option No Audit; prereq HINF student or #; fall, spring, summer, every year) Directed readings or research in topics of current or theoretical interest in health informatics.

HINF 8494. Research in Health Informatics. (1.0-6.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Directed research under faculty guidance.

HINF 8525. Health Informatics Teaching. (2.0 cr.; A-F only; prereq HINF student or #; spring, odd years) 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.

HINF 8535. Advanced Health Informatics Research Methods. (3.0 cr.; A-F only; prereq HINF student or #; spring, odd years) Application of research methods, evaluation, design, data collection, and data analysis in the context of health informatics, including computational and health data challenges.

HINF 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

HINF 8770. Plan B Project. (4.0 cr.; No Grade Associated; prereq Advanced plan B MS student; fall, spring, summer, every year) Research project. Topic arranged between student/instructor. Written report required.

HINF 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

HINF 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Hebrew (HEBR) College of Liberal Arts
HEBR 5090. Advanced Modern Hebrew. (3.0 cr. [max 18.0 cr.]; prereq 3012 or #; fall, every year) 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. (3.0 cr. [max 18.0 cr.]; =HEBR 3200; prereq [3 sem of biblical Hebrew, 5 sem of modern Hebrew] or #; fall, spring, offered periodically) 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. (3.0 cr. [max 18.0 cr.]; prereq Grad student or #; fall, even years) 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.

HEBR 5400. Rabbinic Texts. (3.0 cr. [max 18.0 cr.]; prereq Grad student or #; spring, even years) Language, idiom, and literary forms of classical Rabbinic sources in Hebrew. Selections drawn from legal, homiletical, and narrative texts (Mishnah, Tosefta, Talmud, Midrash). Original socio-historical/cultural background of Rabbinic literature, its enduring religious significance.

HEBR 5990. Topics in Hebrew Studies. (1.0-4.0 cr. [max 12.0 cr.]; prereq Grad student or #; fall, offered periodically) Historical, linguistic, literary, religious, or humanistic study of Hebrew society/culture. Approach/method of study varies with topic.

HEBR 5992. Directed Readings. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading or study. Prereq instr consent, dept consent, college consent.

Hindi-Urdu (HNUR) College of Liberal Arts

HNUR 5040. Readings in Hindi-Urdu Texts. (3.0 cr. [max 9.0 cr.]; prereq 3032 or #; fall, spring, offered periodically) Read authentic materials of various types to improve reading/speaking ability.

HNUR 5993. Directed Readings. (1.0-5.0 cr. [max 15.0 cr.]; fall, spring, every year) Guided individual reading or study of modern Hindi-Urdu texts. Prereq instr consent, dept consent, college consent.

History (HIST) College of Liberal Arts

HIST 5011. Measuring the Past: Quantitative Methods for Historical Research. (4.0 cr.; =HIST 3011; prereq Primarily for 1st-yr grad students; fall, spring, offered periodically) Basics of quantitative historical data collection, measurement, analysis.

HIST 5051. Before Herodotus: History and Historiography of Mesopotamia and the Ancient Near East. (3.0 cr.; A-F or Audit; =CNES 5051; prereq Prev coursework in ancient Near Eastern history recommended; fall, spring, offered periodically) Historical method/sources for ancient Near Eastern history. Historical traditions. Historiographic texts of Mesopotamia and neighboring regions of the ancient Near East, secondary emphasis on their relationship to works of classical historians such as Herodotus. Use of these sources in modern historiography of ancient Near East.

HIST 5053. Doing Roman History: Sources, Methods, and Trends. (3.0 cr.; prereq Grad student or #; fall, spring, even years) 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. Ways in which these issues shape research.

HIST 5111. Proseminar in the History of Medieval Europe. (3.0 cr.; A-F or Audit; prereq Advanced undergrads of exceptional ability or grads; #; fall, spring, offered periodically) Examination of basic scholarly bibliography for medieval Western European history. Aim is to help students to prepare for M.A. and Ph.D. examinations.

HIST 5115. Medieval Latin Historians. (3.0 cr.; prereq Reading knowledge of Latin; fall, spring, offered periodically) 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.

HIST 5251. Socialist/Post-socialist Transformations. (3.0 cr.; A-F or Audit; =GLOS 5603;) Transformations underway in post-socialist societies of Eastern Europe, former Soviet Union. Ramifications of abandonment of state socialism, introduction of market relations. Effect of former system, new market system on cultural institutions/identities.

HIST 5264. Imperial Russia: Formation and Expansion of the Russian Empire in the 18th and 19th Centuries. (3.0 cr. [max 4.0 cr.]; =HIST 3264; fall, spring, every year) 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. (3.0 cr.; =HIST 3265; spring, every year) 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. (3.0 cr.; A-F or Audit; =HIST 3271; fall, spring, offered periodically) 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 5276. Intellectual and Cultural History of Modern Greece. (3.0 cr.; fall, odd years) Literary and cultural contributions of modern Greece. The modern Greek experience seen through Greek historical and cultural monuments. An attempt at self-definition.

HIST 5285. Problems in Historiography and Representation of the Holocaust. (3.0 cr.; =JWST 5111; prereq JWST 3521 or RELS 3521 or #; fall, spring, offered periodically) Relationship of paintings, memorials, and other art forms to the question of understanding the Holocaust. Issues of sources, especially use of the Survivors of the Shoah project in U libraries.

HIST 5294. Social History of Russia and Eastern Europe Through the 19th Century. (3.0 cr.; fall, spring, offered periodically) Lives of peasants and workers, nobles and merchants. Topics include family, marriage, sexuality; culture and tradition; transformation from an agricultural to a modern society.

HIST 5295. Social History of Russia and Eastern Europe From the Late 19th Century to the Present. (3.0 cr.; fall, spring, offered periodically) Social movements (revolutionary, nationalist, women's); communist and post-communist societies.

HIST 5379. Problems in Early American History. (3.0 cr.; fall, spring, offered periodically) 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. (3.0-4.0 cr. [max 8.0 cr.]; prereq 1301, 1302; fall, spring, offered periodically) 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.

HIST 5421. Gender in Latin American History. (3.0 cr.; fall, spring, offered periodically)
Women's history/masculinity. Gender/colonialism, marriage, sexuality, nationalism, labor, political movements, feminism.

HIST 5436. Social History of African Women: 1850 to the Present. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically) Explore the historical forces which have shaped African women's everyday lives and the ways in which these women have been active agents in the making of their own histories.


HIST 5441. Transformations in Pre-Colonial African History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) African internal/external processes before 1600. Framework by which early African history is understood, tools for reconstructing it, themes/debates that have shaped it, new directions in which it is moving.

HIST 5446. Problems in West African History. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically) This problem-centered course explores several of the major historiographical, methodological, and theoretical debates in West African history. Core topics include state formation, trade, slavery, Islam, gender, and colonialism.

HIST 5468. Social Change in Modern China. (3.0 cr.; [EAS 3468, HIST 3468]; spring, offered periodically) 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 Tai 'an; PRC's entry into the world trading system.

HIST 5469. Historiographies of China, 1000-1700. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) Important recent English-language work on Chinese culture during the Song, Yuan, and Ming dynasties. Topics include religion, gender, family structures, ethnic identity, commerce/economics, and political structures/events.


HIST 5474. Sex and the Politics of Desire: Japan and Beyond. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) History of gender/sexuality in modern Japan and Korea. Geography of Japan. Theoretical/methodological literature not specific to Japan. Sexology, eugenics, feminism, nationalism, colonialism, cyber sexuality.

HIST 5478. Tigers and Dragons: The Rise of the East Asian Economies, 1930-Present. (3.0 cr.; [HIST 3478, GLOS 3278]; prereq Grad student; spring, even years) Rise of East Asian Economies, 1930-Present.

HIST 5479. History of Chinese Cities and Urban Life. (3.0 cr.; A-F or Audit; [EAS 3479, HIST 3479, ALL 3371]; fall, spring, offered periodically) Place of medieval Europe in the world. Relations of Europe with Asia, Africa, and the Americas. European knowledge of the world's other great cultures. European travelers/explores. Assessment of other cultures' knowledge of Europe in the period.

HIST 5501. Medieval Europe and the World. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Peuples, lands, cultures of the Middle East, from earliest civilizations to present.

HIST 5502. Topics in Chinese History. (3.0 cr.; max 12.0 cr.; fall, spring, offered periodically) Selected topics not covered in regular courses. Taught as staffing permits.

HIST 5540. Topics in Mediterranean Studies. (1.0-4.0 cr.; max 15.0 cr.; A-F or Audit; prereq Grad student or advanced undergrad with #; fall, spring, every year) Mediterranean history, from Middle Ages to present. Taught as staffing permits.

HIST 5541. Islam in the Catholic Age. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically) Rise of Islam in its Arabian setting. Roles of prophet, orthodox/Islam/caliphs. Development of Islamic state/empire, organizations, institutions, status of Muslims/non-Muslims.

HIST 5547. Empire and Nations in the Middle East. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Modernity in non-Western imperial context. Identity, ideology, economy, environment, language.

HIST 5561. New Directions in the Middle Ages, ca. 300-1100. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) Basic scholarly bibliography for medieval Western European history during early Middle Ages. Foundation for teaching courses in medieval history, preparing for general doctoral exam.

HIST 5562. World History Proseminar. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Critical reading of historical literature dealing with integration of the globe during the early modern period, ca. 1350-1750; book reports, class discussion.

HIST 5563. Socio-Economic History of China. (3.0 cr.; A-F or Audit; prereq Grad student or [adv undergrad, #]; spring, offered periodically) Nature of Chinese socio-political formations and economic development in Qing and Republican eras, 1644-1937. Establishment/methods of state rule, merchants, agrarian social structure, domestic industry, demographic regimes, capitalism, and imperialism. Comparisons using theoretical and case studies of economic development.
HIST 5640. Topics in Legal History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Comparative approaches to methodologies of, and theoretical debates in legal history. Topics from ancient world to present, such as citizenship/statebuilding, religion and the law, women's legal history.

HIST 5642. U.S. Legal History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Topics in history of American law, legal thought, legal institutions, and legal profession. Proceeds thematically. Primary/secondary sources.

HIST 5646. U.S. Women's Legal History. (3.0 cr.; fall, offered periodically) Women's legal status in U.S. history, 1648 to present. Changes in women's legal status in marriage, divorce, and child custody; reproductive/sexual autonomy; and economic/educational equality. Differences among women based on race, class, and ethnicity.

HIST 5648. Development of the Western European Legal Tradition. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Evolution of and interaction among Roman and civil law, customary/feudal law, canon law, and English common law. Primary/secondary sources in English.

HIST 5649. Ideas in Context: Making Early Modern Knowledge, 1500-1800. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) Role of institutions/locus in development of early-modern European thought/culture. University, academy, learned society, princely court, museum, printing house, workshop, trading company, armies/navies, state bureaucracies, salons, other independent associations of nascent civil society.

HIST 5650. Proseminar: Early Modern Europe. (3.0 cr.; A-F or Audit; prereq Hist grad or #; fall, spring, offered periodically) Critical reading of historical literature for early modern Europe, ca. 1450-1700, dealing with France, Germany, Italy, the Low Countries, and Spain. Each student chooses a country to focus on: book reports, class discussion.

HIST 5671. Proseminar: British Empire. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Critical study of major writings in British history, 1760-1945, and preparation for research in field.

HIST 5715. Readings in European Women's History: 1450-1750. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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. (3.0 cr.; max 6.0 cr.; A-F or Audit; prereq Grad or #; fall, spring, every year) 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 5721. Contemporary Europe From the Late 19th Century to the Beginning of the Cold War: 1890-1950. (3.0 cr.; =HIST 3721; prereq previous coursework in 19th- and/or 20th-century Europe; #; fall, spring, offered periodically) The historical literature and debates surrounding major issues in the social, political, cultural, and economic development of Europe from the turn of the century through the impact of WWII. Topics include the development of imperialism, national rivalries, social and political conflict, the rise of fascism and communism, and the origins of war.


HIST 5740. Topics in Modern German History. (3.0-4.0 cr.; max 12.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Readings and discussions on some central questions concerning the history of Germany during the modern period with particular emphasis on the relationship between social change and political development. Offerings vary in thematic and chronological focus.

HIST 5761. Proseminar - Imperial Russia.. (3.0 cr.; A-F or Audit; prereq Knowledge of Russian or German or French; fall, spring, offered periodically) Western and Russian historiography on crucial issues of imperial Russia. Political institutions; culture and society; modernization and reforms; new interpretations.

HIST 5762. Proseminar in 20th Century Russia. (3.0 cr.; A-F or Audit; prereq 5761, Knowledge of Russian or German or French; fall, spring, offered periodically) Western and Russian historiography on crucial issues of 20th-century Russia. The nature of revolutions, debate over the evolution of the Soviet regime, the collapse of empires, new interpretations.

HIST 5777. Proseminar in Habsburg Central Europe. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) 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.

HIST 5794. Proseminar in European Economic History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Europe's rise in the world economy; England's industrial revolution and uneven development in Europe; imperialism and World War I; the Great Depression; the post-1945 economic miracle; continuity and change in Eastern Europe.

HIST 5797. Methods of Population History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Standard methods of population analysis. Focuses on methods widely used for historical population research.

HIST 5801. Seminar in Early American History. (3.0 cr.; A-F or Audit; =HIST 8801; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; =HIST 8802; fall, spring, every year) Readings-intensive course. U.S. history from Mexican-American War to present.


HIST 5821. American History in the Twentieth Century. (3.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, offered periodically) Intensive readings seminar.


HIST 5841. Proseminar in American Economic History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Historical literature on American economic and business history from American Revolution to the modern economy.

HIST 5844. U.S. Labor History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Readings in classic and recent approaches to the history of the working class in the United States. Central topics include slavery and free labor, women's paid and unpaid labor, management strategy, labor protest, and trade union organization.

HIST 5845. History of American Capitalism. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
HIST 5805. Topics in European Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or [advanced undergrad with #]; fall, spring, every year)
Selected topics in Medieval European history, up to 1500 ce.

HIST 5910. Topics in U.S. History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or advanced undergrad student with #; fall, spring, every year)
Selected topics in U.S. history not covered in regular courses. Taught as staffing permits.

HIST 5920. Topics in African History. (3.0 cr. [max 15.0 cr.]; prereq Grad or #; fall, spring, offered periodically)
Topics not covered in regular courses.

HIST 5930. Topics in Ancient History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Grad or #; fall, spring, offered periodically)
Selected topics in ancient history not covered in regular courses. To be taught as staffing permits and as enrolment warrants.

HIST 5931. Topics in Comparative Third World History. (3.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
Topics specified in Class Schedule.

HIST 5932. The Production of Knowledge, Negotiating the Past, and the Writing of African Histories. (3.0 cr. A-F or Audit; [AFRO 5932]; fall, spring, offered periodically)
Recent scholarship on social history of Africa. Focuses on new literature on daily lives of ordinary people in their workplaces, communities, households.

HIST 5933. Seminar in Ancient History. (3.0 cr.; A-F or Audit; prereq Previous coursework in Greek or Roman history; #; fall, spring, offered periodically)
Seminar on a selected topic in ancient history.

HIST 5934. Comparative History and Social Theory. (3.0 cr.; A-F or Audit; prereq Grad student or [upper-div undergrad; #]; fall, odd years)
Works of history/sociology that are broadly comparative/theoretical. Issues of state formation, social movements, social structure, and economic development.

HIST 5935. Methods and Pedagogy in African History. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically)
Current historical methods/sources of African history. Pedagogical issues. Students design their own courses.

HIST 5940. Topics in Asian History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad student or [advanced undergrad; #]; fall, spring, every year)
Topics not covered in regular courses.

HIST 5941. Readings in Chinese Documents. (3.0 cr.; A-F or Audit; prereq Reading knowledge of Chinese; fall, spring, offered periodically)
Readings in Chinese on a topic to be selected by the instructor. Depending on the topic and the time period, readings may involve a mixture of modern and classical Chinese or may be entirely in modern Chinese. Consult instructor for more information.

HIST 5942. Topics: History of Medicine. (3.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Prior history of medicine or history of science course recommended for undergrads; fall, spring, offered periodically)
An exploration of topics central to the history of medicine. Emphasis on mid-18th century to the present. Topics vary yearly.

HIST 5950. Topics in Latin American History. (1.0-4.0 cr. [max 15.0 cr.]; A-F or Audit; prereq Grad or advanced undergrad with #; fall, spring, every year)
Selected topics in Latin American history not covered in regular courses. Taught as staffing permits.

HIST 5960. Topics in History. (1.0-4.0 cr. [max 16.0 cr.]; prereq Grad or [advanced undergrad with #]; fall, spring, every year)
Selected topics in history not covered in regular courses. Taught as staffing permits.

HIST 5962. Bell Library Research Seminar in Comparative World History, ca. 1000-1800 CE. (3.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, offered periodically)
Research seminar on actions of Europeans in wider world, 1000-1800. Based on documents in James Ford Bell Library.

HIST 5964. Comparative Economic History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
Theoretical approaches guide cross-cultural examinations of major issues in the economic history of East Asia, Europe, and the New World. Agrarian structures in economic development, markets, the state and economic development, and the industrial revolution.

HIST 5970. Advanced Research in Quantitative History. (4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, offered periodically)
Students will carry out publishable-quality research on a quantitative historical topic.

HIST 5971. Proseminar: Editing and Publishing. (3.0 cr.; A-F or Audit; )

HIST 5980. Topics in Comparative Women's History. (3.0-4.0 cr. [max 20.0 cr.]; A-F or Audit; prereq Grad student or [advanced undergrad; #]; fall, spring, offered periodically)

HIST 5990. Readings in Comparative History. (3.0 cr. [max 9.0 cr.]; A-F only; prereq #; spring, even years)
HIST 5993. Directed Study. (1.0-16.0 cr. [max 20.0 cr.]; [A-F or Audit; prereq: Grad student or sr], instr consent, dept consent, college consent)

HIST 5994. Directed Research. (1.0-16.0 cr.; fall, spring, summer, every year) Work on a tutorial basis. Prereq [Grad student or sr], instr consent, dept consent, college consent.

HIST 8015. Scope and Methods of Historical Studies. (3.0 cr.; A-F or Audit; prereq #; every year) Development of historical studies over time (especially in 19th and 20th centuries). Methodologies currently shaping historical research. Theoretical developments within the discipline during 19th and 20th centuries.

HIST 8016. Practicum in Historical Writing. (3.0 cr.; A-F only; fall, spring, offered periodically) Facilitate transition from writing seminar papers to writing individual research projects part of dissertation. Practice of making historical arguments in common genres of academic profession, such as grant proposals, prospectus, dissertation chapters.

HIST 8021. Seminar: Advanced Historical Writing. (3.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, offered periodically) Formal writing group. Writing practices for historians. Readings/discussions about historical analysis. Practical application of writing historical narratives. Students complete a major writing project based on their program needs and progress.

HIST 8025. Politics of Historical Memory. (3.0 cr. [max 6.0 cr.]; A-F or Audit; spring, every year) Issues surrounding interaction of memory/history. Genealogy of historical memory. Individual narratives and circulation of historical memory. Sites/forms of collective memory. Justice and historical memory. Case studies, discussions, research projects.

HIST 8110. Medieval History: Research Seminar. (3.0 cr.; A-F or Audit; prereq #, good reading knowledge of Latin, French, one other European language; fall, spring, offered periodically) Research in medieval European history, using primary source material.

HIST 8232. Cultural Fallout: The Cold War and Its Legacy: Research. (3.0 cr.; A-F or Audit; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Dynamics of gender, racial, class, and ethnic relations in U.S. history; intersections of these forces.

HIST 8240. Topics in Research in Gender, Race, Class, or Ethnicity in the United States. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Dynamics of gender, racial, class, and ethnic relations in U.S. history. Intersections of these forces. Topis vary by instructor.

HIST 8245. Human Rights and Crimes Against Humanity: A Global History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Theoretical literature on genocides and human rights and on race/nation. Readings/discussions on meaning of "genocide" and its codification in international law. Historical cases. Students choose case to research.

HIST 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DDS consent; fall, spring, summer, every year) (No description)

HIST 8390. Research in American Indian History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Research/writing skills in American Indian history. Identify research questions, locate sources, conduct original research, produce substantial research paper.


HIST 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DDS consent; fall, spring, summer, every year) (No description)

HIST 8464. Research in Yuan, Ming, and Qing History. (3.0 cr.; A-F or Audit; prereq Good working knowledge of classical Chinese, background in history of late imperial China; fall, spring, offered periodically) Basic skills and resources for doing research in history of late imperial China. Bibliographic exercises; reading and translating primary documents.

HIST 8465. Research in Yuan, Ming, and Qing History. (3.0 cr.; prereq Good working knowledge of classical Chinese, background in history of late imperial China; fall, spring, offered periodically) 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.

HIST 8540. Topics in Mediterranean Studies. (1.0-4.0 cr. [max 15.0 cr.]; A-F or Audit; prereq Grad student or advanced undergrad with #; fall, spring, every year) Mediterranean history from Middle Ages to present. Taught as staffing permits.

HIST 8630. Seminar in World History. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically) Critical examination of historical literature dealing with theoretical approaches to world history and teaching of world history.

HIST 8640. Topics in Legal History Research. (3.0 cr. [max 9.0 cr.]; A-F or Audit; fall, spring, offered periodically) Comparative, methodological, theoretical, and topical courses in legal historical research, from ancient world to present. Offerings rotate.

HIST 8644. Legal History Workshop. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Introduction to legal history and professional socialization. Work-in-progress of leading scholars working in field of legal history. Students can undertake original research.

HIST 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

HIST 8709. Seminar: History of Sexuality. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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. (3.0 cr.; prereq 5715; fall, spring, offered periodically) Research techniques for completing a major research paper based on primary sources.

HIST 8720. Research Seminar on Central European History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, summer, every year) 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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)
HIST 8801. Seminar in Early American History. (3.0 cr.; A-F or Audit; [HIST 5801]; fall, spring, offered periodically)
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. (3.0 cr.; A-F or Audit; [HIST 5802]; fall, spring, offered periodically)
Readings-intensive course. U.S. history from Mexican-American War to present.

HIST 8832. Cultural Fallout: The Cold War and Its Legacy: Research. (3.0 cr.; A-F or Audit; prereq 5831; fall, spring, every year)
Student produces research paper on history/culture of Cold War era in the United States after World War II. Research projects build upon readings from 5831.

HIST 8857. Seminar: Research in the History of American Women. (3.0 cr.; A-F or Audit; prereq 5857 #; fall, spring, offered periodically)
Students define a historical problem or area of research on a topic in American women’s history they would like to pursue in depth, identify appropriate sources and accomplish research in primary and secondary sources, write a 25 to 35-page scholarly article, and read and comment upon each other’s drafts.

HIST 8858. Research in Early American History. (3.0 cr.; A-F or Audit; prereq 5801 or #; fall, spring, offered periodically)
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.

HIST 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 14 cr per semester or summer, 24 cr required; fall, spring, summer, every year)
(No description)

HIST 8900. Topics in European/Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year)
Topics not covered in regular courses.

HIST 8905. Topics in European Medieval History. (1.0-4.0 cr. [max 16.0 cr.]; fall, spring, every year)
Selected topics in Medieval European history, up to 1500ce.

HIST 8910. Topics in U.S. History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year)
Topics not covered in regular courses.

HIST 8920. Topics in African History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, offered periodically)
Topics not covered in regular courses.

HIST 8930. Topics in Ancient History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, offered periodically)
Topics not covered in regular courses.

HIST 8940. Topics in Asian History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, offered periodically)
Topics not covered in regular courses.

HIST 8944. Research Seminar: New Directions in African Social History I. (3.0 cr.; A-F or Audit; prereq #; fall, spring, offered periodically)
The 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.

HIST 8945. Research Seminar: New Directions in African Social History II. (3.0 cr.; S-N or Audit; prereq 8944, #; fall, spring, offered periodically)
Second of two-part course. Students conceptualize and write major research paper.

HIST 8950. Topics in Latin American History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; spring, every year)
Topics not covered in regular courses.

HIST 8960. Topics in History. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; fall, spring, every year)
Topics not covered in regular courses.

HIST 8961. Research Seminar: Intellectual History. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)
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. (4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Grad student; fall, spring, offered periodically)
Students carry out publishable-quality research on quantitative history topic.

HIST 8990. Topics in Comparative History-Research. (3.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year)
Topics vary. Students read/discuss historical works from different geographic areas, develop proposals for comparative research, or pursue comparative research projects.

HIST 8993. Directed Study. (1.0-16.0 cr.; A-F or Audit; prereq Grad student; #; fall, spring, summer, every year)
Students work on tutorial basis. Guided individual reading or study.

HIST 8994. Directed Research. (1.0-16.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Work on a tutorial basis.

History of Medicine (HMED)

HMED 5002. Public Health Issues in Historical Perspective. (3.0 cr.; fall, spring, offered periodically)
Introduction to the evolution of major recurring problems and issues in public health including environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.

HMED 5035. The Germ Theory and Modern Medicine. (3.0 cr.; fall, spring, offered periodically)
Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

HMED 5045. Modern Medical Profession. (3.0 cr.; fall, spring, offered periodically)
Historical analysis of American medical profession in 19th/20th centuries. Role of institutions, influence of social/moral values. Consequences of specialization, scientific innovation.

HMED 5055. Women, Health, and History. (3.0 cr.; prereq Grad student or [jr or sr] with prev coursework in hist or #; fall, offered periodically)
Women’s historical roles as healers, patients, research subjects, health activists. Biological determinism, reproduction, mental health, nursing, women physicians, public health reformers, alternative practitioners. Gender disparities in diagnosis, treatment, research, careers. Assignments allow students to explore individual interests.

HMED 5075. Technology and Medicine in Modern America. (3.0 cr.; A-F or Audit; prereq #; fall, spring, odd years)
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.

HMED 5200. Early History of Medicine to 1700. (3.0 cr.; A-F or Audit; fall, every year)
An introductory survey of the history of medicine in Europe and America.

HMED 5201. History of Medicine from 1700 to 1900. (3.0 cr.; prereq 5200; spring, every year)
An introductory survey of the history of medicine in Europe and America.

HMED 5210. Seminar: Theories and Methods in Medical History. (3.0 cr.; A-F or Audit; fall, every year)
Historiography of the history of medicine.

HMED 5211. Seminar: Theories and Methods in Medical History. (3.0 cr.; A-F or Audit; prereq 5210; spring, every year)
Use of archives, primary sources. Supervised research project.

HMED 5600. Directed Study. (0.0-4.0 cr. [max 16.0 cr.]; prereq #; fall, spring, summer, every year)
Directed Study

HMED 5940. Topics in the History of Medicine. (3.0-4.0 cr. [max 16.0 cr.]; fall, spring, offered periodically)
Seminar on the historical relations between medicine and the State from the 18th to 20th centuries.

**HMED 8001. Foundations in the History of Early Medicine.** (3.0 cr.; A-F only; fall, every year)
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.** (3.0 cr.; A-F only; spring, every year)
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.** (3.0 cr.; A-F only; prereq #; fall, every year)
Models of practice, different schools. Work of representative historians of science, technology, and medicine.

**HMED 8113. Research Methods in the History of Science, Technology, and Medicine.** (3.0 cr.; A-F only; = [HMED 8113]; prereq #; spring, every year)
Introduction to sources, methods, and problems of research in history of science, technology, and medicine. Preparation of major research paper under faculty supervision.

**HMED 8220. Seminar: Current Topics in the History of Medicine.** (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Topics vary.

**HMED 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**HMED 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**HMED 8631. Directed Study.** (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, every year)
tbd

**HMED 8632. Directed Study.** (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; spring, every year)
tbd

**HMED 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st 2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
tbd

**HMED 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**HMED 8830. Topics in the History of Science, Technology, and Medicine.** (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically)
Historical literature of topics common to history of science, technology, and medicine.

**HMED 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

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**History of Science and Technology (HSCI)**

**College of Science and Engineering**

**HSCI 5211. Biology and Culture in the 19th and 20th Centuries.** (3.0 cr.; = [HSCI 3211]; fall, spring, every year)
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. The Darwinian Revolution.** (3.0 cr.; = [HSCI 3242]; fall, spring, offered periodically)

**HSCI 5244. History of Ecology and Environmentalism.** (3.0 cr.; = [HSCI 3244]; ) Development of ecological thought from 18th century natural theology to contemporary ecology and conservation biology; changing views of "balance" and the "economy" of nature; conceptual and methodological developments in ecosystems ecology; connections between ecology and conservation, population and environmental politics.

**HSCI 5331. Technology and American Culture.** (3.0 cr.; = [HSCI 3331]; fall, spring, offered periodically)

**HSCI 5332. Science and American Culture.** (2.0-3.0 cr.; = [HSCI 3332]; fall, spring, offered periodically)

**HSCI 5401. Ethics in Science and Technology.** (3.0 cr.; = [HSCI 3401]; fall, spring, offered periodically)
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.** (3.0 cr.; = [HSCI 3421]; fall, spring, every year)
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 5611. Enlightenment, Revolution, and the Rise of Modern Science.** (3.0 cr.; = [HSCI 3611]; spring, every year)
History of relations between science/European Enlightenment in eighteenth century, Science/public culture, role of science in refashioning humans/societies. Impact of scientific explorations/exploitation afforded by new global/imperial world.

**HSCI 5993. Directed Studies.** (1.0-15.0 cr.; prereq #; fall, spring, summer, every year)
Guided individual reading or study.

**HSCI 5994. Directed Research.** (1.0-15.0 cr.; prereq #; fall, spring, every year)
TBD

**HSCI 8112. Historiography of Science, Technology, and Medicine.** (3.0 cr.; A-F only; fall, every year)
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.** (3.0 cr.; A-F only; = [HSCI 8113]; spring, every year)
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.** (3.0 cr.; A-F or Audit; prereq Grad HSCI major or minor or #; fall, offered periodically)

**HSCI 8125. Foundations for Research in the Scientific Revolution.** (3.0 cr.; A-F or Audit; prereq Grad HSCI major or minor or #; fall, spring, even years)
Development of sciences/natural philosophy, 1500-1725.

**HSCI 8131. Industrial Revolutions.** (3.0 cr.; A-F only; spring, odd years)
Development of industrial society, from 1700 through 1850. Emphasizes developments in mechanical/engineering sciences. Scientific,
HS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HS 8421. Social and Cultural Studies of Science. (3.0 cr.; fall, spring, offered periodically) Review of recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

HS 8441. Women in Science: Historical Perspectives. (3.0 cr.; prereq #; fall, spring, offered periodically) 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.

HS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

HS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

HS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

HS 8830. Topics in the History of Science, Technology, and Medicine. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Historical literature of topics common to history of science, technology, and medicine.

HS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

HS 8900. Seminar: History of Early Physical Science. (3.0 cr.; prereq #; fall, spring, offered periodically) For advanced graduate students; topics in development of natural and mathematical science before 1800.

HS 8910. Seminar: History of Modern Physical Sciences. (3.0 cr. [max 6.0 cr.; prereq #; fall, spring, offered periodically) For advanced graduate students; topics in development of physical sciences since 1800.

HS 8920. Seminar: History of Biological Sciences. (3.0 cr. [max 6.0 cr.; prereq #; fall, spring, every year) For advanced graduate students; topics in development of natural, biological, and medical sciences from Aristotle to the present.

HS 8930. Seminar: History of Technology. (3.0 cr. [max 8.0 cr.; prereq #; fall, spring, offered periodically) For advanced graduate students; topics in development of technology from ancient times to the present.

HS 8940. Seminar: History of Science and Technology in the Americas. (3.0 cr.; prereq #; fall, spring, every year) For advanced graduate students; topics in development of science and technology, emphasizing the United States and Canada.

HS 8950. Seminar: Science and Technology in Cultural Settings. (3.0 cr.; prereq #; fall, every year) For advanced graduate students; topics in development of science and technology in or across specific geographic regions or particular cultures.

HS 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; prereq #; fall, spring, summer, every year) TBD

HS 8994. Directed Research. (1.0-5.0 cr. [max 15.0 cr.]; fall, spring, every year) TBD

Horticultural Science (HORT)

HM 5040. Readings in Hmong Texts. (2.0-4.0 cr. [max 12.0 cr.; prereq 1016 or 3022 with grade of at least B or #; fall, spring, every year) Comprehensive, multidimensional overview of Hmong oral forms/traditions. Hmong legends, mythology, folksongs, birth, marriage/funeral rites. History, social/cultural anthropology. Values, life ways of traditional village society. Societal changes resulting from emigration to U.S.


HM 5012. Common Chinese Medicinal Plants: Growing and Processing. (3.0 cr.; prereq 1001 or BIOL 1009 or CHEM 1015 or #; fall, even years) How to grow, process, store 40 common Chinese herbs/herbal products.


HM 5031. Fruit Production and Viticulture for Local and Organic Markets. (3.0 cr.; A-F or Audit; prereq [1001, 3005] or #; fall, odd years) 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.

HM 5032. Organic Vegetable Production. (3.0 cr.; A-F or Audit; prereq [3005, ENT 1005, PLPA 2001, SOIL 2125] or #; spring, even years) Integrated management of vegetable cropping. Site selection/environment, seed/stand establishment, cultural management, commodity use, handling. Types of vegetable cultivars. Breeding, physiological/environmental control.


HM 5059. Plant Cytogenetics Lab. (1.0 cr. [max 2.0 cr.; prereq [HORT/AGRO 4401, BIOL 4004] or #; spring, even years) Consolidate knowledge of plant cytogenetics by practicing series of microscopy/computational technologies. Examine number, movement, structure/structure modification of chromosomes. Application in plant improvement.

HM 5061. Advanced Turfgrass Science. (2.0 cr.; prereq 4061; spring, every year)
For advanced students in turf with career objectives in professional turf management. Emphasis on ecology, physiology, theory of turf population dynamics/specialized management situations such as golf course, commercial sod production, fine turf aesthetic settings.

**HORT 5071. Ecological Restoration.** (4.0 cr.; prereq [One college course in ecology, one college course in [plant science or botany]] or #; fall, every year)


**HORT 5090. Directed Studies.** (1.0-6.0 cr. [max 18.0 cr.]; prereq 8 cr upper div Hort courses; #; fall, spring, summer, every year)

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.

**HORT 5131. Student Organic Farm Planning, Growing, and Marketing.** (3.0 cr.; =HORT 3131, AGRO 5131, AGRO 3131; prereq 1001 or AGRO 1101 or AGRO 1103 or BIOL 1001 or BIOL 1009 or #; spring, every year)

Students plan/implement cropping/marketing strategies for organic produce/flowers from Student Organic Farm on St. Paul campus.

**HORT 8005. Supervised Classroom or Extension Teaching Experience.** (2.0 cr.; S-N or Audit; =BBE 8005, SOIL 8005, PPLA 8005, AGRO 8005, LAAS 8005; prereq; #; fall, even years)

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.

**HORT 8007. Extension Horticulture Practicum.** (1.0-5.0 cr.; prereq 9 grad cr in [ag or bio] science; #; fall, spring, summer, every year)

Selected activities that may include development of an extension fact sheet, assistance in Dial-U Clinic, or preparation of a workshop or short course.

**HORT 8023. Evolution of Crop Plants.** (3.0 cr.; A-F only; prereq 9 grad cr in ag or bio sciences; spring, odd years)

Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

**HORT 8044. Manipulation of Plant Growth and Reproduction.** (2.0 cr.; prereq PBio 5412; fall, spring, offered periodically)

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.

**HORT 8090. Graduate Horticultural Research.** (1.0-12.0 cr. [max 18.0 cr.]; prereq #; fall, spring, summer, every year)

Conduct literature, lab, and/or field research with horticultural plants and cropping systems.

**HORT 8201. Advanced Plant Breeding.** (3.0 cr.; A-F only; =AGRO 8201; prereq STAT 5301 or equiv; fall, odd years)

Principles/current methods in breeding agronomic/horticultral crops. Use of genotype/environment data to increase genetic gain, population improvement, parent building, alternative selection strategies, breeding for special traits, new approaches.

**HORT 8270. Graduate Seminar.** (1.0 cr.; A-F or Audit; =AGRO 8270; prereq Grad major in [hort or applied plant sciences or ent or agro or pnt brdg or pnt path or soil] or #; fall, spring, every year)

Reports/discussions on problems, investigation work.

**HORT 8280. Current Topics in Applied Plant Sciences.** (1.0 cr.; S-N or Audit; prereq Grad major in [hort or applied plant sciences or ent or agro or pnt brdg or pnt path or soil] or #; fall, spring, every year)

Topics presented by faculty or visiting scientists.

**HORT 8900. Advanced Discussions.** (1.0-3.0 cr. [max 12.0 cr.; S-N or Audit; =AGRO 8900]; prereq #; fall, spring, every year)

Special workshops or courses in applied plant sciences.

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**Housing Studies (HSG) College of Design**

**HSG 5170. Topics in Housing Studies.** (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)

In-depth investigation of a single specific topic, announced in advance.

**HSG 5193. Directed Study in Housing Studies.** (1.0-4.0 cr. [max 8.0 cr.; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year)

Independent study in Housing Studies under tutorial guidance.

**HSG 5196. Field Study: National/International.** (1.0-10.0 cr.; A-F or Audit; =GDES 5196, APST 5196, DES 5196, IDES 5196; prereq #; fall, spring, summer, every year)

Faculty-directed field study in national or international setting.

**HSG 5463. Housing Policy.** (3.0 cr.; A-F or Audit; =PA 5261; prereq [2401 or DHA 2401], [2463 or DHA 2463]; prereq; fall, spring, every year)

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.

**HSG 5464. Understanding Housing: Assessment and Analysis.** (3.0 cr.; A-F or Audit; prereq [2401 or DHA 2401], [2463 or DHA 2463] or #; spring, every year)

Analytical design applied to analysis/presentation of housing/housing-related data. Use of Geographical Information Systems (GIS) to display, analyze, and communicate spatial data related to housing.

**HSG 5467. Housing and the Social Environment.** (4.0 cr.; A-F or Audit; prereq Grad student; fall, every year)

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.** (2.0 cr.; A-F or Audit; prereq Admitted to Housing Studies Certificate Prog; spring, even years)

Integrative seminar and "capstone" to Certificate program. Students prepare an individual career plan that focuses on application of housing studies to community/workplace.

**HSG 5481. Promoting Independence in Housing and Community.** (3.0 cr.; A-F or Audit; prereq [2401 or DHA 2401], [jr or sr or grad student] or #; fall, odd years)

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 5484. Rural Housing Issues.** (3.0 cr.; A-F or Audit; prereq [2401 or DHA 2401], [2463 or DHA 2463] or #; spring, odd years)

Housing issues for non-metropolitan places, small towns, and rural areas. Housing needs and policy implications for rural residents. Economic development strategies for housing availability, adequacy, and affordability.

**HSG 8170. Topics in Housing Studies.** (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; fall, spring, every year)

In-depth investigation of topic announced in advance.

**HSG 8180. Professional Seminar.** (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; fall, spring, every year)

Professional development issues/trends.

**HSG 8192. Readings in Housing Studies.** (1.0-3.0 cr. [max 8.0 cr.; A-F or Audit; prereq; fall, spring, summer, every year)

Independent study, review of books, and periodicals under tutorial guidance.

**HSG 8193. Directed Study.** (1.0-3.0 cr. [max 8.0 cr.]; A-F or Audit; prereq; fall, spring, summer, every year)

Directed study in housing studies.
HUMF 5001. Foundations of Human Factors/Ergonomics. (3.0 cr.; A-F or Audit; = [KIN 5001]; prereq Grad HumF major or minor or #: ) Variability in human performance influenced by interaction with designs of machines/tools, computers/software, complex technological systems, jobs/workings conditions, organizations, sociotechnical institutions. Conceptual, empirical, practical aspects of human factors/ergonomics.

HUMF 5193. Directed Study in Human Factors and Ergonomics. (1.0-4.0 cr. [max 8.0 cr.]; A-F only; prereq #: fall, spring, summer, every year) Independent study in human factors/ergonomics under tutorial guidance.

HUMF 5211. Human Factors and Work Analysis. (4.0 cr.; A-F or Audit; = [ME 5211, IE 5511, IE 4511]; fall, every year) Human factors engineering (ergonomics), methods engineering, work measurement. Displays, controls, instrument layout, supervisory control. Anthropometry, work physiology, biomechanics, Noise, illumination, toxicology. Operations analysis, motion study, time standards.

HUMF 5722. Human Factors Psychology. (3.0 cr.; A-F or Audit; prereq Grad student or #: ) Psychological principles that underlie human interactions with technological systems. Techniques/methodologies to assess faulty/incorrect system design. Emphasizes human-centered approaches. Rigorous evaluation of human-machine interaction.

HUMF 5874. Service Design: Designing complex systems to improve service delivery. (4.0 cr.; A-F only; prereq Grad student; spring, every year) Real world service delivery problems. Perceptual/cognitive strengths/weaknesses addressed when designing systems.


HUMF 8002. Proseminar in Human Factors/Ergonomics. (1.0 cr. [max 2.0 cr.; A-F or Audit; prereq Grad HumF major or minor or #: fall, spring, every year] 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.

HUMF 8333. Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: master's.

HUMF 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: doctoral.

HUMF 8541. Decision Support Systems. (4.0 cr.; A-F or Audit; = [IE 8541]; prereq Undergrad-level computer programming course or #: programming skills recommended; fall, spring, every year) Students build a decision support system for a problem of their choice. How to identify appropriate problems. Styles of DSSs, evaluating their effectiveness.

HUMF 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; fall, spring, summer, every year) Doctoral pre-thesis credits.

HUMF 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) Thesis credits: master's.

HUMF 8794. Human Factors Research. (1.0-4.0 cr.: S-N only; fall, spring, summer, every year) Human factors research.

HUMF 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) Thesis credit: doctoral.

HRIR 5000. Topics in Human Resources and Industrial Relations. (2.0 cr.; prereq HRIR MA student must register A-F, 3021, [CSOM or HRD junior or senior or %]; fall, spring, every year) Analysis of government-mandated employee benefits. Workers' compensation, unemployment insurance, social security, health insurance.


HRIR 5222. Managing Diversity. (2.0 cr.; prereq HRIR MA student must register A-F, 3021, [CSOM or HRD junior or senior or %]; fall, spring, every year) How to manage diverse workforce. Human resource practices examined with respect to diversity. How to incorporate diversity into decision making to enhance organizational performance.


HRIR 5443. Principles of Effective Coaching. (2.0 cr.; prereq HRIR MA student must register A-F, 3021, [CSOM or HRD junior or senior or %]; fall, spring, every year) Skills/competencies required to coach, mentor, develop employees/leaders. Managing coaching process. Planning coaching relationship. Coaching as leadership development strategy. Coaching executives.

HRIR 5654. Public Policies on Employee Benefits: Social Safety Nets. (2.0 cr.; prereq HRIR MA student must register A-F, ECON 1101, [CSOM or HRD junior or senior or %]; spring, every year) Analysis of social safety nets through government-mandated employee benefits. Workers' compensation, unemployment insurance, social security, health insurance.
HRIR 5655. Public Policies on Work and Pay. (3.0 cr.; [PA 5431]; prereq HRIR MA student must register A-F, ECON 1101, [CSOM or HRD junior or senior or %]; spring, every year) 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.


HRIR 5992. Independent Study in Human Resources and Industrial Relations. (1.0-8.0 cr.; prereq % or #; fall, spring, summer, every year) Individual readings or research topics.

HRIR 8012. Applied Quantitative Methods in Human Resources and Industrial Relations. (2.0 cr.; prereq [8011, grad HRIR major or %; grad majors must register A/F; fall, spring, summer, every year) Evaluation of applied statistical research in human resources and industrial relations. Appropriate statistical inferences/applications. Sampling issues, multiple regression, advanced topics.

HRIR 8013. Research Methods in Social and Labor Policy. (3.0 cr.; A-F or Audit; [PA 8386]; prereq 8011, grad HRIR major or %; grad majors must enroll A-F only; fall, offered periodically) Application of social science research methods to public policy issues.

HRIR 8041. Design and Management of Organizations. (4.0 cr.; prereq Econ 1101, Econ 1102, Psy 1001 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, every year) Introduction to micro through macro organizational issues at individual, dyadic, group, organizational, and environmental levels; their implications for organizational design, control, coordination, and development.

HRIR 8061. Introduction to Labor Market Analysis. (4.0 cr.; prereq Econ 1101, Econ 1102 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, spring, summer, every year) Labor supply and demand analysis, its international dimensions; determination of wages, employment and unemployment; accumulation of human capital and investment in education and training; government regulation in areas of discrimination and workplace safety; role of unions in wage determination.

HRIR 8062. Human Resource Strategy and Planning. (2.0 cr.; prereq 8061 or #, grad HRIR major or %; grad majors must enroll A-F only; ) Case studies used to design strategy.

HRIR 8063. Human Resources and Organizational Performance. (2.0 cr.; [PA 8105]; prereq 8061 or #, grad HRIR major or %; grad majors must enroll A-F only; fall, every year) Impact of human resource policies and practices on organizational productivity and effectiveness. Role of government, unions, and private sector institutions on organizational effectiveness.

HRIR 8065. Topics in Macro Labor Market Analysis. (2.0-4.0 cr.; prereq 8061 or #, HRIR PhD student or %; grad majors must enroll A-F only; fall, spring, offered periodically) May include theories of unemployment based on sectoral shocks, theories of wage rigidity, efficiency wage theories, interindustry wage structure, role of labor market in resource allocation, and effects of government intervention in labor market.

HRIR 8074. Labor-Management Negotiations. (2.0 cr.; prereq 8071 or #, grad HRIR major or %; grad majors must enroll A-F only; ) Analysis of the nature of negotiations with applications to private and public sector collective bargaining. Nature of conflict and dilemma between competition and cooperation. Determinants of bargaining strategies, tactics, outcomes, and impasses. Newly emerging issues.

HRIR 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq HRIR MA student, %; fall, spring, summer, every year) (No description)

HRIR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)


HRIR 8812. Core Seminar: Research Methods in Work and Organizations. (4.0 cr.; prereq [Business Admin PhD student or %], grad majors must enroll A-F, spring, offered periodically) Application in research projects.

HRIR 8820. Seminar: Special Topics in Work and Organizations Research. (2.0 cr. [max 12.0 cr.; prereq [Business Admin student or %], grad majors must enroll A-F; spring, every year) Contemporary theories/research on specific topics in work/organizations. Topics vary.

HRIR 8825. Research Practicum/Workshop. (1.0 cr. [max 4.0 cr.]; S-N only; prereq Business Admin PhD student or %, fall, spring, every year) Experience in conducting research/other doctoral student activities.

HRIR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

HRIR 8991. Independent Study in Human Resources and Industrial Relations. (1.0-8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year) Individual readings and/or research projects.

Industrial Engineering (IE)

IE 5080. Topics in Industrial Engineering. (1.0-4.0 cr.; prereq Upper div or grad student; fall, spring, offered periodically) Topics vary each semester.

IE 5111. Systems Engineering l. (2.0 cr.; A-F or Audit; prereq CSE upper div or grad student; fall, every year)
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.

IE 5112. Introduction to Operations Research. (3.0 cr.; A-F or Audit; prerequisite [Math 2243 or Math 3273 or equiv.]; one semester of probability or statistics), [CSE upper div or grad student]; fall, spring, every year)
Survey of Operations Research models/methods in deterministic/stochastic settings. Linear programming, integer programming, networks, forecasting, Markov chains, and queueing systems. Examples from various application areas, such as systems engineering, logistics, design, and project management.

IE 5113. Systems Engineering II. (4.0 cr.; A-F or Audit; prerequisite 5111, a course on basic probability, [CSE upper div or grad student]; spring, every year)
Systems engineering thinking/techniques presented in 5111. Hands-on techniques applied to specific problems. Topics pertinent to effectiveness of design process. Practices and organizational/strategic structure to support collaborative, globally distributed design team.

IE 5441. Financial Decision Making. (4.0 cr.; A-F only; prerequisite CSE upper div or grad student; fall, spring, summer, every year)
Cash flow streams, interest rates, risk management, capital budgeting, cash flow process. Mean-variance portfolio selection, Capital Asset Pricing Model, utility maximization, risk aversion. Derivative securities, asset dynamics, basic option pricing theory.

IE 5511. Human Factors and Work Analysis. (4.0 cr.; A-F or Audit; prerequisite [ME 5211, HUMF 5211, IE 4511]; prerequisite Upper div CSE or grad student; fall, every year)
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.

IE 5512. Applied Ergonomics. (4.0 cr.; A-F or Audit; prerequisite Upper div CSE or grad student, 5511; summer, offered periodically)
Small groups of students work on practical ergonomic problems in local industrial firms. Projects cover a variety of ergonomic issues: workstation design, equipment and tool design, back injuries and material handling, cumulative trauma disorders, illumination and noise, and safety.

IE 5513. Engineering Safety. (4.0 cr.; A-F or Audit; prerequisite Upper div CSE or grad student; fall, spring, every year)
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.

IE 5522. Quality Engineering and Reliability. (4.0 cr.; prerequisite IE 5522 or equivalent, [upper div or grad student or CNR]; fall, spring, offered periodically)
Quality engineering/management, economics of quality, statistical process control design of experiments, reliability, maintainability, availability.

IE 5531. Engineering Optimization I. (4.0 cr.; prerequisite Upper div or grad student or CNR; fall, every year)
Linear programming, simplex method, duality theory, sensitivity analysis, interior point methods, integer programming, branch-bound/dynamic programming. Emphasizes applications in production/logistics, including resource allocation, transportation, facility location, networks/flows, scheduling, production planning.

IE 5541. Project Management. (4.0 cr.; prerequisite Upper div or grad student; fall, spring, every year)
Introduction to engineering project management. Analytical methods of selecting, organizing, budgeting, scheduling, and controlling projects, including risk management, team leadership, and program management.

IE 5545. Decision Analysis. (4.0 cr.; prerequisite IE 5411 or equivalent)
Normative theories of decision making. Emphasizes structuring of hard decision problems arising in business and public policy contexts. Decision trees, expected utility theory, screening prospects by dominance, assessment of subjective probability, multiple attribute utility, analytic hierarchy process, benchmarking with data envelopment analysis, basics of game theory.

IE 5551. Production Planning and Inventory Control. (4.0 cr.; prerequisite IE 5451 or equivalent)
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. Impact of emerging information technologies and of electronic commerce for supply chain management and factory operation.

IE 5552. Design and Analysis of Manufacturing Systems. (4.0 cr.; prerequisite Upper div or grad student)
Flow lines, assembly systems, cellular manufacturing systems, and flexible manufacturing systems. Emphasis is on methodologies for modeling, analysis and optimization of Lead time analysis, capacity and workload allocation, scheduling and shop floor control, work-in-process management, facilities planning and layout, and information management.

IE 5553. Simulation. (4.0 cr.; prerequisite Upper div or grad student; familiarity with probability/statistics recommended; fall, spring, offered periodically)
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.

IE 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prerequisite Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

IE 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prerequisite Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

IE 8531. Discrete Optimization. (1.0-4.0 cr.; prerequisite [max 8.0 cr.; fall, spring, every year)

IE 8532. Stochastic Processes and Queuing Systems. (4.0 cr.; prerequisite IE 4511 or equivalent; fall, every year)
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.

IE 8533. Advanced Stochastic Processes and Queuing Systems. (4.0 cr.; prerequisite IE 8532 or #; spring, offered periodically)

IE 8534. Advanced Topics in Operations Research. (4.0 cr.; prerequisite IE 8532; fall, spring, every year)
Special topics determined by instructor. Examples include Markov decision processes, stochastic programming, integer/combinatorial optimization, and queuing networks.

IE 8536. Advanced Topics in Engineering Management. (4.0 cr.; prerequisite IE 8532; A-F or Audit; spring, offered periodically)
Areas such as financial engineering, revenue management, management of health systems, service operations, management of technology, and public policy.

IE 8538. Advanced Topics in Information Systems. (4.0 cr.; A-F or Audit; prerequisite IE 8541, college-level computer programming course; decision support methods. Case studies of specific systems. Methods for testing usability/ performance. Trust/over-reliance, their impact.
on system performance. System-level issues, general planning, design, information analysis, problem paradigms. How to frame problems. Techniques to combine engineering and information technology.

IE 8541. Decision Support Systems. (4.0 cr.; A-F or Audit; [HUMF 8541]; spring, every year)
Decision Support Systems (DSSs) to assist people in making better decisions, interpreting complex information, and managing complex situations safely/efficiently. Principles of human-centered design, cognitive engineering, and evaluation. Applications in projects of students’ own choosing.

IE 8552. Advanced Topics in Production, Inventory, and Distribution Systems. (4.0 cr. [max 8.0 cr.; prereq 5551; fall, spring, offered periodically])
Cutting edge research issues in production, inventory, and 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.

IE 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

IE 8773. Graduate Seminar. (1.0 cr.; S-N or Audit; fall, spring, every year)
Recent developments.

IE 8774. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq 8773; fall, spring, every year)
Recent developments.

IE 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year])
(No description)

IE 8794. Industrial Engineering Research. (1.0-6.0 cr. [max 10.0 cr.; prereq #; fall, spring, summer, every year])
Directed research.

IE 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year])
(No description)

IE 8951. Plan B Course. (1.0 cr.; S-N or Audit; fall, every year)
Structured environment in which students can complete M.S. Plan B project.

IE 8953. Plan B. (2.0 cr.; A-F or Audit; prereq 8951; spring, every year)
Structured environment in which students can complete M.S. Plan B project.

IE 8991. Curricular Practical Training. (1.0-2.0 cr. [max 6.0 cr.; S-N only; fall, spring, summer, every year])
Industrial work assignment involving advanced mechanical engineering. Review/approval by faculty member/director of graduate studies. Final report covering work assignment.

Information and Decision Sciences (IDSC)
Curtis L. Carlson School of Management

IDSC 8003. Accounting and Information Systems. (4.0 cr.; A-F only; prereq MAcc student; fall, every year)

IDSC 8511. Conceptual Topics and Research Methods in Information and Decision Sciences. (4.0 cr.; prereq Business admin PhD student or #; fall, every year)
Relationships to underlying disciplines; major research streams; seminal articles, survey literature, and major researchers. Provides framework for organizing knowledge about information and decision sciences.

IDSC 8521. System Development. (2.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically)
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.

IDSC 8531. Organizational Theory and Research in Information Systems. (2.0 cr.; A-F only; prereq PhD student in Business Administration; spring, odd years)
Introduction, adoption, use/exploitation of information systems in organizations. Critically examine empirical work. Formulate research questions. Conduct research.

IDSC 8541. Introduction to Economics of Information Systems. (2.0 cr.; A-F only; prereq PhD student in Business Administration or #; spring, even years)
Classical research questions. Methods/findings that form backbone of economics of IS. Online auctions, electronic markets, offshoring, human capital issues.

IDSC 8711. Cognitive Science. (4.0 cr.; prereq Business admin PhD student or #; fall, every year)
Empirically based concepts of knowledge and reason, mental representation and conceptual systems that guide problem solving and decision making. Computational metaphor of mind drawn from psychology, computer science, linguistics, anthropology, and philosophy. Implications for understanding of knowledge work.

IDSC 8721. Behavioral Decision Theory. (2.0 cr.; prereq Business admin PhD student or #; offered alt yrs; fall, spring, offered periodically)

IDSC 8722. Heuristic Decision Making. (2.0 cr.; prereq Business Admin PhD student or #; offered alt yrs)
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.

IDSC 8800. Research Seminar in Information and Decision Sciences. (4.0 cr. [max 20.0 cr.]; prereq Business admin PhD student or #; fall, spring, offered periodically)
Topics, which vary by semester, are selected from new areas of research, research methods, and significant issues.

IDSC 8801. Research Seminar in Information and Decision Sciences. (2.0 cr. [max 20.0 cr.]; prereq Business Admin PhD student or #; spring, every year)
New areas of research, research methods, issues.

IDSC 8892. Readings in Information and Decision Sciences. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year)
Readings useful to a student’s individual program and objectives that are not available through regular courses.

IDSC 8894. Graduate Research in Information and Decision Sciences. (1.0-8.0 cr. [max 16.0 cr.]; prereq Business admin PhD student or #; fall, spring, summer, every year)
Individual research on an approved topic appropriate to student’s program and objectives.

Infrastructure Systems Management Engineering (ISME)
College of Science and Engineering

ISME 5101. Project Management. (3.0 cr.; A-F or Audit; prereq Open to general grad students but with #; fall, every year)
Broad areas in project management/leadership. Emphasizes practical understanding of business/engineering project management. Project planning, scheduling, controlling. Budgeting, staffing, task/cost control. Communicating with, motivating, leading, managing conflict.

ISME 5104. Construction Estimating. (2.0 cr.; A-F or Audit; prereq ISME grad student; )

ISME 5105. Computer Applications II. (1.0 cr.; A-F or Audit; prereq ISE grad student; Application features in Excel, Visual Basic, and Web Authoring. Data reduction, data presentation, interactive Web calculations. Student projects.

ISME 5112. Infrastructure Systems Engineering Management. (2.0 cr.; A-F or Audit; prereq Open to advanced master's students; spring, every year) Managing public works infrastructure. Case studies of decision making in environment of conflicting interests.

ISME 5113. Computer Applications in Infrastructure Systems Engineering. (2.0 cr.; A-F or Audit; prereq ISE grad student; fall, spring, every year) Advanced application of computer tools/ methods in infrastructure engineering problems. Spreadsheet Visual Basic programming, HTML, JAVA script.


ISME 5302. Critical Infrastructure Security and Protection. (2.0 cr.; A-F only; prereq ISE grad student or #; spring, every year) Security challenges of protecting critical infrastructure. 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/management of complex civil infrastructure systems.


ISME 5402. Storm Water Management. (2.0 cr. [max 10.0 cr.]; A-F or Audit; prereq ISE grad student; spring, offered periodically) Components/design of storm water collection systems. Methods of evaluation/management. Maintenance/rehabilitation techniques.


ISME 5500. Public Interactions. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Advanced grad student or open to general grad students with #; fall, every year) Techniques for effective public communication. How to run public hearing. Resources for publishing public notices. Sequence course in three parts.

ISME 5501. Geographic Information Systems. (2.0 cr.; A-F or Audit; prereq ISE student; spring, every year) 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.


ISME 5504. Construction Law and Ethics. (2.0 cr.; A-F or Audit; prereq ISE student; fall, every year) Ethical framework for responsible management of public works projects. Moral leadership, trust in public/private organizations, quality control.

ISME 8015. Capstone Project. (1.0-2.0 cr. [max 3.0 cr.]; A-F or Audit; prereq ISE student; fall, spring, every year) 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.

ISME 8333. FTE: Master's. (1.0 cr.; No Grade Associated; fall, spring, every year) FTE: Master's Prerequisite Master's student, adviser approval, DGS approval.

Innovation Studies (IS)

College of Continuing Education

IS 5001. Introduction to Innovation Studies. (1.0-4.0 cr.; A-F or Audit; prereq %; fall, offered periodically) Key concepts/models from sociology, futures study, and business. Innovative, team leadership strategies. Definition/application of just-in-time concept. Life-long self-improvement skills.

IS 5002. Final Project for Innovation Studies. (1.0-4.0 cr.; A-F or Audit; prereq Completion of IS requirements, %; fall, spring, summer, every year) Either an internship in an organization or a hands-on study project on a contemporary issue or problem. Students apply expertise/ideas to a real-world situation.

IS 5100. Innovation Studies Seminar. (1.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Innovation studies topics.

IS 5950. Special Topics. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Special interdisciplinary topics.

IS 5993. Directed Studies. (1.0-4.0 cr. [max 6.0 cr.]; prereq %; fall, spring, summer, every year) Guided individual reading or study.

Integrated Behavioral Health (IBH)

IBH 8002. Portfolio Seminar. (1.0 cr.; S-N only; prerequisite 6121; fall, spring, summer, every year) Structured environment that ensures completion of well-written/on-time IBH Portfolio.

Interdisciplinary Archaeological Studies (INAR)

INAR 5100. Topics in Interdisciplinary Archaeological Studies. (3.0 cr.; A-F or Audit; prereq InAr grad major or #; fall, spring, offered periodically) Topics specified in the Class Schedule.

INAR 8200. Directed Readings. (1.0-7.0 cr.; prereq InAr grad major or #; fall, spring, every year) TBD

INAR 8300. Directed Research. (1.0-7.0 cr.; prereq InAr grad major or #; fall, spring, summer, every year) TBD

INAR 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

INAR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)
INAR 8866. Doctoral Pre-Thesis Credits. 
(1.0-6.0 cr. [max 12.0 cr.]; No Grade 
Associated; prereq Doctoral student who has 
not passed prelim oral; no required consent 
for 1st/2nd registrations, up to 12 combined cr;% 
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; fall, spring, summer, every year) 
tbd

INAR 8777. Thesis Credits: Master's. 
(1.0-18.0 cr. [max 50.0 cr.]; No Grade 
Associated; prereq Max 18 cr per semester or 
summer; 10 cr total required (Plan A only); fall, 
spring, summer, every year) 
(No description)

INAR 8888. Thesis Credit: Doctoral. 
(1.0-24.0 cr. [max 100.0 cr.]; No Grade 
Associated; prereq Max 18 cr per semester or 
summer; 24 cr required; fall, spring, every year) 
(No description)

International Business (IBUS) 
Curtis L. Carlson School of Management

IBUS 5100. Undergraduate Semester: 
CIMBA (Consortium of Universities for 
International Studies). 
(0.0-18.0 cr. [max 54.0 cr.]; A-F only; prereq 60 cr; fall, spring, every year) 
Semester of 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.

IBUS 5101. Copenhagen Summer Program in 
International Business (Undergraduate). 
(7.5 cr.; S-N or Audit; prereq 60 cr; fall, spring, summer, every year) 
Summer study abroad at one of Carlson 
School's international exchange partner 
universities. Students select courses based on 
aademic needs/interests. For current 
offerings, contact Carlson International Programs.

IBUS 5102. Vienna Summer Program in 
International Business (Undergraduate). 
(4.0-8.0 cr.; S-N only; summer, every year) 
Summer study abroad at one of Carlson’s School’s international exchange partner 
universities. Vienna University of Economics/ 
Business Administration. Students select 
intensive/enrichment courses based on 
aademic needs/interests.

IBUS 5103. Norway Summer Program in 
International Business (Undergraduate). 
(5.0 cr.; S-N only; summer, every year) 
Summer study abroad at one of Carlson 
School's international exchange partner 
universities, BI Norwegian School of 
Management. Three-week program. Focuses on 
Scandinavian management/Norwegian life/ 
society.

IBUS 5110. Business and the Environment 
in Costa Rica. 
(4.0 cr.; A-F only; prereq Sr or 
grad student; fall, spring, every year) 
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 
study, site visits, field trips. Taught in English.

IBUS 5120. Global Business Practicum in 
Central and Eastern Europe. 
(4.0 cr.; A-F only; prereq Carlson grad student; spring, 
summer, every year) 
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.

IBUS 5130. France Seminar: Doing 
Business in the European Union (Graduate). 
(4.0 cr.; S-N only; prereq Carlson grad student; fall, spring, summer, every year) 
Two-week study abroad program at Universite 
Jean-Moulin Lyon 3 in Lyon, France. Includes 
courses taught by international faculty, site 
visits, cultural excursions.

IBUS 5140. Vienna Summer Program: 
International Business (Graduate). 
(4.5-9.0 cr.; S-N only; prereq Carlson grad student; 
summer, every year) 
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.

IBUS 5150. India Seminar: Managing in 
a Global Environment. 
(4.0 cr.; A-F only; spring, every year) 
View of sourcing/delivery of knowledge-
intensive tasks. Site visits, meetings with 
business executives/governmental agencies. 
Two weeks in India over January break, 
preceded by Friday evening classes in fall term 
B (November, early December).

IBUS 5160. Cologne Summer Program: 
European Management (Grad). 
(8.0 cr. [max 24.0 cr.]; S-N only; prereq Carlson grad student; summer, every year) 
Summer study abroad at one of Carlson 
School's international exchange partner 
universities. Students select courses based on 
aademic needs/interest.

IBUS 5170. Global Business Practicum in 
Northern China. 
(4.0 cr.; A-F only; prereq Grad student; spring, every year) 
Collaboration with corporate partner/business 
school in China. Students work in multi-
cultural teams to analyze real-life business 
problems that corporations face in China. 
Examine cultural, social, economic differences 
surrounding global business.

IBUS 5171. Global Business Practicum in 
Southern China. 
(4.0 cr.; A-F only; prereq Grad student; spring, every year) 
Collaboration with corporate partner/business 
school in China. Work in multicultural teams 
to analyze real-life business problems that 
corporates face in China.

IBUS 5172. IBUS 5172: Global Business 
Practicum Brazil. 
(4.0 cr. [max 8.0 cr.]; A-F 
only; summer, every year) 
Study abroad course. Short-term global 
enrichment program traveling to Brazil in May.

IBUS 5180. Economics in Transition: 
A Study of Central and Eastern Europe. 
(4.0 cr.; S-N only; summer, offered periodically) 
Seminar. Participate in field study with 
effective MBA students. Run by executive 
MBA program at Wirtschaftsuniversitaet Wien, 
in Vienna, Austria. Insights into Central/Eastern 
European economies of Bucharest, Romania/ 
St. Petersburg, Russia.

IBUS 5190. Brazil Seminar: Doing Business 
in Brazil. 
(4.0 cr.; A-F only; prereq Carlson grad student; spring, every year) 
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.

IBUS 5200. International Business: 
Undergraduate Exchange. 
(0.0-16.0 cr. [max 160.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5201. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5202. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5203. International Business: Undergraduate Exchange. (0.5-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5204. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5205. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; Carlson School International Programs consent; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5206. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; Carlson School International Programs consent; spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5207. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5208. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5209. International Business: Undergraduate Exchange. (1.0-6.0 cr. [max 60.0 cr.]; S-N or Audit; prereq 60 cr; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5300. International Business: Graduate Exchange. (0.0-16.0 cr. [max 48.0 cr.]; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
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.

IBUS 5301. Copenhagen Summer Program in International Business (Graduate). (4.0-8.0 cr. [max 24.0 cr.; S-N only; prereq Carlson grad student; summer, every year)
Summer study abroad at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5302. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5303. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5304. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5305. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5306. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5307. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5308. International Business: Graduate Exchange. (1.0-6.0 cr. [max 60.0 cr.; S-N or Audit; prereq Carlson grad student; fall, spring, every year)
Study at one of Carlson School's international exchange partner universities. Students select courses based on academic needs/interests.

IBUS 5998. Directed Studies in International Business. (1.0-32.0 cr.; )

Interpersonal Relationships Research (IREL)
College of Education and Human Development

IREL 8001. Proseminar in Interpersonal Relationships Research. (2.0 cr.; S-N or Audit; prereq Grad IRel minor; fall, every year)
Survey of major topics, including theoretical assumptions, methods, and samples of current research.

IREL 8021. Seminar: Statistical and Methodological Issues in Research on Dyadic Relationships. (3.0 cr.; S-N only; prereq Grad IRel minor, [one prior course in multiple regression or structural equation modeling], #; spring, odd years)
Survey of topics in design/analysis of research on behavior in two-person interactions.

IREL 8360. Seminar: Topics in Interpersonal Relationships Research. (1.0-3.0 cr. [max 6.0 cr.; prereq Grad IRel minor or #; fall, spring, offered periodically)
Intensive study of topics.

Introduce Species and Genotypes (ISG)
College of Food, Agricultural and Natural Resource Sciences

ISG 5010. Risk Analysis for Introduced Species and Genotypes. (3.0 cr.; A-F only; prereq Grad student or [sr, #]; fall, every year)

ISG 5020. Risk Analysis Modeling for Introduced Species and Genotypes. (1.0 cr.; S-N only; prereq [5010 or equiv], #: spring, every year)
Four-day workshop. Role/mechanics of mathematical modeling within ecological risk assessment. Integrated exercises, cases.

ISG 8001. Discussions in Introduced Species and Genotypes. (1.0 cr. [max 10.0 cr.; S-N only; fall, spring, every year)
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. (3.0 cr. [max 6.0 cr.]; A-F only; prereq 5010, 5020; summer, every year)
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.

ISG 8031. Cooperative Learning Practicum. (1.0 cr.; A-F only; prereq 8021; spring, every year)
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.

**Italian (ITAL)**
College of Liberal Arts

ITAL 5201. Reading Italian Texts: Poetics, Rhetoric, Theory. (3.0 cr. [max 12.0 cr.]; =ITAL 3201; prereq grad student or #; ) Rhetorical/poetic aspects of language and literature. Interpretive methods, theoretical concepts.

ITAL 5203. Italian Travelers: From the Enlightenment to the Present. (3.0 cr. [max 12.0 cr.]; =ITAL 3203; prereq grad student or #; ) Literary representations of travel, migration, immigration, exile, and tourism in Italy, from Enlightenment to present.

ITAL 5209. Trecento Literature: Ruling the Canon. (4.0 cr. [max 16.0 cr.]; prereq 3015, 3201 or #; ) Works of Boccaccio and Petrarch and their role in establishing the canon of Italian vernacular literature. Taught in English also as MeSt 5610.

ITAL 5289. The Narrow Door: Women Writers and Feminist Practices in Italian Literature and Culture. (4.0 cr. [max 16.0 cr.]; prereq 3015; ) Focuses on issues of gender, sexual difference, equality, and emancipation raised by Italian women writers and thinkers from the 19th century to the present.

ITAL 5305. Staging the Self: Theater and Drama in Modern Italy. (4.0 cr. [max 16.0 cr.]; =ITAL 3305; prereq grad student or #; ) 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.

ITAL 5321. Italian Renaissance Epic. (4.0 cr. [max 16.0 cr.]; prereq 3015, 3201 or #; ) Study of the narrative poems of Boiardo, Ariosto, and Tasso in the context of the fashioning of early modern Europe.

ITAL 5337. Nation and Narration: Writings in the 19th Century. (4.0 cr. [max 16.0 cr.]; prereq 3015; ) Introduces the construction of modern Italian national identity by examining the role that literature plays in this process. Works by Manzoni, Foscolo, Leopardi, Gioia, Verga, Serao, and Deledda studied in the context of a range of sociopolitical and cultural issues.

ITAL 5401. Mondo di Dante. (4.0 cr. [max 16.0 cr.]; prereq 3015, 3201 or #; ) Intensive reading of Dante’s Inferno, Purgatorio, and Vita Nuova with emphasis on Dante’s linguistic and cultural contributions.

ITAL 5502. Making of Modern Italy: From the Enlightenment to the Present. (3.0 cr. [max 12.0 cr.]; =ITAL 3502; prereq grad student or #; ) Italian literary, cultural, and symbolic practices, from Enlightenment to present.

ITAL 5550. Topics in 19th Century Italy. (3.0 cr. [max 12.0 cr.]; prereq Ital 3015 or #; fall, every year) Explores the literature and culture of Italy in the 19th century. Content will vary depending on the instructor. Topics and readings may include literary, critical, cultural, historical, and/or social issues, a specific author, a genre, or other topics of interest for the period. Specific content will be posted in the department and listed in the Course Guide.

ITAL 5609. World of Dante. (4.0 cr. [max 8.0 cr.]; ) 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. (3.0 cr. [max 12.0 cr.]; prereq Ital 3015; fall, every year) 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.

ITAL 5806. Negotiating the Terms: Italian Film and Literature. (3.0 cr. [max 12.0 cr.]; =ITAL 3806; prereq grad student or #; ) Cinematic representations of Italian literary texts. Basic tools of literary/film analysis. How both media impact Italian culture. Taught in English.

ITAL 5970. Directed Readings. (1.0-4.0 cr.; No Grade Associated; prereq Ital 3015; ) Meets unique requirements decided on by faculty member. Content varies by instructor. Specific content varies by instructor. Specific content posted in the department.

ITAL 5993. Directed Studies in Italian. (1.0-15.0 cr.; fall, spring, every year) Individual study with guidance of a faculty member. Prereq instr consent; dept consent, college consent.

ITAL 8333. FTE: Masters'. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ITAL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

ITAL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

ITAL 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 16 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year) (No description)

ITAL 8992. Directed Readings. (1.0-4.0 cr. [max 16.0 cr.]; prereq #; fall, spring, every year) Requirements decided on by faculty member and student: contact hours, number of credits, written/other work.

**Japanese (JPN)**
College of Liberal Arts

JPN 5040. Readings in Japanese Texts. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq 4042 or equiv or #; fall, spring, every year) Students read authentic materials of various types to increase reading/speaking ability. Topics specified in Class Schedule.

JPN 5071. Communicative Competence for Japan-Oriented Careers. (4.0 cr.; prereq 4041 or 4042 or #; ) Effective communication using spoken and written Japanese in contexts likely to be encountered by a career-oriented professional in Japan.

JPN 5211. Introductory Classical Chinese I. (3.0 cr.; =KOR 5211, CHN 5211; prereq Two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; fall, offered periodically) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

JPN 5212. Introductory Classical Chinese II. (3.0 cr.; =KOR 5212, CHN 5212; prereq 5211 and two years of an East Asian language (Chinese, Japanese, Korean) or equivalent or #; spring, offered periodically) Reading excerpts from canonical Chinese texts. Transnational nature of Classical Chinese/its importance in study of East Asian cultures. Taught in English.

JPN 5993. Directed Studies in Japanese. (1.0-15.0 cr.; fall, spring, every year) Individual study with guidance of a faculty member. Prereq instr consent; dept consent, college consent.

JPN 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

JPN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

JPN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

JPN 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year) (No description)

JPN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

**Jewish Studies (JWST)**
College of Liberal Arts
JWST 5111. Midrash: Jewish Biblical Interpretation. (3.0 cr.; [RELS 3115, JWST 3115, CNES 5115, RELS 5115, CNES 3115]; fall, spring, offered periodically) Jewish law studies as mirror of society and as way to actualize its value. Original socioreligious contexts, current applications. Biblical interpretations addressing moral, theological, legal, and literary problems.

JWST 5204. Dead Sea Scrolls. (3.0 cr.; [JWST 3204, RELS 3204, RLS 5204, CNES 5204, CNES 3204]; spring, even years) Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for understanding development of the Bible. Background of Judaism and Christianity. Archaeological site of Qumran.

JWST 5513W. Scripture and Interpretation in Israelite Religion and Judaism. (3.0 cr.; A-F or Audit; [RELS 5513W, CNES 8513, CNES 5513W]; prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, even years) Idea of divine revelation. Impact on religion/literature. How history of Bible’s creation, transmission, interpretation help us think critically about role of revelation in religious traditions.

JWST 5900. Topics in Jewish Studies. (3.0-4.0 cr. [max 8.0 cr.]; fall, spring, summer, every year) Topics specified in Class Schedule.

JWST 5992. Directed Readings. (1.0-12.0 cr.; prereq #; fall, spring, summer, every year) Guided individual reading or study.

JOUR 5111. In-Depth Reporting. (3.0 cr.; A-F only; prereq [3004W or 3004V], [3101 or 3101H], 3121, [your major or approved BIS/IDIM/ICP program]; fall, every year) 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.

JOUR 5155. Database Reporting. (3.0 cr.; A-F only; prereq [3004W or 3004V], [3101 or 3101H], 3121, [your major or approved BIS/IDIM/ICP program]; spring, every year) Obtaining/analyzing digital data for computer-assisted reporting that can be published on various media platforms. Using spreadsheets/databases to manage information, find news stories, produce maps/graphics.

JOUR 5174. Magazine Editing and Production. (3.0 cr.; A-F only; prereq [[3004W or 3004V], [3101 or 3101H], [3155 or 3173W or 3321 or 4302]]; [your major or approved BIS/IDIM/ICP program] or grad student; fall, spring, every year) Writing, editing, illustration, design, layout, photocomposition of print or Web magazine. Emphasizes reporting, telling substantive stories. Work in groups with varying specializations.

JOUR 5251. Psychology of Advertising. (3.0 cr.; [JOUR 4251]; prereq Stat Comm MA grad major or grad mass comm major/minor or #; spring, every year) Psychological principles, research techniques, applications in advertising/selling. Consumer attitudes/behavior. Psychological mechanisms upon which effectiveness of advertisements/commercials depends.

JOUR 5501. Communication, Public Opinion, and Social Media. (3.0 cr.; fall, every year) Theories of mass communication, persuasion, attitude change. Functions of mediated communication in formation/diffusion of public opinion about major social/political issues. Social media as tool for measuring/influencing public opinion.


JOUR 5542. Theory-based Health Message Design. (3.0 cr.; A-F or Audit; spring, every year) Best practices for message design across media/contexts. Students apply concepts to design health campaign messages that affect various audiences. Implications of theories of message engagement for current public health practice.

JOUR 5543. Public Health Campaign Evaluation. (3.0 cr.; A-F or Audit; prereq [JOUR 5541, [enrolled in MA in health journalism or grad student or jour major or mass comm minor or approved IDIM major or ICP major or BIS major[[ or #; spring, every year]) Draws upon the campaign evaluation literature. Recommendations on evaluation research design. Cross-sectional, experimental, and time-based designs. Focuses on summative efforts.

JOUR 5552. Law of Internet Communications. (3.0 cr.; A-F or Audit; spring, every year) Whether/how/which traditional media laws/regulations apply to Internet. Developing law of communication on Internet, global/ethical issues.

JOUR 5601W. History of Journalism. (3.0 cr.; spring, every year) Development of American media from beginnings in Europe to present day. Rise of film/television/Internet. Relation of communications development to political, economic, social trends.

JOUR 5606W. Literary Aspects of Journalism. (3.0 cr.; [ENGW 5606]; spring, every year) Literary aspects of journalism. American/British writers, past/present. Lectures, discussions, weekly papers, critiques.


JOUR 5777. Contemporary Problems in Freedom of Speech and Press. (3.0 cr.; A-F or Audit; [LAW 6030]; prereq Jour major or jour minor or approved BIS/IDIM/ICP program; fall, every year) Legal/constitutional derivation of freedom of speech/press. Emphasizes case law, statutes, judicial theories. Leading cases in privacy torts, prior restraints, news gathering/dissemination. Access to courts/government, including via Internet. Legal-research techniques.

JOUR 5990. Special Topics in Mass Communication: Professional. (3.0 cr.; [max 6.0 cr.]; A-F or Audit; prereq Jour major or Approved IDIM major or ICP major or BIS major; spring, every year) Professional-skills-learning opportunity not regularly offered. Topics specified in Class Schedule.

JOUR 5991. Special Topics in Mass Communication: Context. (3.0 cr. [max 6.0 cr.]; A-F or Audit; spring, offered periodically) Special context topics not regularly offered. Topics specified in Class Schedule.

JOUR 5993. Directed Study. (1.0-3.0 cr.; [max 6.0 cr.]; A-F or Audit; fall, spring, summer, every year) Directed study/projects. Prereq [Jour major or jour minor or approved IDIM major or ICP major or BIS major]. GPA of at least 3.00, college consent, dept consent, instr consent.

JOUR 8001. Studies and Theories of Mass Communication. (3.0 cr.; A-F or Audit; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq 8001; spring, every year)
JOUR 8003. Digital Media Issues and Theories. (3.0 cr.; A-F or Audit; prereq Journalism grad student; fall, spring, offered periodically)

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.

JOUR 8009. Pro-seminar in Mass Communication. (1.0 cr.; S-N only; prereq Grad students enrolled in Mass Communication MA or PhD program; fall, every year)

Introduction/socialization to scholarly discipline of mass communication, mass communication pedagogy, pathways to successful career. Develop action plan for completing graduate school/starting career in academy or relevant communication industries.

JOUR 8191. Health Journalism: Introduction to Health and Medical Journalism. (3.0 cr.; A-F or Audit; prereq Enrolled in MA in health journalism or #; fall, every year)

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.

JOUR 8192. Advanced Health Journalism: Computer-Assisted Reporting on Health. (3.0 cr.; A-F or Audit; prereq Enrolled in MA in health journalism or #; spring, every year)

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.

JOUR 8193. Capstone: Health Journalism and Communication. (4.0 cr.; A-F or Audit; prereq Enrollment in MA in health journalism or #; spring, every year)

Students focus on different aspects of health communication and journalism. Final project (possibly group project) such as publishable article(s), research paper, or multimedia production.

JOUR 8194. Health Journalism Field-Based Practicum. (3.0 cr.; A-F only; prereq [5101, 8191] or enrolled in MA in health jour; fall, spring, every year)

Field-based practicum. Students are teamed with a local news organization, media company, or communications office of a health care entity to write/produce health news/information under guidance of an editorial manager at that institution and a faculty instructor. With faculty permission, may lead to capstone project for 8193.

JOUR 8200. Communication Strategy Research in Rapidly Changing and Complex Media Environments. (3.0 cr.; A-F or Audit; prereq Strat Comm MA grad major; fall, spring, summer, every year)

Concepts, analytical techniques, and methods to analyze audiences, target markets, and social trends affecting communication strategy in context of complex and rapidly changing media environments.

JOUR 8201. Factors Affecting Communication Strategy. (3.0 cr.; A-F only; prereq Strat Comm MA grad major; fall, spring, summer, every year)

Literature/research concerning identification/analysis of the media and environmental, regulatory, competitive, and economic factors that affect the development of communication strategy.

JOUR 8202. Generation and Selection of Communication Strategies. (3.0 cr.; A-F only; prereq Strat Comm MA grad major; fall, spring, summer, every year)

Concepts/methods to support analytic/creative processes that lead to development of breakthrough communication strategies. Criteria for selecting among strategic alternatives.

JOUR 8203. Integration of Communication Strategies Across Media. (3.0 cr.; A-F only; prereq 8200, 8201, 8202, strat comm MA grad major; fall, spring, summer, every year)

Concepts, analytical techniques, and methodologies used to plan communication strategies and implement communication campaigns utilizing a diverse range of media.

JOUR 8204. Measuring the Effectiveness of Strategic Communication Campaigns. (3.0 cr.; A-F only; prereq 8203, Strat Comm MA grad major; fall, spring, summer, every year)

Examination, evaluation, and application of concepts/methods to evaluate effectiveness of strategic communication campaigns and their components.

JOUR 8205. Cases in Strategic Communication. (3.0 cr.; A-F only; prereq 8203, strat comm MA grad major; fall, spring, summer, every year)

Case study analysis concerning development, implementation, and evaluation of communication strategies. Cases cover broad range of organizations, focus on such issues as brand introduction, brand reinforcement, revitalizations, crisis communication, issues management, and legal/ethical considerations.

JOUR 8206. Directed Study: Development of an Integrated Strategic Communication Campaign. (3.0 cr. [max 6.0 cr.]; A-F only; prereq 8205, strat comm MA grad major; fall, spring, summer, every year)

Project to develop a case study analysis concerning development, implementation, and evaluation of a strategic communication campaign.

JOUR 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

JOUR 8442. Seminar: Broadcast News. (3.0 cr.; A-F or Audit; prereq 4442 or #; fall, spring, offered periodically)

Major issues. Confrontations between federal government and network news departments. Historical studies.

JOUR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

JOUR 8501. Seminar: The Process of Quantitative Mass Communication Research. (3.0 cr.; A-F or Audit; prereq 9 cr soc sci, EPsy 5260 or equiv & EPsy 5260; fall, every year)

Logic of social sciences research. Relationship between theory and research, concept explanation, measurement, instrumentation, and design issues.

JOUR 8502. Seminar: Multi-method Research in Mass Communication. (3.0 cr.; A-F or Audit; prereq 8501. [EPsy 5260 or equiv or & EPsy 5260]; spring, every year)

Quantitative/qualitative research principles/techniques applied to mass communication and kindred questions. Reliability, generalizability, and validity in their classic/contemporary senses. Survey methods, focus groups, interviews, other methods. Emphasizes "triangulation" of diverse methods.

JOUR 8503. Seminar: Qualitative Methods in Mass Communication Research. (3.0 cr.; A-F or Audit; prereq Grad students enrolled in Mass Communication MA or PhD program or #; spring, every year)

Qualitative research methodology/data analysis techniques used in field of mass communication. How to conduct qualitative research to address questions related to mass communication. Ethnography, interviews, focus groups, case study, qualitative content analysis, historical research.

JOUR 8504. Seminar: Analyzing Media Content. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically)

Methods of analyzing media content/application of methods to theoretically-driven studies of media content. Conceptual/methodological issues surrounding analyzing media content in today's contemporary digital media environment, including collecting social media data, computer-aided analyses.

JOUR 8513. Seminar: Ethnographic Methods in Mass Communication Research. (3.0 cr.; A-F or Audit; prereq [8001, 8002] or #; same as Anth 8810; spring, every year)

Theoretical foundations in anthropology/social field projects.

JOUR 8514. Seminar: Advanced Mass Communication Theories. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq 8001; fall, spring, offered periodically)

Research paradigms, concepts, findings for developing general theory of mass communication.

JOUR 8601. Seminar: Methods in Mass Communication History Research. (3.0 cr.;


JOUR 8620. Seminar: Advertising Theory and Research. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5251 or #; fall, spring, offered periodically) Advertising as persuasive communication. Current research/theory related to advertising decision-making process.

JOUR 8621. Seminar: Public Relations Theory and Research. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) Study of theoretical body of knowledge in public relations field. Diverse roles played by public relations in organization. Current state of public relations research in regard to theory building. How theory informs professional practice of public relations.

JOUR 8650. Seminar: Psychology of Media Effects. (3.0 cr.; A-F only; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) In-depth study of psychological concepts/theories concerning individual cognitive processing of content of both traditional/new electronic media. Critically evaluate latest empirical research concerning how individuals respond to the content of both traditional mass media/newest electronic digital media.

JOUR 8651. Seminar: Mass Communication, Audiences, and Society. (3.0 cr.; A-F or Audit; prereq 8001 or 8002 or equiv; fall, spring, offered periodically) Interplay between social theories/media studies. Pragmatism, structural-functionalism, Marxism, political economy, cultural studies, globalization.

JOUR 8662. Seminar: Literary Aspects of Journalism. (3.0 cr.; A-F or Audit; prereq 5606; fall, spring, offered periodically) Research in literary aspects of journalism exemplified in careers/works of American/ British writers.

JOUR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

JOUR 8671. Seminar: Communication Ethics--Public/Civic Journalism. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Historical underpinnings, philosophical debate, theoretical dynamics, legal concerns, ethical implications.

JOUR 8673. Seminar: Media Management. (3.0 cr.; A-F or Audit; prereq 5725 recommended; fall, spring, offered periodically) Management issues in media organizations. Relation to dynamics of organization structure, employees, markets, economics/finances.

JOUR 8678. Seminar: Constitutional Law--Theories of Freedom of Expression. (3.0 cr.; A-F or Audit; [LAW 6059]; prereq 5777 or # or law student; spring, every year) Problems of constitutional/tort law affecting the press. Underlying theories.

JOUR 8679. Seminar: Research Methods in Media Ethics and Law. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Research at intersection of first amendment and media ethics.

JOUR 8681. Seminar: International Media Perspectives. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prereq Grad students enrolled in Mass Communication MA or PhD program or #; fall, spring, offered periodically) 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.

JOUR 8721. Seminar: Communication Agencies as Social Institutions. (3.0 cr.; A-F or Audit; fall, spring, every year) Influence/effects of mass communication, internal dynamics of media organizations, criticism/modes of reform. Theoretical frameworks for analysis.

JOUR 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year) (No description)

JOUR 8801. Seminar: Comparative Research in Mass Communication, a Cross-

JOUR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

JOUR 8990. Special Problems in Mass Communications. (3.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Mass comm grad student or #; fall, spring, offered periodically) Topics specified in Class Schedule.

KIN 5001. Foundations of Human Factors/Ergonomics. (3.0 cr.; A-F or Audit; [HUMF 5001]; fall, every year) 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 5103. Developmental/Adapted Physical Education. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) Introduction to physical education for students with disabilities, emphasizing conceptual, organizational, and administrative issues. Topics include historical and legal foundations, service components, individualized education plans, professional roles, and assessment of movement skills.

KIN 5104. Physical Activities for Persons with Disabilities. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq KIN or Rec grad student or MEd student; fall, spring, summer, every year) Steps in planning/building facilities for athletics, physical education, and sport for college, professional, and public use.
**KIN 5115. Event Management in Sport.** (3.0 cr.; A-F or Audit; prereq Grad student; #; spring, summer, every year) Techniques/principles of planning, funding, and managing sport events. Collegiate championships, non-profit events, benefits, professional events.

**KIN 5122. Applied Exercise Physiology.** (3.0 cr.; A-F or Audit; prereq 4385 or equiv or #; fall, offered periodically) 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.

**KIN 5123. Motivational Interventions in Physical Activity.** (3.0 cr.; A-F only; prereq 3126W or grad student; fall, spring, every year) Psychological principles related to physical activity (PA). Delivery of motivational interventions for physical activity. Motivational PA interventions. Two papers, one presentation, two exams.

**KIN 5126. Social Psychology of Sport & Physical Activity.** (3.0 cr.; A-F only; prereq 3126W or equiv or grad student or #; fall, spring, every year) 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.

**KIN 5136. Psychology of Coaching.** (3.0 cr.; fall, spring, summer, every year) 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.** (3.0 cr.; A-F only; prereq FScN 1112 or equiv; fall, every year) 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.

**KIN 5142. Applied Sport Nutrition for Athletic Performance.** (3.0 cr.; prereq Grad student or #; spring, every year) Latest research related to nutrition and human performance. Tools to differentiate between trends and scientific research related to optimizing human performance.

**KIN 5152. Curriculum Development in Physical Education.** (2.0 cr.; A-F or Audit; prereq initial licensure/MEd phys ed student; spring, every year) Trends, issues, and challenges in early childhood/K-12 physical education. Potential effect on curriculum.

**KIN 5171. Foundations of Kinesiology.** (3.0 cr.; A-F or Audit; prereq Kin major or #; fall, every year)

Introduction to the emerging field of kinesiology, broadly conceived as the study of human movement. Development and emergence of the term kinesiology and the scholarly, political, and educational ramifications of its development.

**KIN 5196. Practicum: Developmental/Adapted Physical Education.** (1.0-4.0 cr.; S-N only; prereq [5103 or 5104]; #; fall, spring, every year)

Observation of, participation in physical education instruction for students with disabilities. Current issues in developmental/adapted physical education. Exchange of ideas/problems.

**KIN 5201. Health Education Foundations.** (3.0 cr.; A-F only; summer, every year) Foundations, conceptual framework, and personal philosophy of health. Analysis of individual, school, and community health information. Environmental/social aspects that contribute to healthy living.

**KIN 5202. Current Issues in Health.** (2.0 cr.; A-F only; summer, every year) 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.** (2.0 cr.; A-F only; spring, every year) Effects of media, consumerism, technology, and health related issues. Students form/defend opinions on positive/negative aspects of health information dissemination and how individual health decisions are made.

**KIN 5204. Methods in Health Education.** (3.0 cr.; A-F only; prereq Health licensure student or #; fall, every year) 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.

**KIN 5205. Health Education Curriculum.** (3.0 cr.; A-F only; prereq Health licensure student or #; fall, every year) Curriculum development in health education. Trends in society. How they impact teaching of health curriculum. Culminates in written curriculum for grades 5-12.

**KIN 5235. Advanced Biomechanics II: Kinetics.** (3.0 cr.; A-F or Audit; prereq [3112 or equiv]; PMed 5135, undergrad college physics, intro calculus; spring, every years) 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.

**KIN 5317. Foundations of Kinesiology.** (3.0 cr.; A-F or Audit; prereq Kin major or #; fall, every year)

Critical analysis of management issues within sport industry. Strategic management, corporate social responsibility, human resource management/diversity, governance, sport globalization, sport development.

**KIN 5371. Sport and Society.** (3.0 cr.; A-F or Audit; prereq [3126W, grad student] or #; spring, every year) Sport, sporting processes, social influences, systems. Structures that have effected andramifications of its development.

**KIN 5375. Competitive Sport for Children and Youth.** (3.0 cr.; spring, summer, every year) 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 5385. Exercise for Healthy Aging & Disease Prevention and Management.** (3.0 cr.; A-F only; prereq Physiology or biology undergrad; spring, every year) Exercise testing/prescription with modifications required because of special considerations associated with aging, gender differences, or presence of medical conditions.

**KIN 5421. Sport Finance.** (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) 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.

**KIN 5435. Advanced Theory and Techniques of Exercise Science.** (3.0 cr.; A-F only; prereq [3385, 4385]; Kin major) #; spring, every year) Theoretical constructs, in-depth description of procedures used in exercise science research and clinical settings. Laboratory exercises, lectures.

**KIN 5461. Issues in the Sport Industry.** (3.0 cr.; A-F only; prereq postbac or grad student or #; fall, every year) Critical analysis of management issues within sport industry. Strategic management, corporate social responsibility, human resource management/diversity, governance, sport globalization, sport development.

**KIN 5485. Advanced Electrocardiogram Interpretation.** (3.0 cr.; A-F only; prereq [3385, 4385] or #; fall, every year) Placement and interpretation. Clinical exercise testing hands-on experience in electrocardiogram for resting and exercise testing situations.

**KIN 5505. Human-Centered Design - Principles and Applications.** (3.0 cr.; #[KIN 3505]; fall, every year) 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.** (3.0 cr.; A-F only; #[REC 5511]; fall, every year) Critically examines women’s involvement in/sport science research into practical implications for 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 5555. Pediatric Physiology and Health: Concepts and Applications.** (2.0 cr.; A-F only; prereq 3385 or 4385; summer, every year) 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.

KIN 5601. Sport Management Ethics and Policy. (3.0 cr.; A-F or Audit; prereq MEd or grad student or #; spring, every year) 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.

KIN 5631. Programming and Promotion in Sport. (3.0 cr.; A-F or Audit; prereq Kin or Rec grad student or #; fall, spring, every year) Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing. Discussion, practical application.

KIN 5641. Scientific Theory and Application of Training and Conditioning in Sport. (3.0 cr.; A-F only; prereq 4385 or SPST 3641 or SPST 4641 or exercise physiology course or #; spring, summer, every year) 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.

KIN 5696. Practicum in Kinesiology. (1.0-6.0 cr.; S-N only; prereq [Kin MEd or grad student] or [fall, spring, summer, every year] Practical experience in kinesiology under supervision of a University faculty member and an agency supervisor.

KIN 5720. Special Topics in Kinesiology. (2.0-4.0 cr. [max 12.0 cr.]; prereq Kin upper div undergrad or grad student or #; fall, spring, summer, every year) Current issues in the broad field and subfields in kinesiology, or related coursework in areas not normally available through regular offerings.

KIN 5722. Human Factors Psychology. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, every year) Psychological principles that underlie human interactions with technological systems. Techniques/methodologies to assess faulty/incorrect system design. Emphasizes human-centered approaches. Rigorous evaluation of human-machine interaction.

KIN 5723. Psychology of Sport Injury. (3.0 cr.; prereq Intro psych course; fall, spring, every year) Psychosocial bases of risk factors preceding sport injury, responses to the occurrence of sport injury, and the rehabilitation process. Lecture, discussion, guest lecture, interviews, and presentation experience.

KIN 5725. Organization and Management of Physical Education and Sport. (3.0 cr.; A-F or Audit; prereq Grad/initial licensure or #; spring, summer, every year) Comprehensive analysis of organization and management of physical education and sport in educational settings. Focus on management and planning processes, management skills, functions, roles, decision making, leadership, shared systems, and organizational motivation. For physical education teachers, coaches, community sport administrators.

KIN 5801. Legal Aspects of Sport and Recreation. (4.0 cr.; A-F or Audit; prereq Kin or rec major; fall, spring, every year) Legal issues related to recreation, park, and sport programs/facilities in public/private sectors.

KIN 5804. National Collegiate Athletic Association (NCAA) Compliance. (2.0 cr.; A-F only; prereq [Upper div undergrad or grad student] in Kin, #; spring, every year) Governance structure, policies, and procedures in intercollegiate athletics. Careers in college athletics as coach, administrator, athletic trainer, counselor, etc.

KIN 5941. Clinical Movement Neuroscience. (3.0 cr.; A-F only; prereq [3027 or ANAT 3001 or ANAT 3001 or ANAT 3611 or equiv]; [PHSL 3051 or equiv]; [4441]; spring, offered periodically) Various neural subsystems involved in controlling human motor function. How injury and disease of the nervous system affects motor behavior. Possibilities for rehabilitation and treatment. Lectures, seminars, class presentations.

KIN 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3.0 cr.; A-F or Audit; [REC 5981]; prereq 3151 or equiv; fall, spring, summer, every year) Defines/reviews various types of research in exercise/sport science, physical education, and recreation studies. 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. (2.0 cr.; Student Option No Audit; prereq Grad student; spring, even years) Introduction to structure/function of different organizations (e.g., NIH, AHA). Writing/reviewing grants/manuscripts. Preparing for a job in academia.

KIN 5992. Readings in Kinesiology. (1.0-9.0 cr.; A-F only; prereq [Kin upper div undergrad or MEd or grad student]; #; fall, spring, summer, every year) Independent study under tutorial guidance.

KIN 5995. Research Problems in Applied Kinesiology. (1.0-6.0 cr.; A-F only; prereq [Kin upper div undergrad or MEd or grad student]; 15 cr. of major coursework [including 4981 or 5981]; #; fall, spring, summer, every year) Selected topics in physical activity and human performance.


KIN 8002. Proseminar in Human Factors/ Ergonomics. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq Enrollment in good standing, grad HumF minor; fall, spring, every year) Issues/concerns tailored to interests of faculty/students regarding human factors/ergonomics. Interaction of performance/behavior with design factors in performance environment.

KIN 8112. Seminar: Exercise Physiology. (2.0 cr. [max 8.0 cr.]; A-F only; prereq 5122 or equiv or #; fall, spring, every year) 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.

KIN 8126. Sports Medicine Psychology. (3.0 cr.; A-F only; prereq Grad student or #; spring, offered periodically) Advanced seminar course. Multidisciplinary contributors to sports medicine psychology. Theory, research, and practice in the behavioral/social aspects of injury preventionperiences among physically active populations across the life span.

KIN 8128. Doctoral Sport Management Seminar. (3.0 cr.; A-F only; [REC 8128]; prereq PhD student, #; fall, spring, offered periodically) Analysis of current literature, theoretical constructs, research methodology and design relative to sport management. Focuses on student-selected topics, research problems.

KIN 8132. Seminar: Motor Development. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) Contemporary research literature on motor skill development from before birth to senescence. Emphasizes interaction between physical/environmental/performer constraints. Coordination/control of movement.

KIN 8135. Seminar: Motor Control and Learning. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) Advanced reading/discussion of research on motor control, motor learning, human performance.

KIN 8211. Seminar: Perception and Action. (3.0 cr.; A-F or Audit; prereq grad student or #; spring, offered periodically) 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.

KIN 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

KIN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser
and DGS consent; fall, spring, summer, every year)
(No description)
KIN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 24.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; Dept consent required; No grade associated; 4 completions allowed; up to 24 combined cr.; fall, spring, summer, every year)
tbd
KIN 8696. Internship: Applied Sport Psychology. (3.0-6.0 cr. ; S-N or Audit; prereq 5126, 8126, Kin PhD student; fall, spring, offered periodically)
Supervised internship; emphasis on educational sport psychology approaches to athletic performance enhancement and psychological adjustment to sport injury.
KIN 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year)
(No description)
KIN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)
KIN 8980. Graduate Research Seminar in Kinesiology. (1.0 cr. [max 9.0 cr.]; S-N only; prereq KIN M.S. or Ph.D. or SMGT M.A. or #; fall, spring, every year)
Reporting/discussion of student/faculty research activity.
KIN 8995. Research Problems in Kinesiology. (1.0-12.0 cr. ; S-N only; prereq Kin Ph.D. student or SMGT grad student or #; fall, spring, summer, every year)
Individual scholarly research.
KIN 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; Student Option No Audit; prereq #, %; @, fall, spring, every year)
Guided individual study of Korean language or linguistics.

Laboratory Medicine and Pathology (LAMP)
Medical School

LAMP 5100. General and Systemic Pathology for Dental Students. (6.0 cr.; A-F or Audit; prereq Registered dental student; fall, spring, every year)
Causes, courses, mechanisms, and outcomes of disease. Required as preparation for clinical dental practice and oral pathology.
LAMP 5125. Chronobiology. (2.0-6.0 cr. [max 15.0 cr.]; Student Option No Audit; prereq #, %; fall, spring, every year)
Guided individual study of Korean language or linguistics.

Land and Atmospheric Science (LAAS)
College of Food, Agricultural and Natural Resource Sciences

LAAS 5050. Integrated Topics in Land & Atmospheric Science. (3.0 cr.; A-F or Audit; fall, every year)
Earth system science. Interactions between the land and atmosphere. Biogeochemistry, human-environment interactions, environmental biophysics, and global environmental change.
LAAS 5051. Thesis Proposal Writing for Land & Atmospheric Science. (2.0 cr.; A-F or Audit; spring, every year)
Grant proposals, including proposal formats of various funding sources, how to develop a significance 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. (3.0 cr.; prereq [Chem 1022 or equiv]. Phys 1102, grad or #; fall, spring, every year)
LAAS 5425. Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere. (3.0 cr.; A-F or Audit; prereq One yr college-level [calculus, physics]; fall, odd years)
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 larger-scale geophysical situations.
LAAS 5426. Atmospheric Processes II: Radiation, Composition, and Climate. (3.0 cr.; A-F or Audit; prereq [one yr college-level [calculus, physics, chemistry]]; LAAS 5425 recommended; spring, even years)
LAAS 5480. Special Topics in Land and Atmospheric Science. (1.0-4.0 cr. [max 6.0 cr.; prereq grad student or #; fall, spring, summer, every year)
Lectures by visiting scholar or regular staff member. Topics specified in Class Schedule.
LAAS 5515. Soil Formation: Earth Surface Processes and Biogeochemistry. (3.0 cr.; A-F or Audit; prereq Z125 or #; spring, every year)
LAAS 8005. Supervised Classroom or Extension Teaching Experience. (2.0 cr.; S-N or Audit; [BBE 8005, SOIL 8005, PLPA 8005, AGRO 8005, HORT 8005]; prereq #; fall, spring, every year)
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.
LAAS 8128. Land and Atmospheric Science Seminar. (1.5 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, every year)
Students present an open seminar on an advanced topic and attend seminars presented by other graduate students.
LAAS 8195. Research Problems in Soils. (1.0-5.0 cr. [max 10.0 cr.]; prereq [Grad major

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
in soil sci or related field], #; fall, spring, summer, every year)
Directed research on special topics of interest in soil science or climatology supervised by individual or small groups of faculty.

**LAAS 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**LAAS 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**LAAS 8550. Teaching Experience.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq Grad major in soil sci or related field; #; fall, spring, every year)
Provides students with practical experiences in instructional techniques in a university setting.

**LAAS 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
Doctoral pre-thesis credits.

**LAAS 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**LAAS 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

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**LA 5001. Sustainable Landscape Design and Planning Practices.** (3.0 cr.; = [LA 4001]; prereq 5201, 5203; fall, every year)
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.

**LA 5002. Implementation of Sustainable Landscape Design and Planning Practices.** (3.0 cr.; prereq 5201, 5203; spring, every year)
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.

**LA 5003. Case Studies in Sustainable Landscape Planning and Design.** (3.0 cr.; = [LA 5003]; fall, every year)
Ecology, design, materials, policy, and community. Working from site to regional scales, evaluate case studies through the lens of larger issues and systems, including infrastructure, urban water cycle, transportation, energy, health, food systems, innovation, and metrics.

**LA 5004. Regional Landscape Planning.** (3.0 cr.; prereq FR 3131 or &FR 3131 or FR 5131 or &FR 5131 or GEOG 3561 or &GEOG 3561 or GEOG 5561 or &GEOG 5561; spring, every year)
Critical environmental parameters affecting the growth and development of metropolitan areas. Students assess these parameters/prepare a multifunctional land use plan for a defined locale.

**LA 5131. Geospatial Data Analysis and Design.** (3.0 cr.; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year)
Introduction to geospatial data analysis/application in landscape architectural, environmental design research/practice.

**LA 5201. Making Landscape Spaces and Types.** (6.0 cr.; A-F or Audit; prereq B.E.D. accelerated status or LA grad or #; fall, every year)
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.

**LA 5202. Landscape Analysis Workshop.** (1.0 cr.; S-N or Audit; fall, every year)
Introduction to field techniques for site analysis, including vegetation, soil, and landfill description. One-week session, before fall term, at lake ifasca Forestry and Biological Station.

**LA 5203. Ecological Dimensions of Space Making.** (6.0 cr.; A-F or Audit; prereq LA major or #; recommended for both BED and Grad students; spring, every year)
Design studio experience drawing on ecological, cultural, aesthetic influences to explore development of design ideas responsive to ecological issues and human experience.

**LA 5204. Metropolitan Landscape Ecology.** (3.0 cr.; A-F only; prereq BED accelerated status or LA grad student or #; fall, spring, every year)
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.

**LA 5301. Introduction to Landscape Architecture Drawing.** (3.0 cr.; = [LA 5301, ARCH 2301, LA 5376]; prereq LA grad student or accelerated B.E.D. student; fall, spring, every year)
Perceiving/representing material environment. Sketching/drawing conventions, visual phenomena/forms.

**LA 5351. AutoCAD I.** (3.0 cr.; prereq B.E.D. major or LA grad or #; may not be taken for graduate credit; fall, spring, summer, every year)
Basic concepts, tools, and techniques of computer-aided drawing. Introduction to current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawings. Introduction to 3D drawing capabilities. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

**LA 5352. AutoCAD II.** (3.0 cr.; prereq Arch 5351 or LA 5351, B.E.D. major or LA grad or #; may not be taken for graduate credit; fall, every year)
Intermediate concepts, tools, and techniques of computer-aided drawing with current AutoCAD Release software. Strategies and techniques for producing dimensioned and annotated drawing. Use of dimension variables, attributes, blocks, symbols, and creation of customized menus.

**LA 5371. Computer Methods I.** (1.0 cr.; S-N or Audit; = [LA 5301, ARCH 2301, LA 5376]; prereq B.E.D. accelerated status or LA grad or #; fall, every year)
Introduction to current techniques, programs, and new editions of computer programs, and their application to landscape architecture computing.

**LA 5372. Computer Methods II.** (1.0 cr.; S-N or Audit; = [LA 5375, ARCH 3732, LA 5377]; prereq Arch/LA 5371, LA grad or #; spring, every year)
Current techniques and computer programs, and their application to landscape architecture computing.

**LA 5374. Representation for Landscape Architectural Construction.** (3.0 cr.; fall, spring, every year)

**LA 5375. Advanced Rendering in Landscape Architecture.** (3.0 cr.; = [ARCH 5372, LA 5372, LA 5377]; spring, every year)

**LA 5400. Topics in Landscape Architecture.** (1.0-3.0 cr. [max 12.0 cr.]; prereq B.E.D. accelerated status or LA grad or #; fall, spring, every year)
Current topics in landscape architecture. Taught by regular or visiting faculty in their areas of specialization.

**LA 5401. Directed Studies in Emerging Areas of Landscape Architecture.** (1.0-3.0 cr. [max 12.0 cr.]; = [ARCH 5401, LA 5401]; S-N or Audit; prerequisites: permission of adviser and DGS; fall, spring, every year; 24 cr required; fall, spring, summer, every year)
Directed studies in emerging areas of landscape architecture. Taught by regular or visiting faculty in their areas of specialization.
LA 5402. Directed Studies in Landscape Architecture History and Theory. (1.0-6.0 cr.; prereq #: fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5403. Directed Studies in Landscape Architecture Technology. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #: fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5404. Directed Studies in Landscape Architecture Design. (1.0-6.0 cr.; [max 12.0 cr.]; prereq #: fall, spring, every year) Independent studies under the direction of landscape architecture faculty.

LA 5405. Interdisciplinary Studies in Landscape Architecture. (1.0-6.0 cr.; [max 12.0 cr.]; A-F or Audit; prereq #: fall, spring, every year) Research, planning, or design projects. Topics vary.

LA 5406. Urban Design Journal. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) Methods and theories in urban design and human behavior. Students develop journal as tool for experiencing, analyzing, and recording the urban landscape, its fabric, spatial elements, and individual components, and for analyzing design solutions.

LA 5407. Landscape Architecture Studio. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) Individual and small-group projects focusing on urban issues; design process in Danish conditions; solutions based on knowledge of Danish problems in landscape and urban design and an understanding of how these problems are solved within Danish and European contexts.

LA 5408. Landscape Architecture, Architecture, and Planning. (3.0-4.0 cr.; A-F or Audit; prereq Admitted to Denmark International Study Program co-sponsored by the University; given in Denmark; fall, spring, every year) 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.

LA 5413. Introduction to Landscape Architectural History. (3.0 cr.; A-F or Audit; prereq One course in history at 1xxx or higher; fall, every year) Introductory course examines the multiple roots of landscape architecture by examining the making of types of landscapes over time. Emphasis on ecological and environmental issues, and issues related to political, economic, and social contexts of landscape architectural works.

LA 5431. History of Landscape Architecture: Individual Influences. (3.0 cr.; A-F or Audit; fall, every year) Assessment of influences of individuals on formation of the profession of landscape architecture from 1800 to present. Lectures, presentations, field trips, readings, papers, projects.

LA 5514. Making the Mississippi. (3.0 cr.; A-F or Audit; [LA 3514]; spring, every year) 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 5571. Landscape Construction: Landform Systems and Spatial Performance. (3.0 cr.; A-F or Audit; prereq Accelerated BEd student or LA grad student; fall, every year) Theory and professional applications of landform systems for design. Landform typology, representation methods, manipulation techniques, use of land survey data, earthwork construction issues. Spatial accommodation of vehicles in landscape architecture, including road design.

LA 5572. Plants in Design. (3.0 cr.; A-F or Audit; prereq [5201, 5203, plant identification course] or #: fall, spring, every year) Design principles for using plants in landscape. Cultural/ecological principles in design projects of various scales. Lectures, presentations, field trips, readings, projects.

LA 5573. Landscape Technology: Introduction to Geographic Information Systems. (3.0 cr.; A-F or Audit; prereq jr or sr B.E.D. major or LA grad or #: ) GIS as an analytical tool to solve geographical problems of regional landscape design and resource management. Topics include application techniques, analytical procedures, data characteristics, data sources, input/output methods, and implementation.

LA 5574. Identification of Minnesota Flora. (3.0 cr.; A-F or Audit; prereq BEd accelerated status or LA grad student or #: fall, every year) Introduction to identification of approximately 500 plants commonly used by landscape architects and environmental designers in Minnesota. Students develop a working knowledge of over 250 plants. Focuses on plant selection techniques, plant landscape associations, and issues of plants for use in standard landscape architectural settings. Regular field sessions.

LA 5576. Ecological Restoration Project Planning and Management. (3.0 cr.; A-F only; prereq [MLA student, senior B.E.D.] or senior or grad with one course in ecology/tone college course in plant science or botany or #: fall, every year) Applied practice of ecological restoration of landscapes. Grasslands, wetlands, forests, disturbed agricultural sites, former industrial parcels. Restoration management, skills needed to lead successful projects.


LA 5755. Infrastructure, Natural Systems and the Space of Inhabited Landscapes. (3.0 cr.; A-F or Audit; [LA 4755]; prereq Grad student; fall, every year) 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.

LA 5771. Landscape Infrastructure Systems I. (3.0 cr.; max 6.0 cr.); A-F only; prereq Master of Landscape Architecture Student, [Accelerated Track B.E.D or #: fall, every year) 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.

LA 5772. Landscape Infrastructure Systems II. (3.0 cr.; max 6.0 cr.; A-F only; prereq Master of Landscape Architecture Student, [Accelerated BEd Student or #: spring, every year) Principles, techniques, skills of creating ecological infrastructures of built landscapes. Builds on basic concepts taught in LA 5771. Focuses on ecological connections among plants, landscape structure, earthwork techniques, water management, landscape structural systems.

LA 5790. Special Topics in Metropolitan Design. (3.0 cr.; max 6.0 cr.; A-F or Audit; [ARCH 5790]; prereq Enrollment in CMD prog or #: )

LA 8201. Designing Landscapes for Dwelling and Settlement. (6.0 cr.; A-F or Audit; prereq 5203, 5571, grad LA major, & 8202 or #: fall, spring, every year) 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.

LA 8202. Design of Planned Developments. (2.0-3.0 cr.; prereq Grad LA major or #: fall, spring, every year) 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.

LA 8203. Making Regional Landscape Space. (6.0 cr.; A-F or Audit; prereq 8202, grad LA major; concurrent enrollment 8204 or #; fall, every year) Design exploration of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.

LA 8204. Regional Landscape Space. (3.0 cr.; A-F or Audit; prereq Grad LA major or #; fall, spring, offered periodically) Theoretical investigations and current advances in use of landscape ecology, landscape perception, regional economics, and public policy as informants of design decision-making in regional landscapes at or exceeding township level. Geographic information systems as design tools.

LA 8205. Urban Form Options: Landscape Architecture Studio. (6.0-8.0 cr.; prereq 2 yrs of studio, grad LA major or #; fall, spring, every year) 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.

LA 8206. Making Urban Landscape Space. (6.0 cr.; A-F only; prereq MLA grad student; fall, every year) 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.

LA 8207. Cities on Water International Workshop. (4.0-8.0 cr.; max 16.0 cr.; A-F only; prereq Grad LA or ARCH major or #; spring, every year) Intensive studio course on international applications of sustainable urban design.

LA 8301. Landscape Architecture: Research Issues and Methods. (3.0 cr.; A-F or Audit; prereq 8201 or & 8201, grad LA major or #; fall, spring, every year) Alternative methodological approaches to landscape architectural research and consideration of their appropriateness for contemporary research topics.

LA 8302. Professional Practice. (3.0 cr.; A-F or Audit; prereq 8205, grad LA major or #; spring, every year) Office and project management case studies. Organizational behavior, marketing, sales, strategic planning, financial and cost accounting, insurance, legal issues and contracts.

LA 8333. FTE: Masters. (1.0 cr.: No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

LA 8400. Topics in Landscape Architecture. (1.0-6.0 cr. [max 96.0 cr.]; prereq Grad LA major or #; fall, spring, summer, every year) Seminar offered by regular or visiting faculty in their area of specialization. Content varies with interest of instructor.

LA 8401. Directed Studies in Emerging Areas of Landscape Architecture. (1.0-6.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) Advanced independent studies under direction of landscape architecture faculty.

LA 8402. Directed Studies in Landscape Architecture History and Theory. (1.0-6.0 cr. [max 12.0 cr.]; prereq Grad LA major or #; fall, spring, every year) Advanced independent studies under direction of landscape architecture faculty.

LA 8403. Directed Studies in Landscape Architecture Technology. (1.0-6.0 cr. [max 12.0 cr.]; prereq Grad LA major or #; fall, spring, every year) Advanced independent studies under direction of landscape architecture faculty.

LA 8404. Directed Studies in Landscape Architecture Design. (1.0-6.0 cr.; prereq Grad LA major or #; fall, spring, every year) Advanced independent studies under direction of landscape architecture faculty.

LA 8405. Interdisciplinary Studies in Landscape Architecture. (1.0-6.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad LA major or #; fall, spring, every year) Research, planning, and/or design project. Sample topics: energy efficient design, historic preservation, urban revitalization, agricultural land use, computerized land-use planning, housing.

LA 8406. Concepts of Landscape Evaluation. (3.0 cr.; A-F or Audit; prereq Grad land arch major or #; fall, spring, offered periodically) Philosophical basis for wide-ranging approaches to evaluating qualitative aspects of landscape. Aesthetic factors and integration of landscape evaluation into regional design decision-making.

LA 8407. Perception Manipulation in Design of Exterior Space. (3.0 cr.; prereq Grad land arch major or #; fall, spring, offered periodically) Historic and modern design devices that alter one's sense of spatial control and arrangement to create illusory situations in exterior environment. Organized to inform and test principles of perception distortion in exterior space.

LA 8408. 18th-Century Landscape Theory: Nature and the Sublime, the Beautiful, and the Picturesque. (3.0 cr.; A-F or Audit; prereq Grad land arch or arch major or #; fall, spring, offered periodically) Eighteenth-century landscape architectural theory underpinned most modern western traditions in landscape architecture. These theoretical positions framed the nature of Nature in the context of human experience through treatises and works of landscape architecture.

LA 8409. Fitting Buildings to the Land. (3.0 cr.; A-F or Audit; prereq Grad land arch or grad student with 1 yr grad design or #; fall, spring, offered periodically) Exercises and projects in site manipulation to adjust structures and attendant uses and circulation to specific land parcels.

LA 8411. The foundational studio course on international applications of sustainable design in urban Europe. (4.0-6.0 cr. [max 16.0 cr.]; A-F only; prereq Grad LA or ARCH major or #; spring, every year) Design preparation for restoration/reuse of abandoned sites in urban/extern urban areas reclaimed from/influenced by saltwater coastal environments.

LA 8554. Project Programming. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 8203, grad land arch major or #; fall, every year) Individual research in preparation for final studio.

LA 8555. Advanced Landscape Planning and Design. (6.0 cr.; A-F or Audit; prereq 8205, grad land arch major or #; spring, every year) Advanced studies in area of student's choice.

LA 8574. Landscape Storm Water Management. (3.0 cr.; A-F only; prereq 8201, grad land arch major or #; fall, spring, every year) Theory and applications of hydrology and storm water management techniques. Applied hydrology, catchment delineation, storm water runoff models, and storm water management techniques (detention ponds, swales, channels, culverts, and storm sewer systems, run-off systems, sedimentation, and erosion control systems).

LA 8575. The Art and Ecology of Landscape Detail. (3.0 cr.; A-F only; prereq Grad LA major or #; fall, spring, every year) Design of pavements, enclosures, decks, lighting, electrical, and irrigation systems for landscape architecture. Theory/principles of design of light structures, properties/use of materials, construction communication. Landscape integrity and economic viability as performance issues.

LA 8741. Metropolitan Design Workshop and Optional Seminar. (3.0-6.0 cr.; A-F or Audit; prereq Enrollment in CMD prog or #; spring, every year) Introduction to discipline/methodologies of urban design. Contributing fields/issues, including government/community goals, land use, housing, economic development,
LA 8773. Landscape Infrastructure and Systems III. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year)
Third course in landscape infrastructure/systems sequence that introduces technical skills required to work/obtain professional licensure as landscape architect. Programming, qualitative/quantitative performance of constructed hydrologic systems, planting design, representation of constructed systems, paving systems for hydrologic control.

LA 8774. Landscape Infrastructure and Systems IV. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Master of Landscape Architecture Student or #; fall, every year)
Fourth course in landscape infrastructure/systems sequence that introduces students to technical skills required to work/obtain professional licensure as landscape architect. Use/implementation of complex constructed assemblies in urban context.

LA 8775. Landscape Infrastructure and Site Technology V. (3.0 cr.; A-F only; prereq 8773, 8774 preferred, students outside of Master of Landscape Architecture program are encouraged to enroll upon demonstration of pre-requisite coursework and #; spring, every year)

LA 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, summer, every year)
(No description)

LA 8778. Thesis Credits: Master’s. (1.0-12.0 cr. [max 30.0 cr.]; A-F only; prereq 8777 preferred, students outside of Master of Landscape Architecture program are encouraged to enroll upon demonstration of pre-requisite coursework and #; spring, every year)

LA 8779. Thesis Credits: Master’s. (1.0-20.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required (Plan A only); fall, spring, every year)
Practicum required (Plan A only); fall, spring, summer, every year
(No description)

LAT 5001. Intensive Latin. (3.0 cr.; = [LAT 1001, LAT 1111H]; prereq Prev experience in another foreign language is desirable; fall, every year)
Covers material usually taught over two semesters.

LAT 5003. Intermediate Latin Prose: Graduate Student Enrollment. (3.0 cr.; = [LAT 3003]; prereq [Grade of at least C- or S in [1002 or 5001] or #]; grad student; fall, every year)

LAT 5004. Intermediate Latin Poetry for Graduate Students. (3.0 cr.; = [LAT 3004]; prereq [5003 or equiv]; grad student or %; spring, every year)

LAT 5100. Advanced Reading. (3.0 cr. [max 18.0 cr.]; prereq [3004 or equiv], at least two yrs of college level Latin. Must contact Classical/Near Eastern Studies department for permission to register.; fall, spring, every year)
Reading in Latin texts/authors. Texts/authors vary.

LAT 5200. Advanced Reading in Later Latin. (3.0 cr. [max 18.0 cr.]; prereq [LAT 3004 or equiv], at least two yrs of college level Latin. Must contact Classical and Near Eastern Studies department for permission to register.; fall, spring, offered periodically)
Authors of late antiquity, Middle Ages, Renaissance. Topics specified in Class Schedule.

LAT 5701. Latin Prose Composition. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Latin grammar, syntax, diction, and prose style. Graduated exercises in prose composition.

LAT 5702. Text Criticism. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)

LAT 5703. Epigraphy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Practical/theoretical introduction to Latin epigraphy (study/interpretation of inscriptions). Readings/discussion of epigraphic texts. Their value as historical documents, as evidence for development of Latin language, and as literary texts.

LAT 5705. Introduction to the Historical-Comparative Grammar of Greek and Latin. (3.0 cr.; = [GRK 5705]; prereq Two yrs college [Greek or Latin] or #; fall, offered periodically)
Historical/comparative grammar of Greek/Latin, from proto-Indo-European origins to classical norms.

LAT 5706. History of Latin. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Reading/analysis of documents illustrating stylistic registers/evolution of Latin language, from its earliest attestations through Middle Ages.

LAT 5800. Sight Reading for Graduate Students. (1.0 cr. [max 6.0 cr.]; S-N only; prereq Enrolled in a grad program in Department of Classical/Near Eastern Studies; fall, spring, every year)
Practice in reading Latin texts at sight.

LAT 5993. Directed Studies. (1.0-4.0 cr. [max 18.0 cr.]; prereq #: %; fall, spring, summer, every year)
Guided individual reading or study.

LAT 5994. Directed Research. (1.0-12.0 cr. [max 20.0 cr.]; prereq Grad student or #; fall, spring, every year)
Guided research on original topic chosen by student.

LAT 5996. Directed Instruction. (1.0-12.0 cr. [max 20.0 cr.]; prereq Grad student or #; fall, spring, every year)
Supervised teaching internship.

LAT 8100. Readings in Latin Prose. (3.0 cr. [max 18.0 cr.]; prereq Advanced grad student; fall, spring, every year)
Reading/discussion of Latin prose texts.

LAT 8120. Latin Text Course. (3.0 cr. [max 15.0 cr.]; prereq 3111 or %; not for students in dept of Classical and near East Studies; fall, spring, every year)
Students attend 3xxx Latin courses. Supplementary work at discretion of instructor.

LAT 8200. Readings in Latin Verse. (3.0 cr. [max 18.0 cr.]; prereq Advanced grad student; fall, spring, every year)
Reading/discussion of Latin poetic texts.

LAT 8262. Survey of Latin Literature I. (3.0 cr.; )
Extensive readings in variety of works from republican and early Augustan period.

LAT 8263. Survey of Latin Literature II. (3.0 cr.; )
Variety of works from Augustan and imperial periods.

LAT 8267. Graduate Survey of Latin Literature of Late Antiquity. (3.0 cr.; prereq #; %; spring, offered periodically)
Latin literature of 3rd to 6th centuries A.D., including Ammianus and Augustine.
LING 5994. Directed Research. (1.0-4.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year) Tutorial for qualified graduate students.

LS 5993. Directed Studies. (1.0-4.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year) Guided individual reading or study.

LS 5950. Special Topics. (1.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year) Interdisciplinary topics.

LS 5125. Field Experience. (1.0-8.0 cr.; A-F or Audit; prereq MLS student or #; fall, spring, summer, every year) Off-campus observation, experience, and evaluation in interdisciplinary field of study.

LS 8001. Introduction to Interdisciplinary Inquiry. (3.0 cr.; A-F or Audit; prereq MLS student, %; fall, spring, summer, every year) Required course. Emphasizes what students need to know or be able to do to successfully complete their individually crafted program, including critical thinking, clear writing, and interdisciplinary research.

LS 8002. Final Project for Graduate Liberal Studies. (3.0 cr.; A-F or Audit; prereq MLS; all MLS coursework must be completed by end of sem, %; fall, spring, summer, every year) Students synthesize/complete final project.

LS 8100. Advanced Interdisciplinary Inquiry. (1.0-3.0 cr. [max 5.0 cr.]; A-F or Audit; prereq MLS student, %; spring, every year) Readings/discussion to shape/focus final project. Workshop format. Key ideas of various disciplines, influential thinkers. Emphasizes developing critical themes.

LS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; spring, summer, every year) (No description)

Linguistics (LING) College of Liberal Arts
Greater emphasis on analysis of recorded texts of various kinds. Some grammars of the language/contents compared with field notes from previous semester.

LING 8200. Topics in Syntax and Semantics. (3.0 cr. [max 9.0 cr.]; prereq 5202, 5205 or #; ) Syntax and semantics of natural language, with particular emphasis on the interface between the two.

LING 8210. Seminar in Syntax. (3.0 cr. [max 9.0 cr.]; prereq 5202, 5205 or #; fall, offered periodically) Current issues in syntactic theory. Topics vary.

LING 8300. Topics in Phonetics and Phonology. (3.0 cr. [max 9.0 cr.]; prereq 5303 or #; )

LING 8333, FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

LING 8444, FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

LING 8500. Topics in Second Language Acquisition. (3.0 cr. [max 9.0 cr.]; prereq 5001, 5505; fall, spring, offered periodically) TBD

LING 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

LING 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

LING 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

LING 8888W. Thesis Credit Dissertation Seminar. (1.0-3.0 cr. [max 24.0 cr.]; No Grade Associated; prereq Doctoral student who has passed oral prelims; fall, spring, every year) 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.

LING 8900. Seminar: Topics in Linguistics. (3.0 cr. [max 9.0 cr.]; prereq #; spring, every year) Topics vary, See Class Schedule.

LING 8920. Topics in Language and Cognition. (3.0 cr. [max 6.0 cr.]; prereq 5001 or #; fall, every year) Language-related issues in cognitive science from a linguistic perspective. Serves as elective for cognitive science minor, but only for linguistics nonmajors.

LING 8991. Independent Study. (1.0-4.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year) Independent Study

Logistics Management (LM)

LM 8892. Readings in Logistics Management. (1.0-8.0 cr. [max 16.0 cr.]; prereq Adviser consent or #; fall, spring, every year) Readings useful to student's individual program or objectives that are not available in regular courses.

LM 8894. Graduate Research in Logistics Management. (1.0-8.0 cr. [max 16.0 cr.]; prereq Adviser consent or #; fall, spring, every year) Individual research on an approved topic appropriate to student's program and objectives.

Management (MGMT)

MGMT 5019. Business, Natural Environment, and Global Economy. (2.0 cr.; A-F only; [max 8.0 cr.; prereq MBA student; fall, every year]) Resource deployment policies that affect the natural environment. Sustainability. Local/global environmental threats, how government policies address these issues. Business strategies/practices that produce "win-win" outcomes.

MGMT 5480. Topics in Natural Resources. (3.0 cr.; A-F only; spring, offered periodically) Specific topic for each offering.

MGMT 8101. Theory Building and Research Design. (4.0 cr.; prereq Business admin PhD student or #; spring, offered periodically) Problem formulation, conceptual modeling, theory building, and research design in the social and behavioral sciences.

MGMT 8201. Foundations of Business, Government, and Society. (4.0 cr.; prereq Business admin PhD student or #; fall, offered periodically) Considers works in political and legal philosophy, ethics, and economics.

MGMT 8202. Seminar in International Management. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Overview of the field of international management research.

MGMT 8204. Topics in BGS - I. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, offered periodically) Topics vary.

MGMT 8205. Topics in Business, Government, and Society II. (2.0 cr.; A-F or Audit; prereq PhD student or #; ) Topics vary.

MGMT 8301. Seminar in Organizational Behavior. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Major theories and current research on individual behavior and group processes in organizations from a micro perspective.

MGMT 8302. Seminar in Organizations Theory. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Major theories and current research on organizational and interorganizational topics from a macro perspective.

MGMT 8304. Topics in Organizations I. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, spring, offered periodically) Topics vary.

MGMT 8305. Topics in Organizations II. (2.0 cr.; A-F or Audit; prereq PhD student or #; fall, spring, offered periodically) Topics vary.

MGMT 8401. Seminar in Strategy Content. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, offered periodically) Review of research in strategy formulation.

MGMT 8402. Seminar in Strategy Process. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, every year) Strategic management. Topics vary.

MGMT 8403. Strategy Seminar. (4.0 cr.; prereq Business admin PhD student or #; fall, spring, every year) Strategic management. Topics vary.

MGMT 8404. Topics in Strategy I. (2.0-4.0 cr. [max 8.0 cr.; prereq PhD student or #; spring, odd years]) Topics vary.

MGMT 8405. Topics in Strategy II. (2.0-4.0 cr. [max 8.0 cr.; A-F or Audit; prereq PhD student or #; spring, even years]) Topics vary.

MGMT 8892. Readings in Management Theory and Administration. (1.0-8.0 cr. [max 16.0 cr.; prereq Business admin PhD student or #; spring, every year]) Intensive research on a management topic; major term paper.

MGMT 8894. Graduate Research in Management Theory and Administration. (1.0-8.0 cr. [max 16.0 cr.; prereq Business admin PhD student or #; adviser consent; fall, spring, summer, every year]) Research project on a management problem of interest to student, may be completed in cooperation with a business firm.

Management of Technology (MOT)

MOT 5001. Technological Business Fundamentals. (2.0 cr.; A-F only; prereq
Degree seeking or non-degree graduate students; fall, every year)

MOT 5003. Technological Business Planning Workshop. (1.0 cr.; max 2.0 cr.; A-F only; prereq Degree seeking or non-degree graduate students. Student must also enroll for MOT 5001 or MOT 5002.; fall, spring, every year)
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.

MOT 5224. Introduction to Technological Leadership and Management: Assessing Emerging and Pivotal Technologies. (1.0 cr.; A-F only; fall, every year)
Selected emerging technologies expected to play key roles in future industrial development.

MOT 5991. MOT Independent Study. (1.0-3.0 cr.; max 1.0 cr.; S-N or Audit; prereq MOT grad student; ) Independent study in MOT-related topic.

MOT 8111. Marketing Management for Technology-based Organizations. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
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.

MOT 8112. Management Accounting. (1.5 cr.; [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; fall, every year)
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.

MOT 8113. Operations Management for Competitive Advantage. (1.5 cr.; [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; spring, every year)
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.

MOT 8114. Strategic Technology Analysis. (2.0 cr.; A-F only; prereq Grad MOT major; fall, every year)
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.

MOT 8121. Managing Organizations in a Technological Environment. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
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.

MOT 8122. Financial Management for Technology-based Organizations. (2.0 cr.; A-F or Audit; prereq Grad MOT major; spring, every year)
Creating value within the organization. Financial methods important to managers of technology-based organizations. Budgeting capital, projecting financial needs, and managing working capital.

MOT 8133. Communication in a Technical Environment. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
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.

MOT 8212. Developing New Technology Products. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
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.

MOT 8213. Macroevironment of Technology. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
Development of scenarios of anticipated social, political, governmental, and economic forces affecting technological change. Use of scenarios to respond to industry threats, opportunities, and uncertainties. Corporate strategies, including building alliances for global competitiveness.

MOT 8214. Technology Foresight and Forecasting. (2.0 cr.; A-F only; prereq Grad MOT major; fall, every year)
Tools/techniques for technology forecasting, assessment, and strategic foresight for decision making in business/government. Technology dynamics, R&D strategy, portfolio management, resource allocation.

MOT 8221. Project and Knowledge Management. (1.5 cr.; [max 2.0 cr.]; A-F or Audit; prereq Grad MOT major; spring, every year)
Survey/application of project and knowledge management in management of technology. Business/engineering project/knowledge management. Planning, scheduling, controlling.


MOT 8224. Pivotal Technologies. (2.0 cr.; A-F or Audit; prereq MOT grad major; fall, every year)
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.

MOT 8231. Managing Information Resources in Technology-based Organizations. (1.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
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.

MOT 8232. Managing Technological Innovation. (2.0 cr.; A-F or Audit; spring, every year)
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. (2.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)

MOT 8234. Capstone Project. (0.5-2.0 cr.; A-F or Audit; prereq Completion of two semesters, grad MOT major; fall, spring, summer, every year)
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.

MOT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, summer, every year) (No description)

MOT 8500. Innovation Leadership and Organizational Effectiveness. (0.5-2.0 cr.; A-F only; prereq MOT major; fall, spring, every year)
Made up of four Â½ credit units that unfold over four semesters of MOT program. Building talent, organizational capability, culture needed to execute innovation strategy.

MOT 8900. Conflict Management. (0.5 cr.; prereq Grad MOT major; fall, every year)
Theory and methods for applying conflict management techniques in organizations. Cooperative and competitive models of conflict, basics of bargaining, conflict strategies, communicating styles, listening skills, dispute resolution, third-party mediation, and use of computers for conflict mediation.

MOT 8910. Corporate Responsibility. (1.0 cr.; A-F or Audit; prereq Grad MOT major; fall, spring, every year)
Principles of stakeholder management. Ethical framework for responsible management of investors, employees, suppliers, customers, and external community. Moral leadership, trust in organizations, and quality control. New metaphors and techniques for managing the socially responsible organization.

MOT 8920. Science and Technology Policy. (1.5 cr.; A-F or Audit; prereq MOT grad student; fall, every year)

MOT 8921. Global Management of Technology. (0.0-0.5 cr.; A-F only; prereq MOT student; spring, every year)
Global management of technology.

MOT 8930. Topics in Emerging Technologies. (0.5 cr.; S-N or Audit; prereq MOT grad student; spring, every year)
Invited speakers give half- or full-day seminars on special topics in emerging technologies (e.g., energy systems, tissue engineering, thermal spray coating technology).

MOT 8940. Managing Intellectual Property. (0.5-1.5 cr.; S-N only; prereq MOT grad student; fall, every year)

MOT 8950. International Management of Technology Project. (1.5 cr.; A-F or Audit; prereq MOT grad student; spring, every year)
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.

Marketing (MKTG)
Curtis L. Carlson School of Management

MKTG 8809. Consumer Behavior Research Methods. (2.0 cr.; A-F or Audit; prereq Doctoral student or [masters programs student, #]; fall, spring, offered periodically)
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.

MKTG 8810. Consumer Behavior Special Topics. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Doctoral student or [masters program student, #]; fall, spring, offered periodically)
Theories of consumer categorization. Literature on brand categories, category measurement, brand extensions/dilution/affect. Readings from branding literature. Theoretical analysis.

MKTG 8811. Consumer Attitudes and Persuasion I. (2.0 cr.; prereq ([MBA 6210 or equiv], business admin PhD student) or [#]; fall, spring, odd years)
Reading, discussing, and evaluating theories of consumer attitudes and persuasion. Theoretical analysis, rather than practitioner focus.

MKTG 8812. Consumer Attitudes and Persuasion II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [#]; fall, spring, odd years)

MKTG 8813. Consumer Judgment and Decision Making I. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically)
Different theoretical approaches taken in judgment and decision-making research. Heuristics/biases, affect in decision making, judgments/decisions over time.

MKTG 8814. Consumer Judgment and Decision Making II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically)
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.

MKTG 8831. Seminar: Inter-Organizational Relations. (4.0 cr.; prereq MBA 6210 or equiv, business admin PhD student or [#]; fall, spring, offered periodically)
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.

MKTG 8842. Quantitative Modeling I. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically)
Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/empirical research in marketing, econometrics, and industrial organization. Classic/contemporary articles.

MKTG 8843. Quantitative Modeling II. (2.0 cr.; A-F or Audit; prereq Doctoral student or [master's program student, #]; fall, spring, offered periodically)
Advanced readings seminar. Quantitative research in marketing. Topics from theoretical/empirical research streams in marketing, econometrics, and industrial organization. Classic/contemporary articles.

MKTG 8851. Seminar: Marketing Management and Strategy I. (2.0 cr.; prereq ([MBA 6210 or equiv], business admin PhD student) or [#]; fall, spring, offered periodically)
Topics in marketing management and formulation and implementation of marketing strategies. Diversity of thought, within marketing and strategic management literature.

MKTG 8852. Marketing Management & Strategy II. (2.0 cr.; prereq Business
admin PhD student or #; fall, spring, offered periodically)
PhD seminar. Role of branding within the organization, its business strategy, and its success. Brand management. Critically evaluate fundamental ideas and more recent developments.

MKTG 8890. Seminar: Marketing Topics. (1.0-4.0 cr. [max. 8.0 cr.]; prereq Business admin PhD student or #; fall, spring, offered periodically)
Current topics and problems of interest considered in depth. Topics vary with each offering.

MKTG 8892. Readings in Marketing. (1.0–8.0 cr. [max. 16.0 cr.]; prereq MBA 6210 or equiv, business admin PhD student or #; fall, spring, every year)
Readings useful to student's individual program and objectives that are not available in regular courses.

MKTG 8894. Graduate Research in Marketing. (1.0–8.0 cr. [max. 16.0 cr.]; prereq MBA 6210 or equiv, business admin PhD student or #; fall, spring, summer, every year)
Individual research on an approved topic appropriate to student's program and objectives.

Master of Business Taxation (MBT)
Curts L. Carlson School of Management

MBT 5200. Tax Accounting Methods and Periods. (4.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)
Rules affecting timing of income and deductions for tax purposes. Examination of cash and accrual accounting methods on an overall basis and with respect to individual items of income and deductions; rules for changing accounting methods and periods; annual accounting and transactional concepts, including the claim of right doctrine, the Arrowsmith doctrine, and the tax benefit rule.

MBT 5220. Tax Research, Communication, and Practice. (4.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)

MBT 5223. Tax-exempt Organizations. (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, every year)
Tax law/issues concerning Section 501(c)(3) and other tax-exempt organizations. Qualification, procedures. Unrelated business income, private foundations (including intermediate sanctions), joint ventures.

MBT 5226. Negotiation Techniques in Taxation. (2.0 cr.; A-F or Audit; summer, every year)
Hands-on approach. Applications from facilitating business sales, mergers, and acquisitions, to representing client's position before IRS, to controlling TV remote. Negotiation process: planning, pre-negotiation preparation, strategy development.

MBT 5230. Corporate Taxation I. (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; spring, every year)

MBT 5323. Mergers and Acquisitions I. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; fall, every year)
Different types of acquisitions, disposals, 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.

MBT 5333. Tax Aspects of Consolidated Returns. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; spring, every year)

MBT 5335. Taxation of the Small Business Corporation. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; spring, summer, every year)
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.

MBT 5340. Taxation of Partners and Partnerships. (2.0 cr.; A-F or Audit; prereq Acct 5135, MBT student; spring, summer, every year)
Reviews tax consequences associated with formation, operation, and dissolution of a partnership.

MBT 5346. ASC 740 Computations and Analysis. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; fall, every year)

MBT 5348. Advanced ASC 740 Concepts. (2.0 cr.; A-F or Audit; prereq 5346, MBT student; fall, odd years)
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.

MBT 5350. Wealth Transfer I (Estates and Gifts). (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, spring, summer, every year)

MBT 5353. Trusts and Estates. (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; fall, spring, every year)

MBT 5360. State and Local Taxation. (2.0 cr.; A-F or Audit; prereq Acct 5135, MBT student; spring, every year)
Examines state levying of individual income, corporate income, property, sales, and excise taxes. Tax problems of businesses with multistate operations.

MBT 5361. State and Local Taxation II. (2.0 cr.; A-F or Audit; fall, every year)
Income/sales tax consequences of mergers/acquisitions, corporate reorganizations. Practical application of tax concepts. Planning ideas in drop shipments, investment holding companies, e-commerce, leasing companies, and like tax alternatives. Real property taxation, individual income taxation, state administrative tax procedures, state payroll considerations.

MBT 5363. Compensation and Benefits. (2.0 cr.; A-F or Audit; prereq ACCT 5135, MBT student; spring, every year)
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.

MBT 5370. Taxation of Property Transactions. (2.0 cr.; A-F or Audit; prereq Acct 5135, MBT student; fall, spring, every year)
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.

MBT 5380. Tax Aspects of International Business I. (2.0 cr.; A-F or Audit; prereq 5230, MBT student; fall, spring, every year)
Multinational business operations/transactions involving foreign income. Tax consequences of transactions with/by foreign organizations/companies.
MATS 8001. Structure and Symmetry of Materials. (3.0 cr.; prereq Math 3871 or #, upper div CSE or grad; fall, every year)

MATS 8002. Thermodynamics and Kinetics. (3.0 cr.; A-F or Audit; fall, every year)

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 8003. Electronic Properties. (3.0 cr.; A-F or Audit; spring, offered periodically)


MATS 8004. Mechanical Properties. (3.0 cr.; A-F or Audit; spring, every year)

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 8204. Computational Methods and Applications to Problems in Materials
Science and Engineering. (2.0 cr.; A-F or Audit; prereq Grad student, knowledge of programming languages such as Fortran; spring, every year) Implementation of computational methods/applications to numerical problems in materials science and engineering. Emphasizes implementation to applications.

MATS 8211. Physical Chemistry of Polymers. (4.0 cr.; [CHEM 8211, CHEN 8211]; prereq Undergrad physical chem or #; spring, every year) 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.

MATS 8221. Synthetic Polymer Chemistry. (4.0 cr.; A-F or Audit; [CHEM 8221, CHEN 5221, CHEN 8221, MATS 5221, CHEM 4221]; prereq [Undergrad organic chemistry course, undergrad physical chemistry course] or #; fall, every year) Condensation, radical, ionic, emulsion, ring-opening, metal-catalyzed polymerizations. Chain conformation, solution thermodynamics, molecular weight characterization, physical properties.

MATS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

MATS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

MATS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

MATS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

MATS 8993. Directed Study. (1.0-12.0 cr.; fall, spring, summer, every year)

MATS 8994. Directed Research. (1.0-12.0 cr.; fall, spring, summer, every year)

MATS 8995. Special Topics. (1.0-4.0 cr.; A-F or Audit; fall, spring, summer, every year) New or experimental courses offered by department or visiting faculty.

Mathematics (MATH) Institute of Technology

MATH 5067. Actuarial Mathematics I. (4.0 cr.; prereq 4065, [one sem [4xxx or 5xxx] [probability or statistics] course]; fall, every year) Future lifetime random variable, survival function. Insurance, life annuity, future loss random variables. Net single premium, actuarial present value, net premium, net reserves.

MATH 5068. Actuarial Mathematics II. (4.0 cr.; prereq 5067; spring, every year) Multiple decrement insurance, pension valuation. Expense analysis, gross premium, reserves. Problem of withdrawals. Regulatory reserving systems. Minimum cash values. Additional topics at instructor's discretion.

MATH 5075. Mathematics of Options, Futures, and Derivative Securities I. (4.0 cr.; prereq Two yrs calculus, basic computer skills; fall, every year) Mathematical background (e.g., 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.

MATH 5076. Mathematics of Options, Futures, and Derivative Securities II. (4.0 cr.; A-F or Audit; prereq 5075; spring, every year) 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.

MATH 5165. Mathematical Logic I. (4.0 cr.; [MATH 4152]; prereq 2283 or 3283 or Phil 5201 or CrSci course in theory of algorithms or #; fall, every year) Theory of computability: notion of algorithm, Turing machines, primitive recursive functions, recursive functions, Kleene normal form, recursion theorem. Propositional logic.

MATH 5166. Mathematical Logic II. (4.0 cr.; prereq 5165; spring, every year) First-order logic: provability/truth in formal systems, models of axiom systems, Gödel's completeness theorem. Godel's incompleteness theorem: decidability theorems, representability of recursive functions in formal theories, undecidable theories, models of arithmetic.


MATH 5285H. Honors: Fundamental Structures of Algebra I. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or 2574 or 3283]; fall, every year) 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.

MATH 5286H. Honors: Fundamental Structures of Algebra II. (4.0 cr.; prereq 5285; fall, spring, every year) 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.

MATH 5335. Geometry I. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or & 2374 or & 2574]; fall, every year) 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.

MATH 5336. Geometry II. (4.0 cr.; prereq 5335; spring, every year) 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.

MATH 5345H. Honors: Introduction to Topology. (4.0 cr.; A-F only; prereq [2263 or 2374 or 2573], [2283 or & 2574 or & 3283]; fall, every year) Rigorous introduction to general topology. Set theory, Euclidean/metric spaces, compactness/connectedness. May include Urysohn metrization, Tychonoff theorem or fundamental group/covering spaces.

MATH 5378. Differential Geometry. (4.0 cr.; prereq [2263 or 2374 or 2573], [2243 or 2373 or 2574]; [2283 or 3283] recommended); spring, every year)
Basic geometry of curves in plane and in space, including Frenet formula, theory of surfaces, differential forms, Riemannian geometry.

MATH 5385. Introduction to Computational Algebraic Geometry. (4.0 cr.; prereq [2263 or 2374 or 2574]; [2243 or 2373 or 2574]; fall, every year])
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.

MATH 5445. Mathematical Analysis of Biological Networks. (4.0 cr.; prereq Linear algebra, differential equations; spring, every year)

MATH 5447. Theoretical Neuroscience . (4.0 cr.; prereq 2243 or 2373 or 2574; fall, every year)

MATH 5467. Introduction to the Mathematics of Image and Data Analysis. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or 2574 or 3283 or #]; [[2263 or 2374], 4567] recommended; spring, every year])

MATH 5485. Introduction to Numerical Methods I. (4.0 cr.; prereq [2243 or 2373 or 2573], familiarity with some programming language; fall, every year)

MATH 5486. Introduction To Numerical Methods II. (4.0 cr.; prereq 5485; spring, every year)

MATH 5490. Topics in Applied Mathematics. (4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically)
Topics vary by instructor. See class schedule.

MATH 5525. Introduction to Ordinary Differential Equations. (4.0 cr.; prereq [2243 or 2373 or 2573], [2283 or 2574 or 3283]; fall, spring, offered periodically)

MATH 5535. Dynamical Systems and Chaos. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 3283]; fall, spring, every year)
Dynamical systems theory. Emphasizes iteration of one-dimensional mappings. Fixed points, periodic points, stability, bifurcations, symbolic dynamics, chaos, fractals, Julia/ Mandelbrot sets.

MATH 5583. Complex Analysis. (4.0 cr.; prereq 2 sems soph math [including [2263 or 2374 or 2574], [2283 or 3283] recommended; fall, spring, summer, every year])

MATH 5587. Elementary Partial Differential Equations I. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2374 or 2574]; fall, every year)
Emphasizes partial differential equations with/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.

MATH 5588. Elementary Partial Differential Equations II. (4.0 cr.; A-F or Audit; prereq [[2243 or 2373 or 2573], [2263 or 2374 or 2574], 5587] or #; spring, every year)

MATH 5594H. Honors Mathematics - Topics. (4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq [5593H with grade of at least B, experience in writing proofs] or %; intended for mathematically-talented students with proven achievement in theoretical mathematics courses; fall, offered periodically)
Topics vary depending on interests of instructor. Theoretical treatment of chosen topic.

MATH 5594H. Honors Mathematics - Analysis I. (4.0 cr.; prereq [[2243 or 2373], [2263 or 2383] or 2574]; fall, every year)

MATH 5616H. Honors: Introduction to Analysis II. (4.0 cr.; prereq 5615; spring, every year)

MATH 5651. Basic Theory of Probability and Statistics. (4.0 cr.; prereq [2263 or 2374 or 2573], [2243 or 2373]; [2263 or 2574 or 3283] recommended; Credit will not be granted if credit has been received for: Stat 4101, Stat 5101.. fall, spring, every year)
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.

MATH 5652. Introduction to Stochastic Processes. (4.0 cr.; prereq 5651 or Stat 5101; spring, every year)
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.

MATH 5654. Prediction and Filtering. (4.0 cr.; prereq 5651 or Stat 5101; spring, every year)
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.

MATH 5657. Graph Theory and Non-enumerative Combinatorics. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2383 or 2574 or 3283]; fall, spring, every year)
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.

MATH 5670. Graph Theory and Non-enumerative Combinatorics. (4.0 cr.; prereq [2243 or 2373 or 2573], [2263 or 2574]; [2283 or 3283 or experience in writing proofs] highly recommended; Credit will not be granted if credit has been received for: 4707; fall, spring, every year)
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.

MATH 5711. Linear Programming and Combinatorial Optimization. (4.0 cr.; prereq 2 sems soph math [including 2243 or 2373 or 2573]; fall, spring, every year)
Simplex method, connections to geometry, duality theory, sensitivity analysis. Applications to cutting stock, allocation of resources,
MATH 5900. Tutorial in Advanced Mathematics. (1.0-6.0 cr. [max 120.0 cr.]; A-F or Audit; fall, spring, summer, every year) Individually directed study.

MATH 5990. Topics in Mathematics. (4.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary by instructor. See class schedule.

MATH 8001. Preparation for College Teaching. (1.0 cr.; S-N or Audit; prerequisite: math grad student in good standing or #; fall, spring, every year) New approaches to teaching/learning, issues in mathematics education, components/expectations of a college mathematics professor.

MATH 8141. Applied Logic. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) 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. (3.0 cr.; A-F or Audit; spring, offered periodically) 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. (3.0 cr.; A-F or Audit; prerequisite: Math 5166 or #) 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.

MATH 8152. Axiomatic Set Theory. (3.0 cr.; A-F or Audit; prerequisite: Math 8151 or #) 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.


MATH 8167. Recursion Theory. (3.0 cr.; A-F or Audit; prerequisite: Math 8166; spring, offered periodically) Sample topics: complexity theory, recursive analysis, generalized recursion theory, analytical hierarchy, constructive ordinals.

MATH 8172. Model Theory. (3.0 cr.; A-F or Audit; prerequisite: Math grad student or #) Interplay of formal theories, their models. Elementary equivalence, elementary extensions, partial isomorphisms. Lowenheim-Skolem theorems, compactness theorems, preservation theorems. Ultraproducts.

MATH 8173. Model Theory. (3.0 cr.; A-F or Audit; prerequisite: Math 8172 or #) Types of elements. Prime models, homogeneity, saturation, categoricity in power. Forking.

MATH 8190. Topics in Logic. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically) Offered for one year or one semester as circumstances warrant.

MATH 8201. General Algebra. (3.0 cr.; A-F or Audit; prerequisite: Math 4xxx algebra or equiv or #; fall, every year) Groups through Sylow, Jordan-Hoelder theorems, structure of finitely generated Abelian groups. Rings and algebras, including Gauss theory of factorization. Modules, including projective and injective modules, chain conditions, Hilbert basis theorem, and structure of modules over principal ideal domains.

MATH 8202. General Algebra. (3.0 cr.; A-F or Audit; prerequisite: Math 8201 or #; spring, every year) Classical field theory through Galois theory, including solvable equations. Symmetric, Hermitian, orthogonal, and unitary form. Tensor and exterior algebras. Basic Wedderburn theory of rings; basic representation theory of groups.

MATH 8207. Theory of Modular Forms and L-Functions. (3.0 cr.; A-F or Audit; prerequisite: Math 8201 or #; fall, every year) Groups through Sylow, Jordan-Hoelder theorems, structure of finitely generated Abelian groups. Rings and algebras, including Gauss theory of factorization. Modules, including projective and injective modules, chain conditions, Hilbert basis theorem, and structure of modules over principal ideal domains.

MATH 8208. Theory of Modular Forms and L-Functions. (3.0 cr.; A-F or Audit; prerequisite: Math 8201 or #; fall, every year) Classical field theory through Galois theory, including solvable equations. Symmetric, Hermitian, orthogonal, and unitary form. Tensor and exterior algebras. Basic Wedderburn theory of rings; basic representation theory of groups.

MATH 8251. Algebraic Number Theory. (3.0 cr.; A-F or Audit; prerequisite: Math 8202 or #; spring, every year) 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.

MATH 8252. Algebraic Number Theory. (3.0 cr.; A-F or Audit; prerequisite: Math 8251 or #; spring, every year) 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.


MATH 8270. Topics in Algebraic Geometry. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prerequisite: Math 8201, Math 8202; offered for one year or one semester as circumstances warrant; fall, spring, every year)

MATH 8271. Lie Groups and Lie Algebras. (3.0 cr.; A-F or Audit; prerequisite: Math 8302 or #; fall, offered periodically) 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.

MATH 8272. Lie Groups and Lie Algebras. (3.0 cr.; A-F or Audit; prerequisite: Math 8302 or #; spring, offered periodically) 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.

MATH 8280. Topics in Number Theory. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prerequisite: Math 8302 or #; offered for one year or one semester as circumstances warrant; )
MATH 8300. Topics in Algebra. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year)

  Selected topics.

MATH 8301. Manifolds and Topology. (3.0 cr.; A-F or Audit; prereq [Some point-set topology, algebra, or #]; fall, every year)

Classification of compact surfaces, fundamental group/covering spaces. Homology group, basic cohomology. Application to degree of a map, invariance of domain/dimension.

MATH 8302. Manifolds and Topology. (3.0 cr.; A-F or Audit; prereq 8301 or #; spring, every year)


MATH 8306. Algebraic Topology. (3.0 cr.; A-F or Audit; prereq 8301 or #;)

Singular homology, cohomology theory with coefficients. Eilenberg-Steenrod axioms, Mayer-Vietoris theorem.

MATH 8307. Algebraic Topology. (3.0 cr.; A-F or Audit; prereq 8306 or #;)

Basic homotopy theory, cohomology rings with applications. Time permitting: fibre spaces, cohomology operations, extra-ordinary cohomology theories.

MATH 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

MATH 8380. Topics in Topology. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301 or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, offered periodically)

Selected topics.

MATH 8365. Riemannian Geometry. (3.0 cr.; A-F or Audit; prereq 8301 or basic point-set topology or #; fall, every year)


MATH 8366. Riemannian Geometry. (3.0 cr.; A-F or Audit; prereq 8365 or #; spring, every year)

Gauss, Codazzi equations. Tensor calculus, Hodge theory, spinors, global differential geometry, applications.

MATH 8370. Topics in Differential Geometry. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301 or 8365; offered for one yr or one sem as circumstances warrant; fall, spring, every year)

Current research in Differential Geometry.

MATH 8380. Topics in Advanced Geometry. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8301, 8365; fall, spring, offered periodically)

Current research.

MATH 8385. Calculus of Variations and Minimal Surfaces. (3.0 cr.; A-F or Audit; prereq 4xxx partial differential equations or #;)


MATH 8386. Calculus of Variations and Minimal Surfaces. (3.0 cr.; A-F or Audit; prereq 8595 or #;)

Theory of multiple integrals. Geometrical differential equations, i.e., theory of minimal surfaces and related structures (surfaces of constant or prescribed mean curvature, solutions to variational integrals involving surface curvatures), all extremals for variational problems of current interest as models for interfaces in real materials.

MATH 8387. Mathematical Modeling of Industrial Problems. (3.0 cr.; A-F or Audit; prereq [5xxx numerical analysis, some computer experience] or #; fall, every year)

Mathematical models from physical, biological, social systems. Emphasizes industrial applications. Modeling of deterministic/probabilistic, discrete/continuous processes; methods for analysis/computation.

MATH 8388. Mathematical Modeling of Industrial Problems. (3.0 cr.; A-F or Audit; prereq 8597 or #;)

Techniques for analysis of mathematical models. Asymptotic methods; design of simulation and visualization techniques. Specific computation for models arising in industrial problems.

MATH 8390. Topics in Mathematical Physics. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8601; offered for one yr or one sem as circumstances warrant;)

Current research.

MATH 8401. Mathematical Modeling and Methods of Applied Mathematics. (3.0 cr.; A-F or Audit; prereq 4xxx numerical analysis and applied linear algebra or #; fall, every year)

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.

MATH 8402. Mathematical Modeling and Methods of Applied Mathematics. (3.0 cr.; A-F or Audit; prereq 8401 or #; spring, every year)


MATH 8431. Mathematical Fluid Mechanics. (3.0 cr.; A-F or Audit; prereq 5xxx numerical analysis of partial differential equations or #;)


MATH 8432. Mathematical Fluid Mechanics. (3.0 cr.; prereq 8431 or #;)


MATH 8441. Numerical Analysis and Scientific Computing. (3.0 cr.; prereq [4xxx analysis, 4xxx applied linear algebra] or #; fall, every year)


MATH 8442. Numerical Analysis and Scientific Computing. (3.0 cr.; prereq 8441 or #; 5477-5478 recommended for engineering and science grad students; spring, every year)


MATH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

MATH 8445. Numerical Analysis of Differential Equations. (3.0 cr.; A-F or Audit; prereq 4xxx numerical analysis, 4xxx partial differential equations or #; fall, every year)

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.

MATH 8446. Numerical Analysis of Differential Equations. (3.0 cr.; A-F or Audit; prereq 8445 or #; spring, every year)

Numerical methods for parabolic equations (e.g., heat equations). Methods for elasticity, fluid mechanics, electromagnetics. Applications to specific computations.

MATH 8450. Topics in Numerical Analysis. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year)

Selected topics.

MATH 8470. Topics in Mathematical Theory of Continuum Mechanics. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically)

Offered for one year or one semester as circumstances warrant.

MATH 8501. Differential Equations and Dynamical Systems I. (3.0 cr.; A-F or Audit; prereq 4xxx ODE or #; fall, every year)

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.

MATH 8502. Differential Equations and Dynamical Systems II. (3.0 cr.; A-F or Audit; prereq 8501 or #; spring, every year)

Stable, unstable, and center manifolds. Normal hyperbolicity. Nonautonomous dynamics and


MATH 8505. Applied Dynamical Systems and Bifurcation Theory I. (3.0 cr.; A-F or Audit; prereq 5525 or 8502 or #.) Static/Hopf bifurcations, invariant manifold theory, normal forms, averaging, Hopf bifurcation in maps, forced oscillations, coupled oscillators, chaotic dynamics, co-dimension 2 bifurcations. Emphasizes computational aspects/applications from biology, chemistry, engineering, physics.

MATH 8506. Applied Dynamical Systems and Bifurcation Theory II. (3.0 cr.; A-F or Audit; prereq 5587 or #; fall, offered periodically) 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.

MATH 8520. Topics in Dynamical Systems. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8502; fall, spring, offered periodically) Current research.

MATH 8530. Topics in Ordinary Differential Equations. (1.0-3.0 cr.; A-F or Audit; prereq 8502; fall, spring, offered periodically) Offered for one year or one semester as circumstances warrant.

MATH 8540. Topics in Mathematical Biology. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year) Offered for one year or one semester as circumstances warrant.

MATH 8571. Theory of Evolutionary Equations. (3.0 cr.; A-F or Audit; prereq 8502 or #; fall, every year) 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.

MATH 8572. Theory of Evolutionary Equations. (3.0 cr.; A-F or Audit; prereq 8571 or #; spring, offered periodically) 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.

MATH 8580. Topics in Evolutionary Equations. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8572 or #; offered for one yr or one semester as circumstances warrant; )


MATH 8582. Applications of Linear Operator Theory. (3.0 cr.; A-F or Audit; prereq 8581 or #;) Fourier theory. Self-adjoint, compact, unbounded linear operators. Spectral analysis, eigenvalue-eigenvector problem, spectral theorem, operational calculus.


MATH 8584. Theory of Partial Differential Equations. (3.0 cr.; A-F or Audit; prereq 8583 or #; spring, every year) Fundamental solutions/distributions, Sobolev spaces, regularity. Advanced elliptic theory (Schauder estimates, Garding’s inequality). Hyperbolic systems.

MATH 8590. Topics in Partial Differential Equations. (1.0-3.0 cr.; A-F or Audit; prereq 8602; offered for one yr or one sem as circumstances warrant; fall, spring, every year) Research topics.

MATH 8600. Topics in Advanced Applied Mathematics. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, every year) Offered for one year or one semester as circumstances warrant. Topics vary. For details, contact instructor.

MATH 8601. Real Analysis. (3.0 cr.; A-F or Audit; prereq 5616 or #; fall, every year) Set theory/foundamentals. Axiom of choice, measures, measure spaces, Borel/Lebesgue measure, integration, fundamental convergence theorems, Riesz representation.


MATH 8640. Topics in Real Analysis. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8602 or #; offered for one yr or one sem as circumstances warrant; )

MATH 8650. Fundamentals of Probability Theory and Stochastic Processes. (3.0 cr.; prereq 8651 or 8602 or #; spring, offered periodically) 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.

MATH 8655. Stochastic Calculus with Applications. (3.0 cr.; prereq 8654 or 8659 or #; fall, every year) Stochastic integration with respect to martingales, Ito’s formula, applications to business models, filtering, and stochastic control theory.

MATH 8659. Stochastic Processes. (3.0 cr.; prereq 8652 or #; fall, every year) In-depth coverage of various stochastic processes and related concepts, such as Markov processes and sequences, renewal sequences, exchangeable sequences, stationary sequences, Poisson point processes, Levy processes, interacting particle systems, diffusions, and stochastic integrals.

MATH 8660. Topics in Probability. (1.0-3.0 cr. [max 12.0 cr.]; fall, spring, every year) Offered for one year or one semester as circumstances warrant.

MATH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

MATH 8668. Combinatorial Theory. (3.0 cr.; A-F or Audit; fall, offered periodically) 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.


MATH 8672. Theory of Probability Including Measure Theory. (3.0 cr.; prereq 8651 or #; spring, every year) 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.

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. (3.0 cr.; A-F or Audit; prereq 8668 or #; spring, odd years) Further topics in enumeration, including symmetric functions, Schensted correspondence, and standard tableaux; non-enumerative combinatorics, including graph theory and coloring, matching theory, connectivity, flows in networks, codes, and extremal set theory.

MATH 8680. Topics in Combinatorics. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad math major or #; offered as one yr or one sem crse as circumstances warrant; fall, spring, every year) Selected topics.


MATH 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

MATH 8790. Topics in Mathematics. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Readings, research.

MATH 8990. Topics in Mathematics. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Individually directed study.

MATH 8991. Independent Study. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, summer, every year) Individually directed study.

MATH 8992. Directed Reading. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Individually directed study.

MATH 8993. Directed Study. (1.0-6.0 cr. [max 24.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Individually directed study.

MATH 8994. Topics at the IMA. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, every year) Current research at IMA.

Mathematics Education (MTHE) College of Education and Human Development

MTHE 5011. Arithmetic Structures in School Mathematics. (3.0 cr.; prereq Enrollment in math initial licensure program or tchg exper; fall, spring, every year) 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.

MTHE 5021. Algebraic Structures in School Mathematics. (3.0 cr.; prereq Tchg exper or insr consent; fall, every year) 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.

MTHE 5031. Geometric Structures in School Mathematics. (3.0 cr.; prereq Enrollment in math initial licensure program; spring, every year) Pedagogy, content, and instructional strategies for teaching 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.

MTHE 5100. Topics in Mathematics Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq Ed or grad student; fall, spring, summer, every year) Issues, materials, and instructional techniques focusing on a single current topic of particular relevance to secondary school and college mathematics teachers.

MTHE 5101. Teaching Elementary School Mathematics. (3.0 cr.; prereq Tchg license or student elem ed MEd or special ed or #; spring, summer, every year) Modern trends, methods, and materials used to convey mathematical ideas.

MTHE 5155. Rational Number Concepts and Proportionality. (3.0 cr.; prereq Educ student or #; fall, every year) The relationship between the development of rational number concepts and proportional reasoning skills. Examination of how newer school curricula treat these concepts. Application of materials in the classroom and analysis of results. Reading and responding to current research.


MTHE 5170. Historical Topics in the Mathematics Classroom. (1.0-3.0 cr.; ) Historical underpinnings of school mathematics content and methodology. Cross-cultural contributions in the development of mathematical ideas. Development of lessons, activities, and materials for school use.

MTHE 5171. Teaching Problem Solving. (3.0 cr.; spring, summer, offered periodically) Investigation of fundamental concepts and principles of problem solving, reasoning, and proof. Emphasis on activities and applications appropriate for junior and senior high classes. Pedagogical experiences to prepare teachers to teach problem solving, reasoning, and proof in classrooms.

MTHE 5172. Teaching Probability and Statistics. (3.0 cr.; fall, odd years) Investigation of fundamental concepts and principles of probability and statistics. Emphasis on activities and applications appropriate for junior and senior high school classes. Pedagogical experiences to prepare teachers to integrate quantitative literacy accurately and effectively in classrooms.

MTHE 5305. Middle School Mathematics Methods. (2.0 cr.; A-F only; prereq Elem ed licensure student; fall, every year) The unique needs of middle school students in the mathematics classroom. Mathematics content and pedagogical skills. Adolescent development/psychology. Field placement in a middle school mathematics classroom.

MTHE 5314. Teaching and Learning Mathematics. (3.0 cr.; prereq Math Ed or MEd or CI MEd or grad student or #; fall, every year) Methods, materials, and curriculum development. Principles of learning. Research of review. Preparation/evaluation of tests, units, and materials of instruction. Recent developments in mathematics curriculum and

MTHE 5355. Mathematics for Diverse Learners. (3.0 cr.; prereq Teaching license or student in elem ed or special ed or #; fall, spring, every year)
Mathematical concepts and methods for exceptional students, both low achieving and gifted. Experimental materials and methods designed for underachieving students.

MTHE 5366. Technology-Assisted Mathematics Instruction. (3.0 cr.; spring, every year)
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. (1.0-8.0 cr.; S-N only; prereq MEd/initial licensure student or #; spring, every year)
Student teaching in secondary school mathematics classes.

MTHE 5993. Directed Studies in Mathematics Education. (2.0 cr.; S-N or Audit; prereq Math ed MEd student, #; fall, spring, summer, every year)
Secondary school classroom teaching project to improve specific teaching skills, planned by student, approved/directed by student's adviser.

MTHE 5856. School Mathematics Curricula - 1850 to Present. (1.0-3.0 cr.; A-F only; fall, every year)
Historical antecedents of present day school mathematics curricula. Examine primary source materials by reviewing early mathematics texts from curriculum library.

MTHE 5871. Research in Mathematics Education. (3.0 cr.; prereq 5313, 8501; )
Designed for advanced graduate students in mathematics education. Presentation and discussion of Ph.D. thesis proposals and other contemporary research.

MTHE 5891. Seminar: Mathematics Education. (1.0-3.0 cr.; prereq Math educ PhD student; fall, even years)
Problems of mathematics instruction from kindergarten through junior college; opportunity to develop proposals and design models for empirical research.

MTHE 5995. Problems: Mathematics Education. (1.0-6.0 cr. [max 12.0 cr.]; prereq MA or PhD educ major with math educ concentration; fall, spring, summer, every year)
Students survey most recent literature and design and prepare research reports on special topics.

Mechanical Engineering (ME)
College of Science and Engineering

ME 5070. Topics in Mechanical Engineering. (1.0-4.0 cr. [max 8.0 cr.]; prereq CSE upper div or grad student; fall, spring, every year)
Specialized topics within areas of mechanical engineering. Emphasis on topics of current interest. Topics vary each semester.

ME 5101. Vapor Cycle Systems. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; summer, offered periodically)
Vapor compression and absorption refrigeration systems; heat pumps; vapor power cycle analysis, regeneration, heat, compound cycle modifications, combines gas turbine--vapor cycle systems.

ME 5103. Thermal Environmental Engineering. (4.0 cr.; A-F or Audit; prereq 3331 or 3332, 3333, CSE upper div or grad; fall, every year)
Thermodynamic properties of moist air; psychrometric charts; HVAC systems; solar energy; human thermal comfort; indoor air quality; heating and cooling loads in buildings.

ME 5105. HVAC System Design. (4.0 cr.; A-F or Audit; prereq 5103, [CSE upper div or grad student]; spring, offered periodically)
Design procedures used for heat exchangers, cooling towers, hydronic systems, and air handling systems. HVAC system design for a commercial building.

ME 5113. Aerosol/Particle Engineering. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; fall, every year)
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.

ME 5116. Cleanroom Technology and Particle Monitoring. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student; summer, offered periodically)
Fundamentals of cleanroom technology for microelectronics manufacturing; airborne and liquid-borne particulate contaminants; particle monitors: optical and condensation particle counters, wafer surface scanner, microscopy; filter performance and testing; cleanroom design and operation; high purity systems; particle detection in processing equipment.

ME 5133. Aerosol Measurement Laboratory. (4.0 cr.; A-F or Audit; prereq CSE upper div or graduate student; spring, offered periodically)

ME 5221. Computer-Assisted Product Realization. (4.0 cr.; A-F or Audit; prereq 3221, AEM 3031, CSci 1113, MatS 2001; fall, spring, every year)
Injection molding with emphasis on design of manufacturing processes. Tooling design and specification of processing conditions using computer-based tools; process simulation software and computer-controlled machine tools. Simultaneous process and part design. Production of tooling and parts. Part evaluation.

ME 5223. Materials in Design. (4.0 cr.; prereq 3221, ME upper division or grad student; fall, every year)
Fundamental properties of engineering materials. Fabrication, treatment. Physical/corrosive properties. Failure mechanism, cost/value analysis as related to material selection/specification.

ME 5228. Introduction to Finite Element Modeling, Analysis, and Design. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad, 3221, AEM 3031, CSci 1113, MatS 2001; fall, every year)
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.

ME 5241. Computer-Aided Engineering. (4.0 cr.; A-F or Audit; prereq 3222, CSci 1113 or equiv, CSE upper div or grad; fall, spring, every year)
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.

ME 5243. Advanced Mechanism Design. (4.0 cr.; A-F or Audit; prereq CSE upper div or grad, 3222 or equiv, basic kinematics and dynamics of machines; knowledge of CAD packages such as Pro-E recommended; summer, offered periodically)
Analytical methods of kinematic, dynamic, and kinetooladynamic analysis and synthesis of mechanisms. Computerized design for function, path, and motion generation based on Burmester theory.

ME 5247. Stress Analysis, Sensing, and Transducers. (4.0 cr.; A-F or Audit; prereq AEM 3031, MatS 2001; spring, every year)

ME 5248. Vibration Engineering. (4.0 cr.; prereq CSE upper div or grad, 3281; summer, offered periodically)
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.

ME 5281. Analog and Digital Control. (4.0 cr.; prereq 3201; spring, every year)
Continuous and discrete time feedback control systems. Frequency response, stability, poles and zeros; transient responses; Nyquist and Bode diagrams; root locus; lead-lag and PID compensators, Nichols-Ziegler design method.
Digital implementation aliasing; computer-aided design and analysis of control system.

**ME 5286. Robotics.** (4.0 cr.; A-F or Audit; prereq [3281 or equiv], [upper div ME or AEM or CSci or grad student]; spring, every year)
Manipulator forward/inverse kinematics, homogeneous transformations, coordinate frames, Jacobian/velocity control, task primitives/programming, computational issues. Determining path trajectories. Reaction forces, manipulator dynamics/control. Vehicle kinematics, dynamics, and guidance. Lab project demonstrates concepts.

**ME 5312. Solar Thermal Technologies.** (4.0 cr.; A-F or Audit; prereq [3333, CSE upper div] or grad student; spring, even years)

**ME 5341. Case Studies in Thermal Engineering and Design.** (4.0 cr.; A-F or Audit; prereq 3333, CSE upper div or grad student; fall, spring, every year)

**ME 5344. Thermodynamics of Fluid Flow With Applications.** (4.0 cr.; A-F or Audit; prereq 3333, CSE upper div or grad student; fall, spring, every year)

**ME 5351. Computational Heat Transfer.** (4.0 cr.; A-F or Audit; prereq 3333, CSE upper div or grad student; fall, spring, every year)
Numerical solution of heat conduction/analogueous physical processes. Develop/use computer program to solve complex problems involving steady/unsteady heat conduction, flow/heat transfer in ducts, flow in porous media.

**ME 5446. Introduction to Combustion.** (4.0 cr.; A-F or Audit; prereq 3331, 3332, 3333, CSE upper div or grad student; fall, every year)

**ME 5461. Internal Combustion Engines.** (4.0 cr.; A-F or Audit; prereq CSE upper div or grad student, C or better in [3332, 3333] or 3324; spring, every year)
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.

**ME 5462. Gas Turbines.** (4.0 cr.; A-F or Audit; prereq 3331, 3332, 3333, CSE upper div or grad student; fall, spring, offered periodically)
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. Turbjet, fanjet, turboprop engine performance. Stationary power plants, vehicular propulsion, hybrid vehicles.

**ME 5465. Energy-Resources, Technology and Society.** (4.0 cr.; A-F or Audit; prereq 3333, [CSE upper division or grad]; fall, spring, )
Scientific/technological underpinnings described/analyzed for 21st Century. Energy systems analysis, energy conversion technologies, availability analysis, renewable/non-renewable resources, environmental impacts, societal impacts of energy use patterns/energy policies.

**ME 5566. Modern Thermodynamics.** (4.0 cr.; A-F only; prereq 3331 or equiv; fall, spring, every year)
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.

**ME 8001. Research Ethics and Professional Practice.** (0.0 cr.; No Grade Associated; fall, spring, summer, every year)
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.** (3.0 cr.; A-F or Audit; prereq CSE grad student or #; spring, offered periodically)
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.

**ME 8221. New Product Design and Business Development I.** (4.0 cr.; A-F or Audit; =ETRN 6041, BMEN 8401, ETRN 6087; prereq CSE grad student, some design experience; fall, every year)
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.

**ME 8222. New Product Design and Business Development II.** (4.0 cr.; A-F or Audit; =BMEN 8402; prereq 8221; spring, every year)
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.

**ME 8228. Finite Elements in Multidisciplinary Flow/Thermal/Stress and Manufacturing Applications.** (4.0 cr.; A-F or Audit; prereq 5228 or equiv, 5341, AEM 3031, CSci 1113; fall, spring, offered periodically)

**ME 8229. Finite Element Methods for Computational Mechanics: Transient/ Dynamic Problems.** (4.0 cr.; A-F or Audit; prereq 5228 or equiv, 5341, AEM 3031, CSci 1113; spring, every year)
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.

**ME 8243. Topics in Design.** (4.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, every year)
Topics vary with each offering.

**ME 8253. Computational Nanomechanics.** (3.0 cr.; prereq CSE grad student; spring, every year)
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.

**ME 8254. Fundamentals of Microelectromechanical Systems (MEMS).** (4.0 cr.; A-F only; spring, every year)
Major classes, components, and applications of MEMS. Principles behind operation of MEMS devices/systems. Standard microfabrication techniques. Unique requirements, environments, and applications of MEMS. Students apply microfabrication techniques/applications to design/ manufacture of a MEMS device or microsystem.
ME 8262. Topics in Modeling and Analysis of Manufacturing Processes. (4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 3221, AEM 3016; fall, spring, offered periodically)

ME 8268. Properties and Fabrication of Plastics and Composites. (4.0 cr.; A-F or Audit; prereq 3221, AEM 3031, MatS 2001; spring, every year)

ME 8281. Advanced Control System Design. (4.0 cr.; A-F or Audit; prereq 5281; fall, every year)

ME 8282. Control of Nonlinear Systems. (4.0 cr.; A-F or Audit; prereq 5281; )

ME 8285. Vehicle Dynamics and Control. (3.0 cr.; A-F or Audit; prereq 5281 or EE 5231 or equiv; fall, every year)
Vehicle control systems, dynamic models used in their development. Cruise control, adaptive cruise control, ABS; automated lane keeping, automated highway systems, yaw stability control, active rollover prevention, engine control, active/semi-active suspensions.

ME 8287. Topics in Dynamics and Control. (2.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5281; fall, every year)
Topics vary with each offering.

ME 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ME 8337. Experimental Methods in the Thermal Sciences. (3.0 cr.; A-F or Audit; )
Planning experiments. Uncertainty, qualification, visualization, analogies. Temperature, pressure, heat flux, and flow measurements. Signal processing and analysis. Introduction to optical diagnostics.

ME 8341. Conduction. (3.0 cr.; A-F or Audit; prereq Undergrad class in heat transfer or #; fall, every year)

ME 8342. Convection. (3.0 cr.; A-F or Audit; prereq Grad level course on fundamentals of fluid mechanics that has a substantial component on viscous flows or #; spring, every year)

ME 8343. Radiation. (3.0 cr.; A-F or Audit; prereq Undergrad class in heat transfer or #; spring, every year)

ME 8345. Computational Heat Transfer and Fluid Flow. (3.0 cr.; prereq CSE grad student; fall, spring, every year)

ME 8350. Heat Transfer Physics. (3.0 cr.; A-F only; prereq CSE grad student; spring, even years)

ME 8361. Molecular Gas Dynamics. (3.0 cr.; A-F or Audit; [AEM 8231]; prereq CSE grad student; fall, offered periodically)

ME 8362. Introduction to Plasma Technology. (3.0 cr.; A-F or Audit; prereq 8361; spring, offered periodically)

ME 8381. Bioheat and Mass Transfer. (3.0 cr.; prereq CSE grad student, upper-division transport/fluid courses; [physics, biology] recommended; summer, offered periodically)
Analytical/numerical tools to analyze heat/mass transfer phenomenon in cryobiological, hyperthermic, other biomedically relevant applications.

ME 8390. Advanced Topics in the Thermal Sciences. (1.0-2.0 cr. [max 12.0 cr.]; A-F or Audit, spring, every year)
Topics vary according to instructor.

ME 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

ME 8446. Advanced Combustion. (3.0 cr.; A-F or Audit; prereq Undergrad courses in thermodynamics, fluid mechanics, heat transfer, IT grad student; 5446 or 8641 highly recommended; )
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.

ME 8462. Turbomachinery. (3.0 cr.; A-F or Audit; prereq CSE grad student, 3321, 3322 or equiv or #; summer, offered periodically)
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.

ME 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; % 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; fall, spring, summer, every year)
TBD

ME 8772. Advanced Transportation Technologies Seminar. (1.0 cr.; S-N or Audit; [CE 8213]; fall, every year)
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. (1.0 cr.; S-N or Audit; prereq CSE grad student; fall, spring, every year)
Recent developments.

ME 8774. Graduate Seminar. (1.0 cr.; S-N or Audit; prereq 8773; fall, spring, every year)
Recent developments.

ME 8775. Technical Communication. (1.0 cr.; S-N or Audit; fall, offered periodically)
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. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total)
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.

MDI 5013. Medical Device Center Practicum I. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year) First of three part series of practicum courses for MDI program. Focus on teaching innovation and ethical foundations, technology forecasting and development, communication with functional managers, and corporate executive/leaders.

MDI 5014. Medical Device Center Practicum II. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year) Second of three part series of practicum courses for MDI program. Clinical environment, including research tools/methods, filtering/analyzing translating need, idea/prototyping development, communication with functional managers, and corporate executives/leaders.

MDI 5050. Innovation Leadership and Human Dynamics. (2.0 cr.; A-F only; prereq Grad MDI student; fall, spring, summer, every year) Develop confidence/capability to transition from technical experts to leaders of multidisciplinary innovation teams/projects. Explore mindset, skill set/tool set needed to lead/manage oneself/project teams, lead change initiatives. Conflict management, effective communication, leveraging diverse strengths.

Medical Device Innovation (MDI)
College of Science and Engineering

MDI 5002. Technology Foresight and Forecasting. (2.0 cr.; A-F only; prereq grad MDI major; fall, spring, summer, every year) Tools/techniques for technology forecasting, assessment, foresight for decision making in medical device industry. Topics include technology dynamics, research/development, portfolio management, resource allocation.

MDI 5004. Clinical Foundations of Medical Device Innovation. (3.0 cr.; A-F only; prereq MDI grad student; fall, spring, summer, every year) 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.


MDI 5012. Medical Industry Macro Environment. (3.0 cr.; A-F only; prereq MDI grad student; fall, spring, summer, every year)
mycobacteria, yeast from various body sites. Specimen processing, culture workup, conventional microscopy, molecular/immunological techniques.

MLSP 5113. Advanced Concepts in Diagnostic Microbiology. (3.0 cr.; A-F only; prereq 5111 or #; spring, every year) Physiology/pathogenic interactions between man/microorganism. Epidemiology, prevention, recovery, conventional, immunological, molecular identification methods/treatment of microorganisms involved in human diseases.

MLSP 5211. Fundamentals in Hematology & Hemostasis. (3.0 cr.; A-F only; prereq PHSL 3051 or #; fall, every year) Anatomy/physiology of hematopoietic/coagulation systems. Basic blood cell morphology, common hematology/hemostasis tests. Clinical implications for health/disease.

MLSP 5212. Application of Hematology & Hemostasis Principles. (1.0 cr.; A-F only; prereq 5211 and admission to MLS program; fall, every year) Theory, performance, application of common hematology/hemostatic diagnostic procedures. Interpretation/correlation of laboratory findings. Venipuncture, cell counting, white blood cell differential, red/white blood cell morphology interpretation, coagulation studies.

MLSP 5213. Diagnostic Hematology. (3.0 cr.; A-F only; prereq [5211, 5212] or #; spring, every year) Blood/bone marrow in assessment of hematologic function/disease. Major focus on normal development/differentiation, abnormal changes found in disease. Cytochemical stains, flow cytometry, cytochemistry, molecular diagnostics.

MLSP 5214. Advanced Hematology Morphology. (1.0 cr.; A-F only; prereq [5211, 5212, &5213] or #; spring, every year) Blood/bone marrow in assessment of hematologic function/presence of disease. Major focus on normal development/differentiation, abnormal changes in pathologic conditions. Cytochemical stains, flow cytometry, cytochemistry, molecular diagnostics.

MLSP 5311. Fundamental Biomedical Laboratory Techniques. (4.0 cr.; A-F only; prereq 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry; spring, summer, every year) 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.

MLSP 5312. Body Fluid Analysis. (2.0 cr.; A-F only; prereq 8 credits General Chemistry, 6 credits Organic Chemistry, 3 credits Biochemistry, Successful completion of 5311 with grade of C or higher; fall, every year) Formulas/assists in body fluids, changes that occur in disease, testing used for diagnosis/treatment. Correlation of test results with clinical information discussed. Laboratory skills in body fluid analysis introduced.


MLSP 5511. Principles of Immunobiology. (3.0 cr.; A-F only; prereq PHSL 3051 or #; fall, every year) Immune system function, immunologic/serologic testing. Immunologic techniques utilized in various clinical laboratory settings.


MLSP 5701. Clinical Experience in Microbiology. (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience, apply technical competencies learned on campus to microbiology laboratory. Develop entry-level competencies in making transition to clinical practitioner. Guided by clinical preceptors/university faculty.

MLSP 5702. Clinical Experience in Hematology and Hemostasis. (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Hematology laboratory. Designed to develop entry-level competencies/assist students in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

MLSP 5703. Clinical Experience in Clinical Chemistry and Urinalysis. (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Chemistry laboratory. Designed to develop entry-level competencies/assist student in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

MLSP 5704. Clinical Experience in Transfusion Medicine. (2.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) Gain practical experience/apply technical competencies learned on campus to Transfusion Medicine lab. Designed to develop entry-level competencies/assist in making transition to clinical practitioner. Course guided by clinical preceptors/university faculty.

MLSP 5801. Advanced Practicum Experience in Specialty Disciplines. (1.0 cr.; S-N only; prereq Advanced standing in MLS program; fall, spring, summer, every year) 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 5821. Medical Physics (MPHY) Medical School

MPHY 5138. Research Seminar. (1.0-5.0 cr.; S-N or Audit; fall, every year) Topics introduce techniques/goals of biophysical sciences and medical physics. Lectures/demonstrations.

MPHY 5139. Seminar and Journal Club. (1.0 cr. [max 2.0 cr.]; S-N or Audit; spring, every year) Current research/topics related to goals/methods of biophysical sciences and medical physics. Lectures/discussions.

MPHY 5170. Basic Radiological Physics. (3.0 cr.; = [TRAD 7170]; prereq #; fall, every year) Theoretical/experimental aspects of radiological physics. Physical properties of various ionizing radiations, interactions of ionizing radiations with matter, methods of radiation dose measurement.

MPHY 5171. Medical and Health Physics of Imaging I. (3.0 cr.; = [TRAD 7171]; prereq 5170 or #; fall, every year) 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.

MPHY 5172. Radiation Biology. (3.0 cr.; = [TRAD 7172]; prereq 5170 or #; fall, spring, every year) Effects of ionizing radiation on cells, tissues, and organisms. Biochemical/physiological bases of radiation effects. Biological rationale for radiation therapy practices.

MPHY 5173. Medical and Health Physics of Radiation Therapy. (3.0 cr.; = [TRAD 7173]; prereq 5170 or #; spring, every year) 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.

**MPHY 5174. Medical and Health Physics of Imaging II.** (3.0 cr.; =TRAD 7174; prereq 5170 or #; spring, every year)

**MPHY 5177. Radiation Therapy Physics Lab: Radiation Physics Basics.** (3.0 cr.; A-F only; prereq 5170 or 5173 or #; spring, every year)
This course provides students hands-on experience with Hardware/software used in radiation therapy clinic for physics measurements.

**MPHY 8147. Advanced Physics of Magnetic Resonance Imaging (MRI).** (3.0 cr.; prereq 5174 or #; spring, every year)
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.

**MPHY 8148. Advanced Digital Imaging Science.** (3.0 cr.; prereq 5171 or #; fall, spring, every year)

**MPHY 8149. Advanced Topics in Radiation Therapy Physics.** (2.0 cr.; A-F only; prereq [5170, 5173] or #; fall, every year)

**MPHY 8293. Directed Study in Biophysical Sciences and Medical Physics.** (1.0-12.0 cr.; #; fall, spring, summer, every year)
Individualized study under faculty direction.

**MPHY 8294. Directed Research in Biophysical Sciences and Medical Physics.** (1.0-12.0 cr.; #; fall, spring, summer, every year)
Individualized research under faculty direction.

**MPHY 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MPHY 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MPHY 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.;] No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (No description)

**MPHY 8777. Thesis Credits: Master's.** (1.0-18.0 cr.; [max 50.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**MPHY 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr.; [max 100.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

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**Medicinal Chemistry (MEDC)**

**College of Pharmacy**

**MEDC 5185. Principles of Biomolecular Simulation.** (3.0 cr.; prereq Chem 3502 or #; ) Molecular simulation for students in medicinal chemistry, pharmaceutics, biochemistry, and chemical physics

**MEDC 5202. Research and Development Process of Pharmaceutical Products.** (2.0 cr.; S-N or Audit, ) New drug development process in the U.S. pharmaceutical industry

**MEDC 5245. Introduction to Drug Design.** (3.0 cr.; A-F or Audit; =CHEM 5245, PHAR 6245; prereq Chem; fall, every year)
Concepts that govern design/discovery of drugs. Physical, bioorganic, medicinal chemical principles applied to explain rational design, mechanism of action drugs.

**MEDC 5494. Advanced Methods in Quantitative Drug Analysis.** (2.0 cr.; A-F or Audit; fall, spring, offered periodically) 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.** (1.0 cr.; S-N or Audit, fall, every year)
Selected topics of contemporary interest in medicinal chemistry

**MEDC 5700. General Principles of Medicinal Chemistry.** (2.0 cr.; A-F or Audit; prereq MedC grad student or #; fall, spring, every year)
Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

**MEDC 5710. General Principles of Medicinal Chemistry.** (2.0 cr.; A-F or Audit; prereq MedC grad student or #; ) Fundamental principles of enzyme inhibitors, combinatorial chemistry and library design, drug receptor interactions and signal transduction mechanisms, and molecular modeling.

**MEDC 8001. General Principles of Medicinal Chemistry.** (3.0 cr.; A-F or Audit; prereq Med chem grad student or #; fall, every year)
Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

**MEDC 8002. General Principles of Medicinal Chemistry.** (3.0 cr.; A-F or Audit; prereq Med chem grad student or #; spring, every year)
Fundamental principles of molecular recognition, physicochemical properties of drugs, drug metabolism and disposition, interaction of molecules with DNA/RNA.

**MEDC 8050. Physical and Mechanistic Organic Chemistry.** (2.0 cr.; S-N only; prereq First-year Medicinal Chemistry grad students; fall, every year)
Recitation-based organic chemistry reaction mechanisms course. Actively solve organic chemistry reaction mechanisms/related organic/medicinal chemistry problems during course meeting times with faculty guidance.

**MEDC 8100. Medicinal Chemistry Seminar.** (1.0 cr. [max 6.0 cr.;] prereq Grad major or #; fall, spring, every year)
Current topics.

**MEDC 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MEDC 8420. Natural Products Chemistry.** (3.0 cr.; A-F only; prereq [CHEM 8321, biochemistry] or equiv or course director approval; spring, even years)
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.

**MEDC 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**MEDC 8471. High Throughput Drug Discovery.** (3.0 cr.; A-F only; prereq Undergraduate [chemistry or biochemistry] or #; spring, odd years)
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.

**MEDC 8500. Design of Chemotherapeutic Agents.** (2.0 cr.; A-F or Audit; prereq 5600 or #; fall, offered periodically)
Modern aspects of designing chemotherapeutic agents. Strategies for enzyme inhibition and metabolic blocks in development of anticancer, antimicrobial, and antiviral agents.

MEDC 8600. Chemical Aspects of Drug Metabolism and Bioactivation. (2.0 cr.; A-F or Audit; prereq 5600 or #) Chemical and enzymatic mechanisms of biotransformation and bioactivation of drugs and other xenobiotics. Reactivity and fate of bioactivated metabolites.

MEDC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

MEDC 8700. Advanced Concepts in Drug Design. (2.0 cr.; A-F or Audit; = [CHEM 8700, PHAR 6247H]; prereq 5600 or #; spring, offered periodically) Current approaches to rational design of drugs.

MEDC 8753. MOLECULAR TARGETS OF DRUG DISCOVERY. (3.0 cr.; A-F only; prereq 5710 or 8002 or CHEM 5412 or structural biochemistry or #; fall, even years) 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.

MEDC 8760. Design of Peptidomimetics. (2.0 cr.; A-F or Audit; prereq 5600 or #; ) Current approaches to design and synthesis of mimetics of biologically active peptides. Structural and conformational rationale used in peptidomimetic design.

MEDC 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

MEDC 8800. Medicinal Chemistry Laboratory Techniques. (1.0-2.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad med chem major or #; fall, spring, every year) Experiential rotations in medicinal chemistry research laboratories.

MEDC 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

MEDC 8900. Research in Medicinal Chemistry. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Grad med chem major or #; fall, spring, every year) Study and experimental investigation.

MEDIE 5610. Advanced Topics in Medieval Studies. (3.0-4.0 cr. [max 15.0 cr.]; prereq One yr work in some area of Middle Ages; reading knowledge of appropriate language; #; fall, spring, every year) From late antiquity through end of Middle Ages (circa 300-1500 A.D.). Topics specified in Class Schedule.

MEDIE 5993. Directed Studies in Medieval Studies. (1.0-3.0 cr. [max 6.0 cr.]; prereq One yr work in some area of Middle Ages; reading knowledge of appropriate language; #; fall, spring, every year) Directed study with one of the core faculty of medieval studies program.

MEST 8010. Medieval Studies Colloquium. (3.0 cr. [max 9.0 cr.;] fall, spring, every year) Lectures by and discussions with faculty and visiting speakers.

MEST 8110. Seminar in Medieval Studies. (3.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Appropriate languages; #; fall, spring, every year) Offered when feasible.

MICE 5355. Advanced Fermentation and Biocatalysis Laboratory. (1.0 cr.; S-N only; prereq [3301 or BIOL 3301], [grad student in microbial engineering or upper-div major in [microbiology or chem engineering or biochemistry]]; #; spring, every year) 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.

MICE 8000. Cellular and Cancer Biology. (1.0 cr.; A-F or Audit; prereq [One undergrad or grad course each in [biochemistry, cell biology]] or #; fall, every year) Fundamental concepts in cellular, molecular, and genetic basis of disease. Molecular basis of inflammation and cancer metastasis. Genetic basis for inherited disorders and gene therapy. Molecular mechanisms of pathogenesis.

MICB 5105. Topics in Microbiology, Immunology, and Cancer Biology. (1.0-4.0 cr.; A-F or Audit; prereq, 8012, [8002 or 8003 or 8004] or #; fall, spring, every year) Coloquium format. Readings/discussion on specialized topic.

MICB 5106. Protein Sequence Analysis. (3.0 cr.; prereq Biochem course, knowledge of UNIX operating system recommended; fall, even years) DNA and protein sequence and protein structure databases; protein sequence analysis; methods for display of sequence comparison and prediction results; Genomics Computer Group (SCG) sequence analysis programs; and current literature and research problems.
from structure/function/assembly of tissue components to cellular adhesion mechanisms.

MICA 8009. Biochemical Aspects of Normal and Abnormal Cell Growth and Cell Death. (2.0 cr.; prereq 8004 or BioC 3021, Biol 4004 or #; spring, every year)
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.

MICA 8010. Microbial Pathogenesis. (3.0 cr.; A-F or Audit; prereq MICA grad student or instr; fall, even years)
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.

MICA 8011. Current Topics in Immunology. (3.0 cr.; A-F or Audit; prereq MICA 8003 or #; spring, every year)
Colloquium format. In-depth reading, discussion.

MICA 8012. Writing and Reviewing a Research Proposal. (2.0 cr.; A-F only; prereq First or second year MICA grad student; fall, every year)
Assist first/second year graduate students to prepare research proposals for funding.

MICA 8013. Translational Cancer Research. (2.0 cr.; A-F only; prereq MICA 8012 or #; spring, every year)
Clinical issues in cancer research. Discuss translational research projects as they pertain to a variety of cancers.

MICA 8014. Small RNA Biology. (2.0 cr.; A-F or Audit; prereq BIOC 8002 or MICA 8004 or equiv or #; spring, every year)
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.

MICA 8094. Research in Microbiology, Immunology, and Cancer Biology. (1.0 cr.; [max 5.0 cr.]; S-N or Audit; prereq 1st yr MICA grad student; fall, spring, summer, every year)
One-on-one research training from faculty adviser during laboratory rotation.

MICA 8320. Readings in Neurobiology. (1.0-4.0 cr.; fall, every year)
Topics in neurobiology and neurophysiology.

MICA 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

MICA 8371. Mucosal Immunobiology. (3.0 cr.; A-F or Audit; [BioOBIO 8371, CMV 8371]; prereq 8001 or #; fall, odd years)
Host immune processes at body surfaces. Innate/adaptive immunity at mucosal surfaces, interactions/responses of various mucosal tissues to pathogens, current approaches being used to target protective vaccination to mucosal tissues. Lectures, journal club format.

MICA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

MICA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
TBD

MICA 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
Thesis credit: doctoral.

MICA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq MICA PhD student, adviser consent; fall, spring, summer, every year)

MICA 8910. Seminar: Faculty Research. (0.0 cr.; No Grade Associated; prereq Grad student; fall, spring, every year)
State-of-the-art information presented by scientific experts within/outside the University.

MICA 8920. Seminar: Student Research Topics. (0.0 cr.; No Grade Associated; prereq MICA grad student or #; fall, spring, every year)
Current thesis topics and other aspects of microbiology, immunology, and cancer biology.

Middle Eastern Languages and Cultures (MELC)
College of Liberal Arts

MELC 5601. Persian Fiction in Translation. (3.0 cr.; [Fall 3836, MELC 3601, ALL 5836]; fall, offered periodically)
Impact of westernization on Iran, from 1920s to present. Materials produced by Iranian writers, film makers, and intellectuals. Internal/external forces that bind contemporary Iranian society to world civilization. Works of Hedayat (especially Blind Owl), Chubak, Ali Ahmad, Daneshvar, and Behrang are analyzed/interpreted.

Minnesota Studies in International Development Prog (MSID)
Academic Affairs, Senior Vice President

MSID 5001. International Development: Critical Perspectives on Theory and Practice. (3.0 cr.; [max 6.0 cr.]; A-F only; fall, spring, every year)

Molecular Cellular Developmental Biology (MCDB)
College of Biological Sciences

MCDB 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

MCDB 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student; fall, spring, summer, every year)

MCDB 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

MCDB 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

MCDB 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Doctoral student and DGS consent; fall, spring, summer, every year)

MCDB 8900. Student Research Seminar. (1.0 cr.; [max 10.0 cr.]; S-N or Audit; prereq Grad MCDB or BMBB major %; fall, spring, every year)
Presentation/discussion of student thesis research.

MCDB 8910. Journal Presentations. (1.0 cr.; [max 2.0 cr.]; S-N or Audit; prereq Grad MCDB or BMBB major %; fall, spring, every year)
Discussion of original scientific literature.

**MCDG 8920. Special Topics.** (1.0-4.0 cr. [max 8.0 cr.]; prereq Grad MCDG or BMBB major or %; fall, every year)

Special Topics Course in the Molecular, Cellular, Developmental Biology and Genetics Program, including Iasca Research.

**MCDG 8950. Teaching Practicum.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Grad MCDG major or %; fall, spring, every year)

Supervised experience in classroom, laboratory, and/or recitation instruction; development of skills in effective use of instructional techniques, materials, tests, and measurements.

**MCDG 8993. Directed Studies.** (1.0-5.0 cr. [max 15.0 cr.]; prereq MCDG grad student or %; fall, spring, every year)

Directed Studies.

**MCDG 8994. Research.** (1.0-5.0 cr. [max 10.0 cr.]; S-N or Audit; prereq MCDG grad student or %; fall, spring, every year)

Independent research determined by student's interests, in consultation with faculty mentor.

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**Moving Image Studies (MIMS)**

College of Liberal Arts

**MIMS 5002. Advanced Film Analysis.** (0.0-4.0 cr.; A-F only; prereq Grad student status; spring, every year)

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.

**MIMS 5910. Topics in Moving Image Studies.** (2.0-4.0 cr. [max 8.0 cr.]; A-F only; fall, spring, every year)

Special topics in moving image studies.

**MIMS 8001. Theories of the Moving Image.** (3.0 cr.; A-F only; fall, every year)

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.** (3.0 cr.; A-F only; spring, every year)

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.

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**Music (MUS)**

College of Liberal Arts

**MUS 5101. Piano Pedagogy I.** (2.0 cr.; prereq 8 cr in MusA 1301 or MusA 1401 or %; )

Demonstration and discussion of teaching techniques, methods, and materials for group and individual instruction at the elementary, early intermediate, and late intermediate levels.

**MUS 5102. Piano Pedagogy II.** (2.0 cr.; prereq 8 cr in MusA 1301 or MusA 1401 or %;)

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.** (2.0 cr. [max 8.0 cr.]; A-F only; fall, spring, every year)

Alexander technique with specific applications to music performance. Emphasis on body/mind awareness to promote technical ease and freedom.

**MUS 5151. Organ Literature I.** (3.0 cr.; A-F or Audit; prereq 3502, 3603, sr or grad or %;)

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.

**MUS 5152. Organ Literature II.** (3.0 cr.; A-F or Audit; prereq 3502, 3603, sr or grad or %;)

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.

**MUS 5160. Instrumental Accompanying Skills and Repertoire.** (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq Accomp major; fall, offered periodically)

Performance class in accompanying skills particular to orchestral reductions and non-sonata instrumental accompanying. Repertoire to include, but not be limited to, classical and romantic string concerti, and "encore" pieces.

**MUS 5181. Advanced Piano Literature I.** (2.0 cr.; A-F or Audit; prereq grad piano major or %; fall, spring, even years)

Literature for piano from late Baroque period to mid-20th century.

**MUS 5182. Advanced Piano Literature II.** (2.0 cr.; A-F or Audit; prereq grad piano major or %; spring, offered periodically)

Literature for piano from late Baroque period to mid-20th century.

**MUS 5230. Chorus.** (1.0-2.0 cr. [max 16.0 cr.]; prereq Choral and/or instrumental music background; audition; %; fall, spring, every year)

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.

**MUS 5240. University Singers.** (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Audition; %; fall, spring, every year)

Mixed chorus 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.

**MUS 5241. Vocal Literature I.** (3.0 cr.; A-F or Audit; prereq [12 cr in MusA 1304, grad music student] or %; fall, offered periodically)

Vocal literature of major/minor composers from 17th century to present. Structure, style, performance practice.

**MUS 5242. Vocal Literature II.** (3.0 cr.; A-F or Audit; prereq 12 cr in MusA 1104 or MusA 1304, grad music major or %; spring, offered periodically)

Vocal literature of major and minor composers from 17th century to present; structure, style, and performance practice.

**MUS 5250. Opera Workshop and Ensemble.** (2.0 cr. [max 16.0 cr.]; A-F or Audit; prereq audition; %; fall, spring, every year)

Preparation and performance of operatic arias, choruses, and scenes. Participation in fully staged or workshop productions of music theatre repertoire.

**MUS 5271. Diction for Singers I.** (2.0 cr.; A-F or Audit; prereq 12 cr MusA 1304 or grad music major or %; fall, every year)

Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

**MUS 5272. Diction for Singers II.** (2.0 cr.; A-F or Audit; prereq 12 cr MusA 1304 or grad music major or %; spring, offered periodically)

Principles and techniques of singing in English, Italian, Spanish, German, and French. International Phonetic Association alphabet used.

**MUS 5275. Vocal Pedagogy I.** (3.0 cr.; prereq Sr vocal major or %; spring, every year)
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.

MUS 5276. Vocal Pedagogy II. (3.0 cr.; A-F or Audit; prereq Sr vocal major or #; spring, offered periodically) History of solo vocal performance; selection and preparation of beginning level solo vocal repertoire; development of vocal performance skills (interpretation, expression, artistry), recital programming, and vocal career counseling.

MUS 5280. Opera Theatre. (2.0 cr. [max 16.0 cr.]; A-F or Audit; prereq audition; #; fall, spring, every year) Preparation and performance of fully-staged operatic production. Major involvement in singing, acting, and technical aspects of opera.

MUS 5331. Jazz Improvisation I. (2.0 cr.; A-F or Audit; prereq Music major or #; summer, offered periodically) 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.

MUS 5333. Post-tonal Theory and Analysis II. (3.0 cr.; A-F only; prereq [4504 with a C- or better] or equiv diagnostic test; spring, odd years) Art music composed since 1945. Develop skills in analyzing and interpreting this literature.

MUS 5336. Jazz Arranging. (3.0 cr.; A-F or Audit; prereq 3502 or #; fall, spring, every year) Beginning techniques of arranging for jazz combo and jazz ensemble; vocal and instrumental.

MUS 5340. Jazz Ensemble. (1.0 cr. [max 6.0 cr.]; A-F or Audit; prereq audition; #; fall, spring, every year) A 20-member performing organization covering significant jazz compositions and arrangements written specifically for this medium.

MUS 5380. Gospel Choir. (1.0 cr. [max 4.0 cr.]; A-F only; fall, offered periodically) Performance ensemble. Students explore history of gospel music through experiential/ participatory songs. Field songs, songs of struggle, Southern, traditional, and contemporary songs.

MUS 5400. University and Campus Bands. (1.0 cr. [max 10.0 cr.]; fall, spring, every year) Lab course.

MUS 5410. University Wind Bands. (1.0 cr. [max 14.0 cr.]; A-F or Audit; prereq audition; #; fall, spring, every year) Wind ensemble and symphony bands perform standard and contemporary literature; concerts and tour appearances. Players from all colleges may participate.

MUS 5420. Orchestra. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq audition; #; fall, spring, every year) Symphony orchestra performs standard repertory and major works with chorus; concerts and tour appearances. Players from all colleges may participate.

MUS 5423. Suzuki Pedagogy Practicum. (1.0 cr. [max 2.0 cr.]; A-F or Audit; fall, spring, every year) Supervised teaching of both individual and group lessons. Instructor provides periodic critiques from observation of live or videotaped lessons. Prereq [85424 or 85425], grad music student) or instr consent, grad consent.

MUS 5427. Violin Pedagogy I. (2.0 cr.; A-F or Audit; prereq Violin or viola major or #; fall, offered periodically) Private teaching of violin students at beginning, intermediate, and advanced levels. Discussion and demonstrations of pedagogical techniques.

MUS 5430. Contemporary Music Workshop. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Generation/performance of new chamber works set within context to situate musical works within dynamic field of historical, philosophical, and expressive import.

MUS 5440. Chamber Ensemble. (1.0 cr. [max 8.0 cr.]; A-F or Audit; prereq audition; #; fall, spring, every year) Performance of chamber music; duos, trios, quartets, quintets, and other ensemble combinations for instruments and/or voices.

MUS 5450. Orchestral Repertoire. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Investigation of practical and performance problems in standard orchestral repertoire with regard to style and interpretation.

MUS 5460. World Music Ensemble. (1.0-2.0 cr. [max 16.0 cr.]; fall, spring, every year) Afro-Brazilian/Afro-Caribbean popular repertories. Samba, bossa nova, salsa, merengue, mambo. Planned master classes/clinics with local artists to complement regularly scheduled rehearsals/performances. No audition required.

MUS 5464. Cello Pedagogy. (2.0 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. For practical application in conjunction with string technique course.

MUS 5470. University Brass Choir. (1.0 cr. [max 8.0 cr.]; prereq audition; #; fall, spring, every year) 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.

MUS 5481. Trumpet Pedagogy. (2.0 cr.; prereq Sr or grad in music or #; fall, spring, odd years) Principles of trumpet pedagogy. Discussion of literature, history, and current teaching aids.

MUS 5485. Transcription for Winds. (2.0 cr.; prereq 3502 or #; fall, offered periodically) Principles of music manuscript and examination of transcription examples. Transcription projects with score and parts. Smaller projects that involve arrangements and original compositions.

MUS 5490. Percussion Ensemble. (1.0 cr. [max 10.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Practice and performance of standard and contemporary compositions for percussion instruments in various combinations.

MUS 5491. Percussion Literature I. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad or #;) 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.

MUS 5492. Percussion Literature II. (2.0 cr.; A-F or Audit; prereq Jr or sr or grad or #; fall, spring, offered periodically) 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.

MUS 5533. Music Since 1945. (3.0 cr.; A-F only; prereq 4504, #; spring, offered periodically) Art music composed since 1945. Skills in analyzing and interpreting this literature.

MUS 5541. 16th-Century Counterpoint. (3.0 cr.; A-F or Audit; prereq [3501, 3508] or pass basic skills exam; fall, spring, offered periodically) 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.

MUS 5550. Class Composition. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq [4504, 4514 with C- or better] or #; fall, spring, every year)
Original works in various forms. Development of individual compositional style in a post-tonal idiom. Various forms, performing forces, techniques.

MUS 5561. Orchestration I. (3.0 cr.; A-F or Audit; prereq 3502; fall, every year)
Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

MUS 5562. Orchestration II. (3.0 cr.; A-F or Audit; prereq 5561; spring, every year)
Scoring techniques for ensembles in combination and full orchestra; year-long sequence. Score study of representative works from 18th through 20th centuries.

MUS 5571. Schenkerian Analysis for Performers. (3.0 cr.; A-F or Audit; prereq 3502; fall, summer, offered periodically)
Theory/analysis of tonal music using principles developed by Henrich Schenker. Basic concepts/notation, their application to excerpts/short pieces from 18th/19th centuries.

MUS 5573. Analysis of Late-Romantic Orchestral Literature. (3.0 cr.; A-F or Audit; prereq 3502 or Theory IV Exam or #; [4504 or equiv] recommended; spring, offered periodically)
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.

MUS 5574. Wagner's Ring: Conception, Coherence, Consequence. (3.0 cr.; A-F or Audit; prereq 3502 or equiv; spring, odd years)
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.

MUS 5591. Introduction to Music Information Technology. (3.0 cr.; A-F or Audit; prereq Music grad student or #; fall, every year)

MUS 5592. Music Informatics Seminar. (3.0 cr.; A-F or Audit; prereq 5591 or #; spring, every year)
Filtering, formant synthesis, reverberation techniques, additive synthesis. Interactive MIDI applications.

MUS 5597. Music and Text. (3.0 cr.; A-F or Audit; fall, every year)
Designed for music majors only. Introduction to analysis of music with texts. Song/operas.

MUS 5611. Resources for Music Research. (3.0 cr.; A-F or Audit; prereq 3603; fall, spring, summer, every year)
Development of skills in identifying, locating, and evaluating resources for research in music.

Computer-searching techniques, acquaintance with basic reference sources in the field, preparation of the music research paper.

MUS 5620. Topics in Opera History. (3.0 cr.; [max 6.0 cr.]; A-F or Audit; prereq Grad music major or #; fall, even years)
Study of specific operas. Development of opera in context of other artistic, social, cultural, political events, movements, changes. Periods/countries vary each semester.

MUS 5621. Baroque Music and Its Contexts. (3.0 cr.; A-F only; prereq Grad student in music or #; fall, offered periodically)
Genres, styles, and contexts of music composed in Western Europe between 1600 and 1750. Emphasizes works typically not covered in undergraduate music history classes. Individual works as representative of larger aesthetic, social, political, and theological issues.

MUS 5624. Music of J. S. Bach. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; spring, odd years)
Issues of musical style, historical context. Moves chronologically through Bach's career. Relationships between his duties and works he composed. Genesis, function, relationship of a work to genre and performing forces. Lectures, presentations, research/analysis assignments.

MUS 5647. 20th-Century European/ American Music. (3.0 cr.; prereq 3603 or equiv, 5501 or equiv, 12 undergrad cr in music history; spring, offered periodically)
Emphasizes major artistic movements, stylistic turning points, social roles of music. Interactions between high art, popular, ethnic musics; contributions of men and woman as composers and performers.

MUS 5658. History of the Symphony in the 20th Century. (3.0 cr.; A-F or Audit; prereq 3603, 5501 or #)
History of symphony (and related genres) in Europe and America, ca. 1890 to present. Changing aesthetic concerns, structural, harmonic, and timbral innovations. Sociocultural contexts; analysis and criticism.

MUS 5668. Beethoven's Symphonies. (3.0 cr.; A-F or Audit; prereq 3603, #)
Analytical overview of selected movements from Beethoven's 9 symphonies. Principles of sonata analysis (norm and deformation); introduction to wider contexts of interpretation and understanding (generic, expressive, social).

MUS 5701. Music, Disability, and Society. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, odd years)
Study of intersection of music/disability in culture from perspective of interdisciplinary disability studies. Musician's injuries, "adaptive music" accommodations, participation in music/music education as human/civil right. Universal Instructional Design pedagogy.

MUS 5732. Free Jazz: From Structure to Gesture. (3.0 cr.; A-F only; prereq Grad student in music or #; spring, even years)
Discuss musical form of free jazz comprising flow expressivity, collaborative interaction, gestural communication from theoretical/practical point of view. Major representatives such as Ornette Coleman, Cecil Taylor, Archie Shepp, The Art Ensemble of Chicago, John Coltrane. Sound material include classical recordings but also recent free jazz CDs/DVDs.

MUS 5804. Folk and Traditional Musics: Selected Cultures of the World. (3.0 cr.; A-F or Audit; prereq 1801 or 1804 or music grad or #)
A study of selected music traditions from 5 to 7 world cultures. Genres, social institutions, concepts, styles, instruments, and usages.

MUS 5950. Topics in Music. (1.0-4.0 cr. [max 15.0 cr.]; fall, spring, summer, every year)
Each offering focuses on a single topic. Topics specified in Class Schedule.

MUS 5993. Directed Studies. (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq instr consent, dept consent, college consent.

MUS 8110. Sonata Seminar. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Accompanying emphasis, strings and winds by audition, #; fall, spring, every year)
Performance in standard Baroque, Classical, and Romantic sonatas for piano and violin, cello, viola, flute, clarinet, or oboe.

MUS 8112. Instrumental Repertoire: Reduction and Realization. (2.0 cr.; A-F or Audit; prereq Grad student in accompanying/conducting; fall, spring, every year)
Reducing orchestra scores, representing orchestral reductions at piano, working with conductors. Conductors join course in mid-semester.

MUS 8131. Advanced Keyboard Skills. (2.0 cr.; A-F or Audit; prereq Grad student in music or #)
Diatonic/chromatic tonal harmony applied to keyboard. Emphasizes harmonization, transposition, and improvisation. Open score and clef reading using alto, tenor, and soprano clefs.

MUS 8133. Seminar in Basso Continuo. (3.0 cr.; A-F or Audit; prereq Grad student in Music or #)
Realization of figured basses (bass lines annotated with Arabic numerals indicating harmony) and performance of continuo parts in European concerted music from 17th/18th centuries at keyboard. Emphasizes developing stylistic accompaniment skills at harpsichord/organ.

MUS 8151. Seminar in Organ Repertoire. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; fall, offered periodically)
Repertoire for pipe organ. Readings/presentations on selected areas of repertoire of 15th through 20th centuries. Organ design/construction of various European and American schools, as well as relevant performance practices.

MUS 8170. Advanced Vocal Accompanying Skills and Repertoire. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq [French, German, Italian...
MUS 8171. Song Repertoire and Performance for Pianists and Singers: German Lieder. (2.0 cr.; A-F or Audit; prereq [Grad student with major in vocal performance or in accompanying or in piano]; #; spring, offered periodically)
Surveys standard German-language song repertoire: Mozart, Schubert, Schumann, Brahms, Strauss, Wolf.

MUS 8181. Operatic Accompaniment Skills and Repertoire. (2.0 cr.; A-F or Audit; prereq Grad student with major in accompanying or in conducting; fall, spring, every year)
Development of skills required in operatic accompanying/coaching work. Standard opera arias, cultivation of orchestral sound at the piano, stylistic traditions, working with conductors.

MUS 8182. Opera History in Context: Monteverdi and Mozart. (3.0 cr.; A-F only; prereq Grad student in music or #; fall, every year)
Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Focuses on two representative composers and some of their significant operas.

MUS 8183. Opera History in Context: Verdi and Britten. (3.0 cr.; A-F only; prereq Grad student in music or #; fall, spring, every year)
Development of opera in context of other artistic, social, cultural, and political events, movements, and changes. Focuses on two representative composers and some of their significant operas.

MUS 8237. Score Study: Choral. (3.0 cr.; A-F or Audit; prereq #; fall, every year)
Analysis of various choral scores ranging from Renaissance through 20th century. Reading of choral and choral/orchestral scores at piano, including scores with C clefs and transposing instrument.

MUS 8255. Choral Literature: Baroque Era to the Present. (3.0 cr.; A-F or Audit; prereq #; spring, every year)
Survey of sacred and secular choral works.

MUS 8299. Performance in Choral Conducting. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Preparation and performance of choral conducting recital, with supporting paper.

MUS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MUS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

MUS 8450. Graduate Seminar in Conducting. (3.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Grad student in conducting or #; fall, spring, every year)
Development of musicianship, conducting, rehearsal, and analytical skills. Repertoire, gesture, score study, interpretation, pedagogy, and performance presentation in wind band, orchestral, and choral conducting. Students meet twice weekly in group seminar, and prepare and participate in weekly conducting labs scheduled with all major University ensembles.

MUS 8479. Performance and Document: Wind Ensemble/Band Conducting. (2.0 cr.; A-F or Audit; prereq 8472, #; fall, spring, every year)
Preparing and performing full wind ensemble or band conducting program with supporting document.

MUS 8489. Performance and Document: Orchestral Conducting. (3.0 cr.; A-F or Audit; prereq #; fall, spring, every year)
Preparing and performing full orchestral conducting program with supporting document.

MUS 8501. Music Theory Pedagogy. (3.0 cr.; A-F or Audit; prereq Grad student in music or #; fall, spring, offered periodically)
Comparison of pedagogical philosophies/methods in music theory. Pedagogical literature, practice teaching, curriculum design.

MUS 8550. Composition. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Creation of original musical works in various instrumental and vocal forms; advanced development of writing and realization of musical ideas.

MUS 8556. Readings in Music Theory. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, offered periodically)
Seminars on major theoretical text or group of interrelated texts. Pre-tonal, tonal, post-tonal, or non-Western focus in individual offerings.

MUS 8570. Seminar in Composition. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq Composition emphasis or #; fall, offered periodically)
Aesthetic and professional issues in composition. Survey of professional activities, including [e]sum[e] and grant writing and concert production.

MUS 8571. Composers' Laboratory. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 8570; fall, spring, offered periodically)
Preparation 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.

MUS 8580. Topics in Tonal Analysis. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically)
Seminar. Sample topics: string quartets of Beethoven, chamber music of Brahms, significant works by tonal composers.

MUS 8581. Schenkerian Theory and Analysis I. (3.0 cr.; A-F or Audit; prereq #; )
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].

MUS 8582. Schenkerian Theory and Analysis II. (3.0 cr.; A-F or Audit; prereq 8581 or #; spring, odd years)
Application of Schenkerian theory to 18th-/19th-century music, coordinated with critical study of major music treatises from that era.

MUS 8584. Current Issues in the Analysis of 19th-Century Music. (3.0 cr.; A-F or Audit; prereq [[3502, 3512] or equiv placement exam.]; #; grad-level Schenkerian analysis recommended; spring, odd years)
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.

MUS 8590. Topics in 20th-Century Analysis. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad music major, #; fall, spring, every year)
Seminar explores literatures of 20th-century art music.

MUS 8631. Seminar: Music in Medieval Europe. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically)
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.

MUS 8632. Seminar: Music in Early Modern Europe. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically)
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.

MUS 8640. Seminar in Musicology. (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Musicology or theory emphasis or #; fall, spring, every year)
Topics vary; readings, research, strategies, and methods.

MUS 8644. Seminar: Advanced Research in Historical Musicology. (3.0 cr.; A-F or Audit; prereq Undergrad music degree; fall, offered periodically)
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.

MUS 8647. Seminar: The Critical Editing of Early Music—Method and Practice. (3.0 cr.;
MUSA 5101. Piano: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5102. Harpsichord: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)  Private instruction.

MUSA 5103. Organ: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5116. Trumpet: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5117. Trombone: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, summer, every year)  Private instruction.

MUSA 5118. Euphonium: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5119. Tuba: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5123. Guitar: Elective (graduate non-major in music). (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq %; fall, spring, every year)  Private instruction.

MUSA 5401. Piano: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5402. Harpsichord: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5403. Organ: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5404. Voice: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5405. Violin: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5406. Viola: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

MUSA 5407. Cello: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year)  Private instruction.

Music Applied (MUSA)
College of Liberal Arts

A-F or Audit; prereq Undergrad music degree; fall, offered periodically
Preparation of critical editions from primary sources of vocal and instrumental music (partbooks and tablatures). Nature of musical sources, both manuscripts and prints. Stemmatic filiation, editorial judgment and method, presentation of text.

MUS 8651. Sonata Theory. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically)  Principles of the classic sonata: norms, types, and deformations. Structural analysis, analytical methodologies, and fundamentals of sonata hermeneutics.

MUS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed Prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)  tbd

MUS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)  No description


MUS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)  No description

MUS 8994. Directed Research. (1.0-3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)  Directed research.

MUS 8999. Recital Credits: Doctoral. (4.0 cr. [max 20.0 cr.]; A-F or Audit; prereq DMA student, #; fall, spring, summer, every year)  Registration for recital credits coincides with performance of D.M.A. recital (five recitals for 20 credits).
MUSA 5409. Flute: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5411. Oboe: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5412. Clarinet: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5413. Saxophone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5414. Bassoon: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5415. French Horn: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5416. Trumpet: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5417. Trombone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5418. Baritone: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5419. Tuba: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5421. Percussion: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 5423. Guitar: Music Major Secondary (graduate). (2.0-4.0 cr. [max 24.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, every year) Private instruction.

MUSA 8301. Piano: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8302. Harpsichord: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8303. Organ: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8304. Voice: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8305. Violin: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8306. Viola: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8307. Cello: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8308. Double Bass: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8309. Flute: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8311. Oboe: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8312. Clarinet: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8313. Saxophone: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8314. Bassoon: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8315. French Horn: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8316. Trumpet: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8317. Trombone: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8318. Euphonium: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8319. Tuba: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8321. Percussion: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8322. Harp: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8323. Guitar: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

MUSA 8324. Accompanying/Coaching: Music Major (graduate). (2.0-4.0 cr. [max 48.0 cr.]; A-F or Audit; prereq Audition, %; fall, spring, summer, every year) Private instruction.

Music Education (MUED)

College of Liberal Arts

MUED 5313. Youth Music: Preferences, Influences, and Uses. (3.0 cr.; A-F or Audit) Prereq Grad student in music or music education or #; fall, even years) Youth music preferences and their determinants. How music influences youth behavior. Students/teachers' uses of commercial styles.

MUED 5350. Student Teaching in Classroom Music. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year) 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 5450. Student Teaching in Vocal Music. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year) Supervised teaching and observing of vocal music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5550. Student Teaching in Instrumental Music. (4.0-8.0 cr.; A-F or Audit; prereq Music ed major; #; fall, spring, every year)
Supervised teaching and observing of instructional music in elementary, junior high, and senior high schools. Weekly seminar emphasizing classroom management, curriculum development, and administration of music programs.

MUED 5621. African Performing Arts in Education. (3.0 cr.; A-F only; prereq Grad student in [music or other arts or education] or #:; spring, offered periodically) Representation of African performing arts in educational settings outside Africa. Performance practices, principles, techniques. Analyzing, listening, playing instruments, dancing. Performing with master artists, developing educational materials, reviewing resources, designing integrated arts projects.

MUED 5647. Teaching the Percussion Instruments. (2.0 cr.; A-F or Audit; fall, spring, offered periodically) Contemporary approaches for teaching percussion in the schools; development of curricular materials and practice in performance techniques.

MUED 5650. Student Teaching Seminar. (2.0 cr.; A-F or Audit; prereq At least C- in all required [music, music education, professional education] courses; fall, spring, every year) Reflective practice during student teaching. Developing materials for professional employment (e.g., resume, portfolio).

MUED 5664. Teaching Music with Technology. (3.0 cr.; A-F or Audit; fall, spring, offered periodically) Home page development techniques, software/materials, audio/video utilities, research applications.

MUED 5669. Psychology of Music. (3.0 cr.; A-F or Audit; prereq Psy 1001 or Psy 3604 or #:; fall, every year) 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.

MUED 5750. Topics in Music Education. (1.0-4.0 cr. [max 16.0 cr.]; A-F or Audit; prereq Grad student in [music education/therapy or education] or #:; fall, spring, summer, every year) Focuses on single topic, specified in Class Schedule.

MUED 5800. Group Music Leadership Skills. (3.0 cr.; A-F or Audit; prereq [[Completion of [MUS 1151, MUS 1152] or MUS 1155], music therapy major] or #:; spring, every year) 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.

MUED 5803. Therapeutic Music in Music Settings. (4.0 cr.; A-F only; prereq [5804, 5805] or #:; fall, every year) 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.

MUED 5804. Music Therapy Methods and Procedures I. (4.0 cr.; A-F or Audit; prereq 5800 or #:; fall, every year) 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.

MUED 5805. Music Therapy Methods and Procedures II. (4.0 cr.; A-F only; prereq 5804 or #:; spring, every year) Second course in professional sequence for music therapy. Topics include psychotherapy techniques and other music therapy approaches. Practicum in the community, in-class lab.

MUED 5806. Career Preparation. (4.0 cr.; A-F or Audit; prereq 5805 or #:; spring, every year) Ethics, grant writing, resume/CV preparation, supervision, board certification, professional responsibilities. Students design evidence-/research-based music therapy program, present their proposals to class/community.

MUED 5807. Psychiatric Music Therapy. (3.0-4.0 cr.; A-F only; prereq Grad music therapy student or #:; fall, every year) 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.

MUED 5808. Medical Music Therapy. (3.0-4.0 cr.; A-F only; prereq Grad music therapy student or #:; spring, every year) Role/scope of music therapy in medical treatment. Medical diagnoses. How to program appropriate music therapy interventions to address patient needs.

MUED 5855. Music Therapy Internship. (1.0-13.0 cr.; S-N or Audit; prereq Music Therapy major or #:; fall, spring, every year) Six-month resident internship in music therapy at an affiliated, approved hospital or clinic.

MUED 5991. Independent Study. (1.0-4.0 cr. [max 8.0 cr.]; A-F or Audit; prereq Music ed or music therapy major or grad, #:; fall, spring, summer, every year) Independent study project organized by the student in consultation with the appropriate instructor.

MUED 8119. Advanced Applications of Research Methods. (3.0 cr.; A-F only; prereq Grad music education student or #:; spring, odd years) Application of research methods/design. Emphasizes both quantitative and qualitative methods. Contemporary procedures/theories of data collection, management, analysis, and interpretation.

MUED 8210. Advanced Music Teaching Seminar. (1.0 cr. [max 3.0 cr.]; A-F only; prereq Grad student in music education or with music teaching license; fall, spring, every year) 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.

MUED 8211. Foundations of Music Education. (3.0 cr.; A-F or Audit; prereq Grad student in [music or music education] or #:; fall, summer, every year) Major historical, philosophical, sociological, and psychological foundations of music education. Primary literature in the field. Role and current state of music education.

MUED 8212. Curriculum Design in Music Education. (3.0 cr.; A-F only; prereq Grad student in music education or #:; fall, spring, every year) Examines/critically analyze curricular models from multiple perspectives, consider influence on music teaching/learning. Design/construct curricula with view towards promoting musical growth.

MUED 8280. Seminar: Current Trends in Music Education. (3.0 cr. [max 30.0 cr.]; A-F only; prereq #:; fall, spring, summer, every year) Current issues/trends in music education: philosophical, historical, psychological, and pedagogical. Course's focus varies, reflecting the dynamic nature of the field.

MUED 8284. Seminar: Research and Scholarly Issues. (3.0 cr.; A-F or Audit; prereq Doctoral student in music or music education or #:; spring, odd years) Scholarly/professional expectations of music educators and music therapists in academia.
and other positions of leadership. Writing for a variety of professional purposes/publications.

**MUED 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**MUED 8880. Master’s Research Project.** (3.0-6.0 cr. [max 12.0 cr.]; A-F only; prereq Grad music ed major; #; fall, spring, summer, every year)

Individual projects for MM in Music Education emphases (Research/Pedagogical).

**MUED 8900. Seminar: Music Education Doctoral Seminar.** (1.0 cr. [max 8.0 cr.]; A-F only; prereq %; fall, spring, every year)

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.

**MUED 8994. Directed Research.** (1.0-8.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)

tbd

### Nanoparticle Science and Engineering (NPSE)

Institute of Technology

**NPSE 8001. Introduction to Nanoparticle Science and Engineering.** (3.0 cr.; A-F or Audit.

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.** (3.0 cr.; A-F or Audit; prereq 8001; CSE grad student or #; summer, offered periodically)

Practical exposure to computational and experimental techniques in nanoparticle research. Required for Ph.D. students minoring in nanoparticle science and engineering.

**NPSE 8101. Nanoparticle Science and Engineering Seminar.** (1.0 cr.; S-N or Audit; prereq CSE grad student or; fall, spring, every year)

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 instrumention for nanoparticle research. Speakers from the University of Minnesota as well as external experts.

### Natural Resources Science and Management (NR)

**College of Food, Agricultural and Natural Resource Sciences**

**NR 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**NR 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year)

(No description)

**NR 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, every year)

tbd

### Neurology (NEUR)

Medical School

**NEUR 5121. Descriptive Neurology.** (2.0 cr.; O-N or Audit; prereq enrolled OT or PT; spring, every year)

Central and peripheral nervous system.

Correlation of neuroanatomy, neuropathology, clinical neurology, and pathology of the nervous system.

**NEUR 5230. Cerebrovascular Hemodynamics and Diseases I.** (4.0 cr.; A-F only; prereq PHSL 3051 or PS00L 3063; [MATH 1271 or MATH 1371], [MATH 1272 or MATH 1372], [PHYS 1201W or PHYS 1301W], #) or [grad student, PHSL 5061 or #]; fall, every year)

Principles of cerebrovascular disease/pathophysiology, hemodynamics, diagnostic imaging, and endovascular devices. Bench-to-bedside experiments. Clinical trials, including design constraints and biostatistics.

**NEUR 5240. Cerebrovascular Hemodynamics and Diseases II.** (4.0 cr.; A-F only; prereq 5230; #; spring, every year)


**NEUR 8201. Clinical Pediatric Neurology.** (1.0-15.0 cr.; )

### Neuroscience (NSC)

Medical School

**NSC 5031W. Perception.** (3.0 cr.; prereq Psy 3031 or Psy 3051 or #; fall, offered periodically)

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.

**NSC 5037. Psychology of Hearing.** (3.0 cr.; prereq Psy 3031 or #; fall, spring, every year)

Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech, clinical and other applications.

**NSC 5040. Brain Networks: From Connectivity to Dynamics.** (4.0 cr.; A-F or Audit; fall, odd years)

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.** (3.0 cr.; prereq [3101, 3102W] recommended; spring, every year)


**NSC 5203. Basic and Clinical Vision Science.** (3.0 cr.; prereq #; fall, odd years)

Basic and clinical vision science.

**NSC 5461. Cellular and Molecular Neurosciences.** (4.0 cr.; A-F or Audit; prereq NSc grad student or #; fall, every year)

Lectures by team of faculty, problem sets in important physiological concepts, discussion of original research papers.
NSC 5462. Neuroscience Principles of Drug Abuse. (2.0 cr.; =PHCL 5462; prereq #: spring, offered periodically)
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.

NSC 5481. Invertebrate Neurobiology. (3.0 cr.; A-F or Audit; fall, spring, every year)
Fundamental principles/concepts underlying cellular bases of behavior and "systems" neuroscience. Particular invertebrate preparations. Offered annually the last 10 weeks of spring semester.

NSC 5540. Survey of Biomedical Neuroscience. (2.0 cr.; A-F or Audit; prereq #; intended for members of biomedical community or students with advanced scientific backgrounds; summer, every year)
Current topics in biomedical neuroscience, accompanied by supporting, fundamental concepts. Intensive, one week course.

NSC 5551. Itasca Cell and Molecular Neurobiology Laboratory. (4.0 cr.; S-N or Audit; prereq Neuroscience grad or #: summer, every year)
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 immunohistochemical studies in experimental preparations.

NSC 5561. Systems Neuroscience. (4.0 cr.; A-F or Audit; prereq NSc grad student or #: fall, every year)

NSC 5661W. Behavioral Neuroscience. (3.0 cr.; A-F or Audit; prereq Grad NSc major or grad NSc minor or #: spring, every year)
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.

NSC 5667. Neurobiology of Disease. (2.0-3.0 cr.; S-N or Audit; =NSU 5667; prereq #: fall, even years)
Basic clinical/pathological features, pathogenic mechanisms. Weekly seminar course.

NSC 5668. Neurodegeneration and Repair. (2.0 cr.; prereq #: spring, every year)
Pathogenic mechanisms of neuronal death, neurodegenerative disease, neuronal repair. Weekly seminar course.

NSC 8014. Small RNA Biology. (2.0 cr.; A-F or Audit; prereq BIOC 8002 or MICA 8004 or equiv or #: spring, every year)
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.

NSC 8026. Neuro-Immune Interactions. (3.0 cr.; =PSY 8026; prereq 5561, McIB 4131; fall, offered, offered periodically)
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.

NSC 8041. Cognitive Neuroscience. (4.0 cr.; A-F only; =CGSC 8041; prereq #: fall, every year)

NSC 8207. Seminar: Psychopharmacology. (1.0-3.0 cr. [max 12.0 cr.]; =PSY 8070, PHCL 8207; prereq #: fall, spring, every year)
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.

NSC 8208. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; prereq [5212, 6112, PSY 5021, PSY 5061] or #: fall, even years)
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, dependence on drugs of abuse; stimulants, hallucinogens, depressants, opiates. Student presentations.

NSC 8211. Developmental Neurobiology. (3.0 cr.; A-F or Audit; prereq Neuroscience grad student or #: spring, every year)
How neuronal types develop. Emphasizes general mechanisms. Experimental data demonstrating mechanisms.

NSC 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1.0 cr.; S-N or Audit; =CGSC 8041; fall, spring, every year)
Advanced seminar. Course is offered fall and spring semesters.

NSC 8217. Systems and Computational Neuroscience. (2.0 cr.; S-N or Audit; prereq 5561 or #: fall, spring, every year)
Advanced seminar.

NSC 8221. Neurobiology of Pain and Analgesia. (3.0 cr.; prereq #: fall, spring, offered periodically)
Pain and analgesia. Course is triennial.

NSC 8222. Central Regulation of Autonomic Function. (3.0 cr.; A-F or Audit; prereq 5561; fall, spring, every year)
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.

NSC 8247. Anatomy and Physiology of Hearing and Balance. (3.0 cr.; =OTOL 8247; spring, every year)
Structure/function of auditory/vestibular systems. Network analysis of middle/inner ear mechanics, hair cell biophysics, auditory nerve/ CNS electrophysiology, information processing, neural mechanisms subserving balance/gaze, cellular morphology, and computer models.

NSC 8248. Directed Readings in Auditory Physiology. (1.0-2.0 cr.; =OTOL 8248; fall, spring, every year)
Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

NSC 8320. Readings in Neurobiology. (1.0-4.0 cr.; fall, spring, every year)
Topics in neurobiology and neurophysiology.

NSC 8321. Career Skills and Understanding Responsibilities as a Neuroscientist. (0.5 cr.; max [2.0 cr.]; S-N or Audit; prereq Neuroscience grad major or #: fall, spring, every year)
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.

NSC 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser approval; fall, summer, every year)
FTE: Master's

NSC 8334. Laboratory Neuroscience. (1.0-3.0 cr. [max 10.0 cr.]; S-N or Audit; prereq Grad NSC major; fall, spring, every year)
Guided research.

NSC 8411. Teaching in Neuroscience. (1.0 cr.; max [4.0 cr.]; S-N or Audit; prereq instr approval; spring, offered periodically)
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.

NSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

NSC 8481. Advanced Neuropharmacapeutics. (4.0 cr.; A-F or Audit; =PHM 8481, CMB 8481; fall, offered periodically)
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.

NSC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; max [12.0 cr.]; No Grade

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
NSCI 5010. Introduction to Neuroscience for Graduate Students. (3.0 cr.; A-F or Audit; prereq =: 6110; BioC 3021, Biol 4004; #; intended for grad students outside neuroscience program who require comprehensive intro course; spring, every year)

NSCI 5101. Neurosurgery (NSU) Medical School

NSU 5667. Neurobiology of Disease. (2.0-3.0 cr.; #; prerequisite: NSCI 5667; fall, every year)

NSU 8318. Neuroradiological Conference. (1.0 cr.; S-N or Audit; fall, spring, summer, every even year)

NSU 8320. Neurosurgical Conference. (1.0 cr.; S-N or Audit; fall, spring, summer, every year)

NSU 8324. Fundamentals of Neuroscience for Neurosurgery. (1.0-15.0 cr.; S-N only; fall, spring, summer, every year)

Nursing (NURS) School of Nursing

NURS 5010. Foundations of Interprofessional Communication and Collaboration. (1.0 cr.; S-N only; prerequisite: Nursing student, fall, every year)

NURS 5011. Interprofessional Diabetes Experience. (2.0 cr.; A-F only; prerequisite: NURS 5010)
NURS 5032. Human Response to Health and Illness: Children and Childbearing Families. (6.0 cr.; A-F or Audit; prereq Professional master of nursing [MN] student; spring, every year)
Family responses to health/illness. Emphasizes application of nursing process in children/childbearing families. Seminar/community-based project focus on family as unit of care.

NURS 5033. Population Response to Health and Mental Illness. (5.0 cr.; A-F or Audit; prereq Nursing postbaccalaureate certificate program; summer, every year)
Population-based nursing practice. Emphasizes application of nursing process in promoting mental health and public health, and in preventing illness across life span. Clinical experiences include interactions with individuals, families, communities, and systems.

NURS 5034. Nursing Care of Complex Clients and Diverse Populations. (2.0 cr.; A-F or Audit; prereq 5033; fall, offered periodically)
Critical analysis of current/emergent nursing care issues. Essential role of nursing in providing care for complex/diverse populations.

NURS 5035. Practical Nursing Care for Complex Health Conditions. (4.0 cr.; A-F or Audit; prereq Nursing postbaccalaureate certificate program or master of nursing program; fall, every year)
Clinical decision-making, comprehensive nursing care of clients with complex health problems. In collaboration with a clinical preceptor and a faculty adviser, students develop an individualized learning contract.

NURS 5040H. Seeking Solutions to Global Health Issues. (3.0 cr.; A-F only; prereq Grad student or Nursing Honors student or CLA Upper division honors student or #; fall, every year)
Global health issues from interdisciplinary perspective. Ethical/cultural sensitivity, complexities. Students propose realistic actions to resolve issues.

NURS 5113. Web-based Teaching and Learning Strategies. (2.0 cr.; S-N or Audit; spring, every year)
Skills necessary to design, produce, implement, and evaluate effective technology enhanced learning environments. Pedagogical/technological issues surrounding teaching with technology.

NURS 5115. Interprofessional Health Care Informatics. (3.0 cr.; A-F or Audit; fall, spring, every year)
Implications of informatics for practice, including nursing, public health, and health care in general. Electronic health record issues. Ethical, legislative, political, and global/future informatics issues.

NURS 5116. Consumer Health Informatics. (1.0 cr.; A-F only; prereq Grad student or #; fall, spring, every year)
Examines issues from consumer's perspective in acquisition, understanding, use or provision of health information. Online strategies for improving health. Impact on consumer-provider relationships/ethical and legal issues.

NURS 5117. Consumer Health Informatics Practicum. (1.0 cr.; S-N only; prereq [Grad student. [5116 or &5116]] or #; fall, every year)
Apply student knowledge to analysis of health needs and consumer health principles, theories, and research to a consumer health informatics project.

NURS 5210. Palliative Care for Children. (1.0 cr.; prereq #; summer, every year)

NURS 5170. Research Topics. (1.0-16.0 cr.; [PUBH 6170]; fall, spring, offered periodically)
Exploration of research topic to meet individual student needs.

NURS 5183. Scholarly Leadership. (1.0 cr.; S-N or Audit; prereq Advanced doctoral nursing student; #; spring, every year)
Implications of dissertation research on advancing science, clinical practice, and leadership in nursing and health care. Principles of scholarly collaboration.

NURS 5190. Essentials of Holistic Health Assessment. (3.0 cr.; A-F only; prereq Admission to MN Program; fall, spring, every year)
Health assessment knowledge/skills for nursing practice across life span. History taking, interviewing techniques, technical skills to perform complete, systematic health assessment, focused assessments for acute care settings.

NURS 5200. Holistic Health Assessment and Therapeutics for Advanced Practice Nurses. (3.0 cr.; A-F only; prereq Admission to advanced practice nursing area of study (DNP or Post-Graduate certificate program); #; fall, summer, every year)
Health assessment knowledge/skills for advanced nursing practice with patients across age span, including pregnancy. Selected nursing interventions, complementary therapies for application to specific populations/illnesses.

NURS 5221. Refugee Health: Trauma, Stress, and Coping. (3.0 cr.; prereq Grad student or #; fall, spring, summer, offered periodically)
War, displacement, and associated stressors affecting psychosocial health of refugees. Migration experiences, family/community dynamics, approaches for recovery. Creating community-based interventions to support refugee health.

NURS 5222. Advanced Physiology. (3.0 cr.; A-F only; fall, every year)
Systems approach to human physiology/pathophysiology. Physiologic changes across life span. Emphasizes clinical application using population-specific content related to various specialty areas in advanced practice nursing.

NURS 5223. Assessment of Psychopathology for Advanced Practice

Psychiatric/Mental Health Nursing. (4.0 cr.; prereq Nurs grad or #; spring, every year)
Advanced concepts from nursing theory and research, social sciences, neuropsychology, and neuropsychology in the assessment of psychiatric symptoms and disorders across the age continuum. During clinical, develop proficiency in the assessment of psychopathology in clients with psychiatric symptoms.

NURS 5225. Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing. (3.0 cr.; prereq 5228 or #; fall, spring, every year)
Advanced concepts in neuroscience, psychopharmacology, and clinical management related to psychopharmacologic treatment of psychiatric disorders/symptoms. Application to problems in various clinical settings.

NURS 5228. Pharmacology for Advanced Practice Nursing. (2.0 cr.; A-F or Audit; prereq Grad nursing student or #; fall, every year)
Overview of pharmacological principles for commonly used medication classes. Each drug class, related physiology. Pharmacodynamics and pharmokinetics of drug classes and specific medications.

NURS 5229. Clinical Pharmacotherapeutics. (2.0-4.0 cr.; A-F only; prereq 5222, [5228 or PHAR 5800], DNP student; #; spring, every year)

NURS 5241. Nursing Leadership for Effective Practice. (3.0 cr.; A-F or Audit; prereq Final sem of MN Program; fall, every year)
Leadership theory/application. System issues affecting nursing practice and patient outcomes.

NURS 5501. Professional Issues in Nurse-Midwifery. (1.0-2.0 cr.; S-N or Audit; prereq Nurs grad major; #; spring, every year)
Analysis of professional issues that confront and impact the practice of certified nurse-midwives. History and development of the professional organization including certification, legislation, ethical dimensions, public policy, and clinical practice issues.

NURS 5550. Assessment and Support of Women in Labor. (2.0 cr.; S-N only; prereq Admission to DNP Program; spring, every year)
Self-directed study with goal of working with experienced labor nurses/learning knowledge/skills required to perform labor. Clinical experience. Completion of selected online modules related to nursing care of women in labor.

NURS 5604. Advanced Health Assessment and Interventions with Adolescents. (2.0 cr.; prereq CPsy 5303 or equiv or #; summer, every year)
Integrates knowledge from nursing, public health, health behavior, and adolescent
development as framework for developing health assessment/intervention strategies for clinical practice with adolescents.

NURS 5800. Nursing Topics. (1.0-4.0 cr. [max 8.0 cr.]; prereq #; fall, spring, summer, every year) Course allows students to study a topic not included in regular courses, or for faculty to offer a course to determine interest in a topic.

NURS 5808. American Indian Health and Health Care. (2.0 cr.; prereq Upper div or grad student or #; fall, spring, every year) Examines health of native nations in Minnesota within historical/cultural contexts. Epidemiology of major health conditions, health services, traditional Indian medicine, health beliefs. Opportunities for contact with Native American community.

NURS 5812. Global Health Through Study Abroad. (2.0-3.0 cr.; S-N only; prereq #; spring, summer, every year) Nursing as a global profession and the issues that impact health of populations worldwide.

NURS 5820. Foundations of Infection Control. (3.0 cr.; prereq Baccalaureate degree in health related field or #; fall, spring, summer, offered periodically) Integrates microbiology, epidemiology, and patient care practices applied to a population-focused practice. Focuses on risk identification, prevention strategies.

NURS 5830. Advanced Clinical Nursing. (1.0-6.0 cr.; prereq Grad nursing major; #; fall, spring, summer, every year) Independent study or faculty seminar on special clinical topic.

NURS 5925. Grant Writing and Critique. (1.0 cr.; prereq Grad student or #; spring, every year) Self-paced course. Online modular format. How to write/critique grants. Students select a research or program grant to critique, applying knowledge obtained through learning modules.

NURS 5940. Contemporary Issues in Nurse Anesthesia. (2.0 cr.; S-N only; prereq 5930; spring, every year) Analysis of economic, legal, political, ethical, and social factors that influence the practice and profession of CRNAs.

NURS 8100. The Discipline of Nursing. (3.0 cr.; prereq Grad nurs major or #; fall, spring, summer, every year) Knowledge structures used in nursing; theories, models, and conceptual frameworks. Articulation and evaluation of personal conceptual framework for advanced nursing practice.

NURS 8112. Theoretical Foundations of the Discipline. (3.0 cr.; prereq 8100 or equiv, knowledge of phil of sci; fall, every year) Paradigms in nursing and related methods of inquiry, knowledge structures, and projection of needs for further knowledge development and testing.

NURS 8113. Theory Development in Nursing. (3.0 cr.; S-N or Audit; prereq 8100 or equiv, 8112 or #) Strategies for theory development; synthesis of theoretical formulations in nursing using selected inductive and deductive theory development strategies.

NURS 8115. Integrated Seminar in Nursing Informatics. (3.0 cr.; A-F or Audit; prereq Doctoral student; #; fall, every year) Problem-focused topics related to nursing and health informatics theory, measurement, and ethical/policy issues. Interdisciplinary, cross-institutional relationships. Interpersonal dynamics that support trust-building exchanges.

NURS 8116. Clinical Decision Support: Theory and Application. (3.0 cr.; A-F only; prereq 5115 or [HINF 5430, HINF 5431] or #; spring, every year) Principles/concepts of knowledge management and decision making. Students design a clinical decision support intervention. Legal, ethical, and practical issues related to its implementation and maintenance of CDS interventions.

NURS 8121. Health Behaviors and Illness Responses. (3.0 cr.; A-F or Audit; prereq Doctoral student or #; fall, spring, offered periodically) Theories of health behaviors and responses to illness are analyzed/critiqued. 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.

NURS 8124. Family Health Theory. (2.0-3.0 cr.; prereq 8100 or #; fall, every year) Emerging theory in family nursing science. Related theories. Research on family systems for structuring a systemic framework to examine clinical problems related to family health care. Applications to selected phenomena of interest to health care.

NURS 8134. Interventions and Outcomes Research. (3.0 cr.; A-F or Audit; prereq 8121, PhD student; #, spring, every year) 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.

NURS 8140. Moral and Ethical Positions in Nursing. (3.0 cr.; prereq Grad nurs major or #; fall, spring, summer, every year) Synthesis of ethical positions, from nursing perspective. Research process/methods appropriate for research studies, proposal development.

NURS 8150. Anesthesia. (2.0 cr.; S-N only; prereq PhD student in nursing, advanced applied statistics) or #; fall, every year) Integrates scientific, statistical, and practical aspects of research. Inter-relationships among design, sample selections, subject access, human subjects requirements, instrument selection and evaluation, data management, analyses plans, grant writing, and research career issues. Field experiences required.


NURS 8176. Research on Decision Making in Health Care. (3.0 cr.; prereq One graduate-level research course; #, fall, offered periodically) Conceptual models/studies on decision making about health care. Formulating research proposals to investigate health care decisions by health care professionals, health care policy makers, patients/clients, or families.

NURS 8177. Advanced Nursing Research Practicum. (2.0 cr.; S-N or Audit; prereq PhD nursing student; #, adviser consent; fall, spring, summer, every year) Students collaborate with research team under supervision of faculty mentor in designing/conducting a health-related research project.

NURS 8178. Methods for the Study of Family Health Phenomena. (3.0 cr.; prereq 8124, 8110 or equiv or #) Conceptual and methodological approaches in study of family health phenomena from nursing perspective. Research designs formulated to study questions in this area.

NURS 8180. Doctoral Proseminar I: Scholarly Development. (1.0 cr.; S-N or Audit; prereq Doctoral nursing student; fall, spring, offered periodically) Transition to doctoral study. Begins socialization process to role of nursing scholar/scientist. Career trajectories of nursing scholars who have pursued various roles.

NURS 8182. Policy Implications of Nursing Research. (1.0 cr.; S-N only; prereq Nursing doctoral student or #; spring, every year) Nursing research as a foundation for health policy. Research utilization for resolution of global, national, and state policy issues affecting population health and health service delivery. Political analysis to effect policy change.

NURS 8185. Qualitative Data Analysis for Health Care Research. (3.0-4.0 cr.; prereq 8171 or grad course in qualitative research methods; summer, every year) Techniques for descriptive, interpretive, and analytic data. Data preparation, management, and analysis. Transforming data from multiple texts to theoretical conceptualizations. Writing, dissemination of findings.

NURS 8190. Critical Review in Health Research. (2.0 cr.; A-F or Audit; prereq Advanced statistics course, #; spring, every year) 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.

NURS 8193. Special Topics in Nursing Research. (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Seminar and/or individual study of research design, methodologies, or instruments.

NURS 8194. Problems in Nursing - Plan B. (1.0-6.0 cr.; S-N or Audit; prereq [8100 or & 8100], [8170 or & 8170], #; fall, spring, summer, every year) Using a scholarly process to address a specific issue relevant to science/practice of nursing.

NURS 8195. Mixed Methods in the Social, Behavioral, and Applied Health Sciences. (3.0 cr.; A-F only; prereq #, spring, every year) 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.

NURS 8240. Advanced Practice Nursing: Roles and Issues. (2.0 cr.; prereq Admission to advanced practice area of study or #; fall, spring, summer, every year) Current most relevant professional/health care issues affecting diverse advanced practice nursing roles. Role theory, practice models, interdisciplinary team function, reimbursement, certification, scope of advanced nursing practice.

NURS 8241. Health Care Leadership for a Changing World. (2.0 cr.; [max 3.0 cr.; prereq AHC grad student or #; fall, spring, every year) Application of leadership theory/research to strengthen students. capacity to facilitate change in health care delivery system.

NURS 8242. Population Focused Health Care Delivery Systems. (2.0 cr.; prereq Grad nurs student or #; fall, spring, summer, every year) Health care organizations/delivery systems, their relation to health of diverse populations. Models of population-focused care, use of research to improve health care delivery, effect of economic/social factors on health/health services.

NURS 8311. Specialized Focus in Research-based Clinical Reasoning and Management in Acute Care. (3.0-4.0 cr.; prereq 5200, 5222, 8100, 8140, 8170, 8240, 8303, 8305, 8309, advanced pharmacology, [pathophysiology or immunobiology]; fall, spring, offered periodically) Synthesis/utilization of knowledge/research in care of adults with acute/critical illness. Participation in (a clinical area of interest) in advanced decision making and in management of clients requiring restorative care.

NURS 8314. Intervention Models for Adults/Elders with Chronic Health Conditions. (3.0-4.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170; #; fall, spring, every year) Development of theory-/research-based nursing intervention models for adults/elders with chronic health conditions. Students implement/evaluate intervention models in an advanced practice role with chronically ill adults/elders.

NURS 8315. Advanced Practice Nursing for Adults. (4.0-5.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170; #; fall, spring, offered periodically) Development of clinical expertise in provision of advanced nursing care to adults with acute health problems needing restorative care. Students utilize theory/research to manage/evaluate acute health problems in a selected adult specialty area.

NURS 8316. Implementing Advanced Practice Roles in Adult Nursing. (4.0 cr.; A-F or Audit; prereq 5222, 5800, 8100, 8140, 8170, 8314, 8315; spring, every year) Clinical nurse specialist roles of case management, teaching, consultation, and collaboration. Students use theory/research to provide advanced nursing care to adults within context of selected specialty area.

NURS 8320. Multidisciplinary Seminar on Social Perspectives of Aging. (3.0 cr.; spring, offered periodically) Literature/policy on key social aspects of aging, emphasizing service, policy, and ethical implications; generation of research questions.


NURS 8322. Primary Health Care for Elders. (3.0-6.0 cr.; A-F or Audit; prereq 8321, #; fall, every year) Data-based primary care management of common acute/chronic conditions of elderly. Physiological, psychosocial, and pharmacological interventions. Age-related, cultural, family, and community variations. Implementation, evaluation of interventions.

NURS 8323. Advanced Nursing Care of the Elderly II: For Nurse Practitioners. (5.0-6.0 cr.; A-F or Audit; prereq 8322, 8xxx advanced gerontological nurs course, grad nurs major, #; spring, every year) Synthesis and application of theory and research to effectively implement advanced gerontological nursing practice. Focuses on comprehensive primary care management across settings, evaluation of care, role analysis, and impact of contextual factors on health care services for the elderly.

NURS 8324. Advanced Nursing Care of the Elderly II: For Clinical Nurse Specialists. (6.0 cr.; A-F or Audit; prereq Grad nurs major, #; spring, every year) Synthesis and application of theory and research to effectively implement an advanced gerontological nurse. Comprehensive client care management across settings, evaluation of care, role implementation, and influences of contextual factors on health care services for the elderly.

NURS 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; fall, spring, summer, every year) (No description) Prereq Master’s student, adviser and DGS consent.

NURS 8340. Advanced Practice Psychiatric/Mental Health Nursing with Individuals and Their Families. (7.0 cr.; prereq 5200, 5223, [5225, 8100, 8121, 8140, 8170; fall, every year) Evaluation of theory and research; their application to advanced clinical management of biological, psychological, and social responses of individuals and families to psychiatric illness. Developing clinical expertise in assessment, diagnosis, treatment planning, and management of individuals and their families.

NURS 8341. Advanced Practice Psychiatric/Mental Health Nursing in Groups and Community. (7.0 cr.; prereq 5340, 8340, & 8240; spring, every year) Application of theory and research to advanced practice psychiatric/mental health nursing with groups and community systems, including populations at risk. Clinical practicum provides experiences for developing advanced practice roles in variety of healthcare settings.
NURS 8360. Advanced Clinical Nursing. (1.0-6.0 cr.; prereq Grad nurs major, #; fall, spring, summer, every year) Independent study or faculty seminar on special clinical topic when interest exists.

NURS 8361. Special Topics in Nursing. (1.0-4.0 cr.; prereq Grad nurs major, #; fall, spring, summer, every year) Students select and study a topic of interest.

NURS 8402. Primary Care: Assessment and Management of Health for Advanced Practice Nurses. (2.0-4.0 cr.; A-F or Audit; spring, summer, every year) Data-based assessment/management of preventive health services and common acute/chronic conditions of primary care populations. Emphasizes clinical reasoning and independent/collaborative practice health care plans. Prereq-5200, 5222, 5224, 8242.

NURS 8403. Primary Care Practice for Family Nurse Practitioners: Assessment and Management of Health. (4.0 cr.; S-N or Audit; prereq 5200, 5222, 8402; fall, spring, offered periodically) Application of advanced practice comprehensive health histories and physical assessments in formulating client centered databases. Development/implementation of care plans. Follow-up evaluation of primary care delivered to families across life span.

NURS 8404. Family Practice Practicum I. (2.0 cr.; A-F or Audit; prereq 5200, 5222, 5224, 8402, 8601; fall, every year) Comprehensive advanced nursing assessment for acute/chronic health conditions of primary care population across life span. Synthesis of/ application of nursing theory/research in implementing/evaluating safe/effective nursing interventions to promote health and prevent illness.

NURS 8405. Family Practice Practicum II. (2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq 5200, 5222, 5224, 8402, 8601; spring, every year) Synthesis of advanced practice nursing theory in data collection and in assessment of client in his/her environment. Implementation/evaluation of interventions for disease management in primary care setting. Nursing theory/research used in developing nursing practice models for health promotion, disease prevention, and intervention.

NURS 8406. Health Care of Children for the Family Nurse Practitioner. (3.0 cr.; A-F or Audit; prereq #; fall, every year) Application of midrange theories, models, concepts applicable to promotion, maintenance, restoration of health of infants, children, adolescents within context of their families/communities. Current research evaluated/used for designing age-specific interventions for children and their families.


NURS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NURS 8450. Primary Care: Health Assessment and Care of Well Children. (3.0 cr.; prereq 5200, 5222, & 8451; spring, every year) Study of age-specific and family-centered assessment, prevention, and health promotion nursing interventions for infants through adolescents. Emphasis on theories and concepts related to comprehensive health supervision. Stresses the use of critical thinking for clinical decision making to implement and evaluate advanced practice nursing interventions.

NURS 8451. Primary Care Practicum: Health Assessment and Care of Well Children. (2.0-3.0 cr.; A-F or Audit; prereq 5200, & 8450, #; spring, every year) Focus on age-specific, family-centered nursing assessments/interventions to promote wellness of children, infants through adolescence. Emphasizes compiling/evaluating interventions for children/families. Practicum includes exposure to models of primary prevention.

NURS 8452. Primary Care: Common Acute Health Conditions Affecting Children. (2.0 cr.; prereq 8501, 8451, & 8453, #; fall, every year) Research-based evaluation and management of common acute conditions affecting children from infancy through adolescence. Exploration of theories and models used to explain and predict physiologic and psychologic adaptation of children and their families.

NURS 8453. Primary Care Practicum: Common Acute and Chronic Health Conditions Affecting Children. (3.0 cr.; prereq 8411, 8442, & 8452, #; fall, every year) Focus on age-specific, family-centered nursing assessment and intervention of minor acute and chronic conditions of children within family context. Emphasis on nursing intervention strategies include diagnostics, therapeutics, education, and follow-up evaluation of outcomes.

NURS 8455. Health Care for Children and Youth with Special Health-Care Needs. (2.0 cr.; prereq 8454; fall, every year) Primary care of children and youth with special healthcare needs, emphasizing growth and development, pathophysiology, specific conditions, and holistic, family-centered, community-based, culturally competent, and coordinated approach to assessment and intervention.


NURS 8457. Assessment and Intervention Models in Families of Children with Special Health Care Needs. (4.0 cr.; prereq 8124 or equiv, 8100, 8456, #; spring, every year) In-depth, systemic, and theory-based study of family health assessment methods and intervention models. Practicum to assess, intervene, and evaluate intervention models related to patterns of functioning in families of children with complex health-care needs.

NURS 8459. Advanced Nursing Care of Children With Acute Illness for Pediatric Clinical Nurse Specialists. (2.0 cr.; prereq Nursing grad student admitted to pediatric clinical nurse specialist area of study or #; fall, spring, offered periodically) Synthesis/application of theory/research to effectively implement pediatric clinical nurse specialist role. Focuses on comprehensive care management across settings, evaluation of care, role implementation, and contextual factors affecting health care for children with special health needs and families.

NURS 8500. Reproductive Health Care for Women Practicum for the Family Nurse Practitioner. (2.0 cr.; S-N or Audit; prereq Concurrent registration with NURS 8501, 8405; spring, every year) Synthesis/utilization of nursing knowledge/research in clinical decision making process related to women's reproductive/sexual health throughout life cycle. Evaluation of patient outcomes using nursing standards/criteria.

NURS 8501. Reproductive Health Care for Women. (3.0-8.0 cr.; prereq 5200, #; spring, every year) Theory, current research underlying clinical practice in assessing/managing issues related to women's reproductive/sexual health throughout life cycle.

NURS 8502. Reproductive Health Care for Women at Risk. (2.0-6.0 cr.; prereq 8503 or 8520; spring, every year) Theoretical and research basis for advanced practice nursing care of women and infants at risk for medical and/or psychosocial problems. Selected high-risk perinatal and complicated gynecological and neonatal conditions.

NURS 8503. Nurse-Midwifery Care of the Childbearing Family. (4.0-10.0 cr.; A-F or Audit; prereq 8501, #; fall, every year) Theoretical/research based, coordinated midwifery intrapartum care, management, support of women and their families. Labor, birth, immediate postpartum period, and newborn care. Development/implementation of nurse-midwifery care. Draws from research that provides basis for practice.

NURS 8504. Nurse Midwifery and Women's Health Care Nurse Practitioner Primary Care
NURS 8520. Advanced Concepts in Women's Health for the Nurse Practitioner. (3.0-8.0 cr.; A-F or Audit; prereq 8501; #; fall, every year) Theoretical and research basis for women's healthcare nurse practitioner practice building on foundations of gynecological and antepartum care. Preparation of childbearing family for birth and selected complex health concerns for women.


NURS 8601. Interventions for Health of Populations. (3.0 cr.; prereq 8040; spring, every year) Synthesis of behavior formation/change, public health, and nursing models, theories, and research for critiquing and designing population-focused interventions. Developing, implementing, evaluating, and proposal writing for culturally competent public health interventions in community-based settings.

NURS 8602. Public Health Nursing Intervention Practicum. (3.0 cr.; S-N or Audit; prereq 8242, 8601; fall, spring, every year) Applying principles, theory, and research about epidemiology/public health/public health nursing interventions to population-focused health issues. Collaborating with community-based preceptors to achieve public health objectives.

NURS 8603. Public Health Nursing Leadership Practicum. (3.0 cr.; S-N or Audit; prereq 8100, 8170, 8241, 8242, 8600; fall, spring, every year) Synthesis of leadership and advanced public health nursing theories and research; their applicability within public health nursing leadership situations.

NURS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

NURS 8701. Nursing and Health-Care Systems Administration I. (4.0 cr.; A-F or Audit; prereq #; fall, offered periodically) Intensive study of nursing and healthcare administration and leadership. Application of nursing, organization, care delivery, and population health improvement theories to health systems administrative practice. Planning, organizing care systems, assembling, and developing material and human resources.

NURS 8702. Nursing and Health-Care Systems Administration II. (4.0 cr.; A-F or Audit; prereq 8701; #; spring, offered periodically) Intensive development of competencies associated with skilled administration of healthcare services. Application of organization, nursing, political, and economic theories in operationalizing and evaluating administrative and leadership practice of nurses in healthcare delivery systems.

NURS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

NURS 8800. Methods for the Study of Family Health Phenomena. (2.0 cr.; prereq 8124, 8175 or equiv or #) Exploration of conceptual and methodological approaches in study of family health phenomena from a nursing perspective. Formulation of research design to study questions in family health.

NURS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)


NUTR 5625. Nutritional Biochemistry. (3.0 cr.; prereq BioC 3021 or #; fall, every year) Overview of biochemical molecules and pathways important in nutritional events.

NUTR 5626. Nutritional Physiology. (3.0 cr.; A-F or Audit; prereq NUTR 5625; spring, every year) 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.

NUTR 5627. Nutritional and Food Toxicology. (3.0 cr.; A-F only; [FSCN 4622]; prereq BIOC 3021; designed for students majoring in [nutrition or food science or toxicology]; spring, every year) Toxic agents, organisms, and toxic effects that are important in the toxic events, with a focus on food toxicants and nutrient-toxicant interaction.

NUTR 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NUTR 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

NUTR 8620. Advances in Nutrition. (2.0 cr.; prereq M.S. or Ph.D. student, two semesters in the nutrition program; fall, spring, every year) Recent research or special topics (e.g., obesity, vitamin biochemistry, nutrition education).

NUTR 8621. Presentation Skills. (1.0 cr.; S-N or Audit; prereq %; fall, every year) Orientation to nutrition graduate program. Presenting scientific seminars, using electronic presentation programs/equipment.

NUTR 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

NUTR 8695. Independent Study: Nutrition. (1.0-10.0 cr. [max 30.0 cr.]; No Grade Associated; prereq #; fall, spring, summer, every year) Written report for master's plan B project.

NUTR 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

NUTR 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

Obstetrics and Gynecology (OBST) Medical School

OBST 8224. Gynecological Endocrinology I. (1.0-15.0 cr.; prereq prereq 8223; fall, spring, every year)
OBST 8225. Gynecological Endocrinology II. (1.0-15.0 cr.; prereq prereq 8224; fall, spring, every year)

OBST 8226. Obstetrical Physiology and Anesthesiology. (1.0-15.0 cr.; prereq prereq 8225; fall, spring, every year)

OBST 8227. Preceptorship in Clinical Practice. (1.0-15.0 cr.; prereq prereq 8226; fall, spring, summer, every year)

OBST 8240. Human Gametes and Fertilization. (3.0 cr.; fall, spring, every year)

OBST 8241. Human Gametes and Fertilization Laboratory. (2.0 cr.; fall, spring, every year)

OBST 8243. Topics in Family Planning. (2.0-8.0 cr. [max 12.0 cr.]; fall, spring, summer, every year)

Occupational Therapy (OT)
Academic Health Center Shared

OT 5121. Issues in Mental Health. (1.0 cr.; S-N or Audit; prereq One course gen psych, one course abnorm psych.; fall, every year)
Psychiatric/neuropsychological assessment/treatment. Issues related to medical/behavioral management and to roles of OT/PT with respect to clients with mental health needs. Interaction between physical/mental health and disability.

OT 5122. Descriptive Neurology. (2.0 cr.; A-F or Audit; prereq OT student or #; fall, every year)
Relates neuroanatomical/neuropsychological principles to neurological conditions commonly seen in occupational/physical therapy practice.

OT 5161. Theory of Physical Medicine and Rehabilitation Applied to Medical Sciences. (2.0 cr.; A-F or Audit; prereq OT student or #; fall, every year)
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.

OT 5182. Functional Neuroanatomy and Neurophysiology. (4.0 cr.; A-F or Audit; prereq Registered occupational therapy student or #; spring, every year)
Neuroanatomical structures as functional systems, basic neurophysiologic concepts. Emphasizes applications for understanding/treating physical dysfunctions.

OT 5300. Concepts for Occupational Therapy Practice. (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Critical thinking, ethics, professional resources/organizations, patient-therapist relationship. Level I fieldwork experience.

OT 5313. Therapeutic Occupation. (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Occupational therapy philosophy, history, and frames of reference. Activity analysis applied to purposeful, therapeutic activities for individuals and groups.

OT 5341. Introduction: Evaluation and Intervention I. (4.0 cr.; A-F or Audit; prereq 5393 or #; spring, every year)
Assessment concepts/techniques. Application to patient populations with both mental/physical disabilities. Treatment planning/documentation.

OT 5342. Compensatory Rehabilitation: Evaluation and Intervention II. (4.0 cr.; A-F or Audit; prereq 5300, 5313 or #; spring, every year)
Assessment of daily living performance areas; adaptation techniques to compensate for performance deficits. Level I fieldwork experience.

OT 5343. Specialty Topics: Evaluation and Intervention III. (4.0 cr.; A-F or Audit; prereq 5342 or #; fall, every year)
Applies 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.

OT 5344. Neurorehabilitation: Evaluation and Intervention IV. (5.0 cr.; A-F or Audit; prereq 5343 or #; spring, every year)
Assessment/intervention related to perception, cognition, reflexes, sensory integration, and motor control. Application to individuals with multiple performance component deficits.

OT 5360. Dynamics of Group Models. (2.0 cr.; A-F or Audit; prereq 5313 or #; fall, every year)
Application of group/team dynamics in diverse professional settings.

OT 5370. Theory of Occupation. (1.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Occupational therapy frames of reference, role of activity, and historical development of profession.

OT 5375. Community Resources and Health-Care Issues. (2.0 cr.; A-F or Audit; prereq [5300, 5342] or #; fall, every year)
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.

OT 5376. Adult Education and Planning. (1.0 cr.; A-F or Audit; prereq 5313 or #; spring, every year)
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.

OT 5380. Management of Occupational Therapy Services. (3.0 cr.; A-F or Audit; prereq [5360, 5375, 5376] or #; spring, every year)
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.

OT 5391. Occupation Across the Life Span. (3.0 cr.; A-F or Audit; prereq [5375, 5376] or #; spring, every year)
The well elderly, school therapy, work-related injuries/industrial rehabilitation. Fieldwork.

OT 5392. Research in Occupational Therapy. (3.0 cr.; A-F or Audit; prereq 5313 or #; spring, every year)
Analysis of scientific literature, development of research proposals.

OT 5393. Functional Anatomy and Kinesiology. (4.0 cr.; A-F or Audit; prereq enrolled OT student or #; fall, every year)
Gross human anatomy emphasizing skeletal, muscular, circulatory, and peripheral nervous systems of the extremities and trunk. Includes cadaver lab projections. Analyzing functional human movement from a biomechanical perspective.

OT 5394. Orthotics. (3.0 cr.; A-F or Audit; prereq 5341 or #; fall, every year)
Analysis, design, and construction of orthotic devices.

OT 5395. Independent Study in Occupational Therapy. (1.0-4.0 cr. [max 16.0 cr.]; prereq Enrolled OT student or #; fall, spring, summer, every year)
Independent Study in Occupational Therapy

OT 8300. Research Seminar in Occupational Therapy. (1.0 cr.; S-N or Audit; prereq 5392 or #; fall, spring, every year)
Critical review of research literature in occupational therapy. Issues related to ethical/successful conduct/publication of research. Development of Plan B project outline.

OT 8310. Research Problems in Occupational Therapy. (1.0-6.0 cr.; S-N or Audit; prereq [5392, Plan B OT student] or #; fall, spring, every year)
Individual, concentrated study of a problem in occupational therapy. Completion of Plan B project.

OT 8320. Fieldwork Education in Occupational Therapy I. (1.0-6.0 cr.; S-N or Audit; prereq Occupational therapy student or #; fall, spring, summer, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.

OT 8321. Fieldwork Education in Occupational Therapy II. (1.0-6.0 cr.; S-N or Audit; prereq Occupational therapy student or #; fall, spring, summer, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.

OT 8322. Fieldwork Education in Occupational Therapy III: Optional. (1.0-6.0 cr.; S-N or Audit; prereq Occupational Therapy or #; fall, spring, every year)
Supervised clinical practice in affiliated hospitals and community agencies. Students apply critical thinking through supervised application of theory/skills.
OPH 5501. Orthoptics I. (4.0 cr.; S-N only; prereq Admission to Orthoptics Certificate program; summer, every year)
First semester of Orthoptics Certificate program.

OPH 5601. Orthoptics II. (5.0 cr.; S-N only; prereq Enrollment in Orthoptics Certificate program; fall, every year)
Second semester of Orthoptics training program.

OPH 5701. Orthoptics III. (5.0 cr.; S-N only; spring, every year)
Third semester of Orthoptics certificate program.

OPH 8010. Clinical Ophthalmology. (5.0 cr.; fall, spring, summer, every year)

OPH 8013. Basic and Clinical Neuro-ophthalmology. (2.0 cr.; spring, every year)


OBIO 8021. Oral Microbiology. (2.0 cr.; prereq Dental specialist or oral research trainee or #; fall, odd years)

OBIO 8022. Oral Neuroscience. (2.0 cr.; prereq Dental specialist or oral research trainee or #; spring, even years)
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.

OBIO 8023. Physical Biology of the Oral Cavity. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; spring, odd years)

OBIO 8024. Genetics and Human Disease. (1.0 cr.; prereq Dental specialist or oral research trainee or #; spring, every year)
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.

OBIO 8025. Topics in Cariology. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; spring, odd years)
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.

OBIO 8026. Salivary Glands and Secretions. (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; fall, even years)

OBIO 8027. Structural and Biological Aspects of Dental Biomaterials. (1.0 cr.;
prereq Dental specialist or oral research trainee or #; summer, odd years)
Relates composition/structure of dental biomaterials to their behavior in a biological environment. Cause/mechanism of such effects. Materials that have beneficial effects. Dental implantology, guided tissue regeneration.

**OBIO 8028. Molecular Basis of Cellular and Microbial Adhesion.** (2.0 cr.; A-F or Audit; prereq Dental specialist or oral research trainee or #; spring, even years)
Biochemical basis of adhesion phenomena. Cells of immune system, development of organs, tissue formation, bacterial colonization of the human.

**OBIO 8030. Oral Biology Seminar.** (1.0 cr.; [max 10.0 cr.; S-N or Audit; prereq Dental specialist or oral research trainee or #; fall, spring, every year)
Faculty and student discussion of current topics in oral biology.

**OBIO 8093. Tutorial in Oral Biology.** (1.0-2.0 cr.; S-N only; prereq #: fall, spring, every year)
Semester-long apprenticeship with faculty members to familiarize students with faculty research interests. Individual study of selected topics.

**OBIO 8094. Directed Research.** (1.0-10.0 cr.; S-N or Audit; prereq #: fall, spring, every year)
tbd

**OBIO 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**OBIO 8371. Mucosal Immunobiology.** (3.0 cr.; A-F or Audit; =MICA 8371, CMB 8371; prereq MICA 8001 or equiv or #: fall, every year)
Host immune processes at body surfaces. Innate/adaptive immunity at mucosal surfaces. Interactions/responses of various mucosal tissues to pathogens. Approaches to target protective vaccine to mucosal tissues. Lectures, journal.

**OBIO 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**OBIO 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.;]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
tbd

**OBIO 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.;]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

**OBIO 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.;]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**OSUR 5257. Ambulatory General Anesthesia for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program.; fall, spring, summer, every year)
Clinical rotation involving experience in outpatient management and using intravenous sedation and general anesthesia.

**OSUR 5276. Medicine Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program.; fall, spring, summer, every year)
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.

**OSUR 5277. Physical Diagnosis for Oral Surgery Residents.** (0.0-6.0 cr.; A-F or Audit; prereq Participation in oral and maxillofacial surgery training program.; spring, summer, every year)
Six-week didactic course coupled with evaluation of patients.

**OSUR 8250. Oral and Maxillofacial Surgery Rotation for the Oral and Maxillofacial Surgeon.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Rotations at assigned oral and maxillofacial surgery clinics and operating rooms at Fairview-University Medical Center, Hennepin County Medical Center, Veterans Administration Medical Center.

**OSUR 8251. Oral and Maxillofacial Surgery Core Curriculum.** (0.0-2.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Standardized curriculum of fundamental concepts of surgery and medicine. Fourteen core curriculum topics covered in a two-year cycle.

**OSUR 8253. Case Presentations and Chief Conferences.** (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Topic-oriented journal reviews. Guest oral surgeons, specialists, or chief resident present topics in case-based format.

OSUR 8254. Oral and Maxillofacial Surgery Resident Presentations. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Contemporary subjects researched and presented by current residents.

OSUR 8255. General Surgery Rotation for the Oral and Maxillofacial Surgeon. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Clinical rotation on general surgery, neurosurgery, and surgical intensive care unit at Hennepin County Medical Center. Seminars, clinics, and operating room experience.

OSUR 8256. Contemporary Anesthesia Literature Review. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
Seminar presentation format of current publications that address anesthesia management for the oral and maxillofacial surgery patient.

OSUR 8260. Surgical Rounds for the Oral and Maxillofacial Surgeon. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
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 sequelae complications.

OSUR 8262. Plastic Surgery Rotation for the Oral and Maxillofacial Surgeon. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
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.

OSUR 8267. Anesthesia Rotation for the Oral and Maxillofacial Surgeon. (0.0-6.0 cr.; S-N only; prereq Participation in oral and maxillofacial surgery training program; fall, spring, summer, every year)
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.

**Organizational Leadership, Policy and Development (OLPD)**

**OLPD 5001. Formal Organizations in Education.** (3.0 cr.; fall, spring, summer, every year)
Classical/current theories of organizations. Applications to education and related fields.
OLPD 5002. Independent Colleges as Formal Organizations. (3.0 cr.; A-F or Audit; prereq Bachelors degree must be completed before starting this course.; fall, spring, summer, every year) Provide certificate students with introduction to contemporary thinking on organizations/ administration. Primary focus on organizational theory.

OLPD 5011. Leading Organizational Change: Theory and Practice. (3.0 cr.; fall, every year) How theory is incorporated, affects the change process, and can improve schools/institutions of higher education. Characteristics that impact change processes/outcomes. Leadership/policy effects.

OLPD 5021. Historical Foundations of Modern Education. (3.0 cr.; =HUM 4021, HUM 3021) Analysis and interpretation of important elements in modern education derived from pre-classical sources: Greeks, Romans, Middle Ages, Renaissance, Reformation, Enlightenment, and Industrial Revolution.

OLPD 5028. Education Imagery in Europe and America. (3.0 cr.) Images and ideas of education expressed in the visual arts of Western civilization (antiquity to 20th century) in relation to concurrent educational thought and practice; symbolism, myth, propaganda, didacticism, genre, caricature.

OLPD 5041. Sociology of Education. (3.0 cr.; =SOC 5455); spring, every year) 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. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr.; fall, summer, every year) 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. (3.0 cr.; A-F or Audit; fall, spring, summer, every year) 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. (3.0 cr.; summer, every year) 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. Ethnicographic Research Methods. (3.0 cr.; fall, spring, every year) 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. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year) Topical issues in organizational leadership, policy, development.

OLPD 5087. Seminar: Organizational Leadership, Policy, and Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year) Shared responsibility of students/instructor in presentation of topics.

OLPD 5095. Problems: Organizational Leadership, Policy, and Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year) Course or independent study on specific topic within department program emphasis.

OLPD 5096. Internship: Organizational Leadership, Policy, and Development. (1.0-9.0 cr. [max 24.0 cr.;] fall, spring, every year) Internship in elementary, secondary, general, postsecondary administration, or other approved field related setting.

OLPD 5102. Knowledge Constructions and Applications in International Development Contexts. (3.0 cr.; spring, every year) Interrelationships of knowledge capital (noetic symbolic resources) and culture through intrinsic, cross/multicultural perspectives. Distinguishing knowledge from information/data. National/international developments occurring along basic/applied knowledge paths.

OLPD 5103. Comparative Education. (3.0 cr.; fall, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad student; ) 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.

OLPD 5107. Gender, Education, and International Development. (3.0 cr.; A-F or Audit; fall, every year) Role of gender/sex 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. (3.0 cr.; spring, every year) 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. (3.0 cr.; spring, every year) 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. (3.0 cr.; =ANTH 5128); spring, offered periodically) 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. (3.0 cr.; spring, every year) 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 5141. Global Youth Policy and Leadership: Comparative Youth Policy and Leadership. (3.0 cr.; A-F only; fall, every year) Comparative approach to public responses at global level to youth development and leadership issues. Social systems such as education, health, employment, and recreation. Role of individuals, communities, governments, and international organizations in providing programs/services.

OLPD 5142. Youth Futures in International and Global Contexts. (3.0 cr.; A-F only; prereq CIDE student or #; spring, every year) Strategic trends in global youth development. Implications. Reconciling trends with normative scenarios with respect to presence, absence, and projected likelihood of suitable policies, workable collaborations, and funding.

OLPD 5144. Cultural Models, Simulations, and Games. (3.0 cr.; Upper Div or grad student; fall, every year) Use of dynamic educational models, simulations, and games in international education/development courses. Storytelling, simulated intercultural encounters, imagination, knowledge construction/applications, time, ethics, computer simulations, games, systems.

OLPD 5200. Special Topics in Adult Education. (1.0-8.0 cr. [max 12.0 cr.]; spring, summer, offered periodically) Exploration of issues, methods, and knowledge in areas of adult education. Content varies.

OLPD 5201. Strategies for Teaching Adults. (3.0 cr.; A-F or Audit; prereq Grad student only; fall, spring, summer, offered periodically)
OLPD 5202. Perspectives of Adult Learning and Development. (3.0 cr.; fall, summer, offered periodically) 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. (3.0 cr.; A-F or Audit; spring, offered periodically) 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. (1.0 cr.; A-F or Audit; summer, every year) 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. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; summer, every year) Review workplace literacy programs, funding, program planning, and needs assessment. Reaching/recruiting workers. Role of employers and the unions. Writing for low literacy employees.

OLPD 5213. Introduction to Adult Literacy in the Community. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; summer, every year) 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.

OLPD 5224. Formal Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; fall, offered periodically) Assessment of adult English/literacy skills for work, family, and community, and continuing education. Formal testing policy, techniques, standardized tests. Assumptions about testing, cultural bias, and interpretation of formal tests. Test preparation programs.

OLPD 5225. Informal Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; fall, offered periodically) Informal assessment of adult English/literacy skills for work, family, community, and further education. Informal testing techniques, setting educational goals, formal versus informal assessment.

OLPD 5226. Advanced Assessment of Adult Literacy. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; fall, offered periodically) Applications/case studies. Educational planning for work, family, community.

OLPD 5233. Methods of Teaching Beginning Adult Literacy. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; fall, offered periodically) 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.

OLPD 5234. Methods of Teaching Intermediate Adult Literacy. (1.0 cr.; A-F or Audit; prereq [5211 or ADED 5211], [5233 or ADED 5233]; fall, offered periodically) 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.

OLPD 5235. Methods of Teaching Advanced Adult Literacy. (1.0 cr.; A-F or Audit; prereq 5211 or ADED 5211; fall, offered periodically) 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.

OLPD 5296. Field Experience in Adult Education. (1.0-6.0 cr.; S-N or Audit; fall, spring, summer; every year) Supervised fieldwork and practice. Presentations and evaluations of adult education practices.

OLPD 5302. Educational Policy: Context, Inquiry, and Issues. (3.0 cr.; fall, spring, summer, every year) Review of social science concepts/research in considering educational policies/issues, process of inquiry that affect policy development, implementation, evaluation. Focus on pre-K-12. Role of educational leaders, administrators.

OLPD 5310. Data-Driven Decision Making I. (1.0 cr.; prereq Broadband Internet access, a newer computer, spring, every year) Data-driven decision making for schools/administrators. Focuses on data collection/analysis needs of educational organizations and on use of appropriate software/databases to collect, manage, analyze, and report school information.

OLPD 5311. Data-driven Decision Making II. (1.0 cr.; prereq [5310 or EdPA 5310], broadband Internet access, newer computer; summer, every year) Continuation of 5310. Data-driven decision making for schools/administrators. Hands-on training in student policy organizations in using technology to analyze data to make educational decisions.

OLPD 5321. The Principal as Leader of High-Performing Schools. (3.0 cr.; fall, spring, summer, every year) Role of principal: qualifications, duties, problems.

OLPD 5322. Leaders in the Superintendency and Central Office. (3.0 cr.; fall, summer, every year) 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. (3.0 cr.; prereq Technology access; fall, every year) Women in leadership in context of larger systems and their own lives. Supporting equity/equality across areas of difference.

OLPD 5324. Strategic Financial Planning and Policy for Educational Leaders. (3.0 cr.; prereq Grad student pursuing licensure as elementary-secondary [principal or superintendent]; spring, summer, every year) State-local school finance systems, budgeting, governmental fund accounting. Interpretation of financial information.

OLPD 5332. Leadership Development Seminar. (3.0 cr.; fall, spring, offered periodically) Assessment and development of skills required of the educator in planning, decision making, and human relations. Introduction to contemporary issues in educational administration.

OLPD 5341. The American Middle School. (3.0 cr.; fall, summer, every year) Focus on the uniqueness of the early adolescent and appropriate learning situations. For educators working with middle-level students.

OLPD 5344. School Law. (3.0 cr.; spring, summer, every year) 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. (3.0 cr.; A-F or Audit; prereq postbac, MED, or grad student; fall, spring, every year) 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.
K-12 principal or dir of special educ; spring, summer, every year
Skills for administrator/leader. Human resources administration, employee recruitment, selection, orientation/support, supervision, performance appraisal of school district personnel.

OLPD 5356. Disability Policy and Services. (3.0 cr.; spring, summer, every year)
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. (3.0 cr.; Student Option No Audit; =[CI 5178]; prereq MEd student in Teacher Leadership Program; fall, spring, summer, every year)
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.

OLPD 5364. Context and Practice of Educational Leadership. (3.0 cr.; A-F or Audit; fall, summer, every year)
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. (3.0 cr.; prereq Administrator or supervisor or professional responsible for managing general or special or alternative education program; fall, spring, every year)
Legislative, procedural, executive, and judicial actions that affect services, families, and children with special needs at federal, state, and local levels.

OLPD 5372. Youth in Modern Society. (3.0 cr.; fall, every year)
Youth in advanced societies and as a social entity; functions and roles in industrial society, family, education, politics and government, economy and work, welfare and religion; organizations, social movements, and subcultures; empirical research and cross-cultural perspectives.

OLPD 5374. Leadership for Professional Development. (4.0 cr.; prereq Postbaccaleaureate, at least 3 yrs teaching experience; fall, every year)
Designing, implementing, evaluating staff development in preK-12 settings. Research-based standards for effective staff development. Need for embedded time for collaborative learning, evaluating staff/student outcomes.

OLPD 5381. The Search for Children and Youth Policy in the U.S.. (3.0 cr.; spring, every year)
Review of contemporary policy issues affecting children and youth in the U.S. and South Africa; identify national standards, norms and principles of youth development; conflicting expectations facing policy-makers; and search for the critical content of youth policy.

OLPD 5385. Licensure Seminar: Program Policies and Inclusionary Leadership. (1.0 cr.; S-N or Audit; fall, spring, summer, every year)
Preparation for licensure program. Program overview, preassessment, reflective practice, APA writing, exit panel review, administrative employment interview.

OLPD 5386. Leadership Portfolio Seminar. (1.0 cr.; S-N or Audit; prereq 5385 or 5385 or EDPA 5385; fall, spring, summer, every year)
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.

OLPD 5387. Leadership for Teaching and Learning. (3.0 cr.; spring, summer, every year)
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. (2.0 cr.; fall, summer, every year)
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. (3.0 cr.; spring, every year)
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. (1.0 cr.; prereq Designed for students working on licensure in PK-12 administration; fall, summer, every year)
Competencies of leadership, policy, and political influence. Legal/regulatory applications focusing on special education law.

OLPD 5392. Special Education Finance: Program Models, Policy, and Law. (2.0 cr.; prereq [5324 or 5324 or EDPA 5324 or &EDPA 5324]. Knowledge of special education; summer, every year)
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.

OLPD 5393. Leading School Finance Elections. (1.0 cr.; S-N or Audit; spring, every year)
Comprehensive planning model for conducting school finance elections. Emphasizes systems, strategies, and campaign tactics.

OLPD 5394. Leadership in Community Education Finance and Law. (1.0 cr.; S-N or Audit; prereq [5324 or EDPA 5324]. Recommended; summer, every year)
Interplay between finance and laws directly applicable to community education. MN Statute 124D, revenues/expenditures, and UFRAS approached from frame of resource development.

OLPD 5396. Field Experience in PK-12 Administration: Authentic Practice in Leadership. (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq #; fall, spring, every year)
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.

OLPD 5402. Education and Human Resource Development Through Tourism. (3.0 cr.; A-F or Audit; spring, offered periodically)
Policies/practices of education and human resource development in tourism industry.

OLPD 5403. Tourism Studies Capstone Seminar. (3.0 cr.; S-N or Audit; prereq Tourism studies major; fall, offered periodically)
Students present, critique, and discuss implications of supporting programs for tourism.

OLPD 5404. The Business of Tourism. (3.0 cr.; A-F or Audit; fall, offered periodically)
Introduction to major theories, concepts, skills, and techniques influencing tourism business/industry.

OLPD 5405. Critical Issues in Business and Industry. (3.0 cr.; spring, every year)
Identification and analysis of major current issues in business and industry education.

OLPD 5411. Teaching Marketing Promotion. (3.0 cr.; A-F or Audit; spring, summer, every year)
Materials, methods, and approaches to teaching marketing promotion. Covers the basic elements of the marketing mix: advertising, promotion, public relations, direct selling, visual merchandising, and direct marketing.

OLPD 5452. Methods of Teaching Business and Marketing Concepts. (3.0 cr.; A-F or Audit; fall, every year)
Recent research/developments in teaching business concepts related to economics, business organization/management, business law, entrepreneurship, marketing, international business, information systems, accounting, risk management, and personal finance.

OLPD 5454. Technical Development: Specialized. (1.0-12.0 cr.; A-F or Audit; prereq #; fall, spring, summer, every year)
Students select/study technical processes/principles based on subjects they plan to teach, integrate specialized technical instruction in advanced/emerging areas.

OLPD 5457. Methods of Teaching Business Employment and Marketing Employment. (3.0 cr.; A-F or Audit; spring, every year)
Recent research/developments in teaching for business employment. Administrative support positions, accounting/information processing,
marketing, sales, computer operations, other occupations using desktop computing.

OLPD 5475. Curriculum Development for Business and Marketing Education. (3.0 cr.; A-F or Audit; fall, summer, every year) Introduction to conceptual models for design/delivery of business/marketing education programs in secondary/postsecondary schools, in adult education settings, and in business/industry. Preparing programs of instruction for secondary/postsecondary level. Making decisions regarding course content.

OLPD 5476. Field Based Projects in Business and Industry. (1.0-4.0 cr.; S-N or Audit; fall, spring, summer, every year) Curricular, instructional, developmental, or evaluative problems and projects applicable to local school or business and industry situations.

OLPD 5480. Special Topics in Business and Industry Education. (1.0-4.0 cr.; spring, summer, every year) Content varies by offering.

OLPD 5493. Directed Study in Business and Industry. (1.0-4.0 cr.; fall, spring, summer, every year) In-depth individual inquiry in the content areas related to business and industry.

OLPD 5498. Occupational Experience in Business and Industry. (1.0-10.0 cr.; S-N or Audit; prerequisite: fall, spring, summer, every year) Observation/employment in business/industry to develop technical/occupational competencies. Includes 100 clock hours of supervised work experience per credit.

OLPD 5501. Principles and Methods of Evaluation. (3.0 cr.; [EPSY 5243]; fall, spring, summer, every year) 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. (3.0 cr.; prerequisite: [EPSY 5243] or PA 5311 or PUBH 6034 or another introductory evaluation course approved by instructor; fall, summer, every year) Examination of foundational theories/models currently available to practitioners. Communication with clients about value/utility of program. Systems theory.

OLPD 5521. Cost and Economic Analysis in Educational Evaluation. (3.0 cr.; fall, every year) Use and application of cost-effectiveness, cost-benefit, cost-utility, and cost-feasibility in evaluation of educational programs and programs.

OLPD 5524. Evaluation Colloquium. (1.0 cr. [max 24.0 cr.]; S-N or Audit; [EPSY 5246]; prerequisite: [EPSY 5243] or [EPSY 5246]; fall, spring, every year) Informal seminar of faculty/students. Issues/problems of program evaluation.

OLPD 5528. Focus Group Interviewing Research Methods. (3.0 cr.; fall, every year) Skills needed to conduct focus group interviews. Students conduct focus group study and report results at final class session.

OLPD 5601. Foundations of Human Resource Development. (1.0 cr.; fall, spring, summer, every year) Introduction to human resource development as a field of study and practice.

OLPD 5602. Economic Foundation of Human Resource Development. (1.0 cr.; prerequisite: 5601 or HRD 5101; fall, spring, summer, every year) Introduction to economics as core discipline supporting theory/practice of human resource development.

OLPD 5603. Psychological Foundation of Human Resource Development. (1.0 cr.; prerequisite: 5601 or HRD 5101; fall, spring, summer, every year) Introduction to psychology as core discipline supporting theory/practice of human resource development.

OLPD 5604. Systems Foundation of Human Resource Development. (1.0 cr.; prerequisite: 5101; fall, spring, summer, every year) Introduction to systems theory as a core discipline supporting the theory and practice of human resource development.

OLPD 5605. Strategic Planning through Human Resources. (3.0 cr.; A-F or Audit; prerequisite: 5607 or 5615 or HRD 5201 or HRD 5301; spring, offered periodically) 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.

OLPD 5606. Evaluation in Human Resource Development. (3.0 cr.; A-F or Audit; spring, summer, every year) Evaluation of human resource development efforts from the perspective of impact on organizations, work processes, and individuals, plus follow-up decisions.

OLPD 5607. Organization Development. (3.0 cr.; A-F or Audit; prerequisite: Grad student only; fall, spring, summer, offered periodically) Introduction to major concepts, skills, and techniques for organizational development/change.

OLPD 5610. Survey of Research Methods and Emerging Research in Human Resource Development. (3.0 cr.; A-F or Audit; prerequisite: [Registered, in attendance] at conference of Academy of HRD; spring, offered periodically) 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.

OLPD 5611. Facilitation and Meeting Skills. (1.0 cr.; fall, spring, summer, every year) 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. (3.0 cr.; prerequisite: Grad student only; spring, summer, every year) Problems, practices, programs, theories, and methodologies in human resource development as practiced internationally.

OLPD 5615. Training and Development of Human Resources. (3.0 cr.; A-F or Audit; prerequisite: Grad student only; spring, summer, offered periodically) Training and development of human resources in organizations. Process phases of analysis, design, development, implementation, and evaluation.

OLPD 5616. Training on the Internet. (3.0 cr.; prerequisite: Grad student only; spring, summer, every year) Major concepts, skills, and techniques for giving and receiving training on the Internet.

OLPD 5619. Planning and Decision-Making Skills. (1.0 cr.; fall, spring, summer, every year) 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 5625. Technical Skills Training. (3.0 cr.; summer, offered periodically) Analyzing technical skills training practices in business and industry. Systems and process analysis and trouble-shooting of work behavior; design methods and developing training materials.

OLPD 5670. Special Topics in Human Resource Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year) Issues, methods, and knowledge in HRD areas. Topics vary.

OLPD 5696. Internship: Human Resource Development. (1.0-10.0 cr.; S-N or Audit; prerequisite: [3901 or HRD 3601, 3696 or HRD 3196, 3620 or 3640 or HRD 3201 or HRD 3301, 3202 or ADED 3101], background or [5607 or 5615 or HRD 5201 or HRD 5301, 5801 or WHRE 5001, grad student]], #; fall, spring, offered periodically) Students apply/contract for human resource development positions.

OLPD 5697. International Field Study in Human Resource Development. (3.0 cr.; max 6.0 cr.; A-F only; prerequisite: 5001; spring, summer, every year) 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.

OLPD 5701. U.S. Higher Education. (3.0 cr.; fall, summer, every year) U.S. higher/postsecondary education in historical/contemporary perspective. Emphasizes structure, history, and purposes of system as a whole.
OLPD 5704. College Students Today. (3.0 cr.; =EPSY 5451; spring, summer, every year) 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 5721. Race and Ethnicity in Higher Education. (3.0 cr.; fall, spring, summer, every year) 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. (2.0-3.0 cr.; =EPSY 5421; fall, spring, offered periodically) Scope, administration, coordination, and evaluation of programs in college and university student affairs.

OLPD 5728. Two-Year Postsecondary Institutions. (2.0-3.0 cr.; fall, spring, summer, offered periodically) Present status, development, functions, organization, curriculum, and trends in postsecondary, but nonbaccalaureate, institutions.

OLPD 5732. The Law and Postsecondary Institutions. (3.0 cr.; fall, spring, offered periodically) Analysis of court opinions and federal regulations affecting postsecondary educational institutions.

OLPD 5734. Institutional Research in Postsecondary Education. (2.0-3.0 cr.; A-F or Audit; prereq 5701; EPSY 5231 or EPSY 8261; grad student) or #; fall, offered periodically) 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.

OLPD 5736. Public Engagement and Higher Education. (3.0 cr.; A-F only; spring, every year) Study/practice of public engagement in higher education. Civic roles of post-secondary education institutions.

OLPD 5739. Plan B Research Design. (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad student; ) 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.

OLPD 5801. Survey: Human Resource Development and Adult Education. (3.0 cr.; prereq Grad student only; fall, spring, summer, every year) 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.

OLPD 5804. Leadership in OLPD. (2.0 cr.; spring, summer, every year) Leadership, leadership roles/responsibilities. Application to Organizational Leadership, Policy, Development.


OLPD 5808. Student and Trainee Assessment. (2.0 cr.; A-F or Audit; =HRD 5601; fall, spring, summer, every year) Developing learning progress reporting systems/tests for skills instruction in business/industry. Evaluating instructional effectiveness. Applying tests/evaluation instruments to assess/report learning. Students develop each type of test and evaluation plan for a course.

OLPD 5811. Education for Work. (3.0 cr.; spring, offered periodically) Examination of contextual bases underlying education for work; implications for practice.


OLPD 5813. Enhancing Work-based Learning Through Collaboration. (2.0 cr.; summer, every year) Interagency planning issues/practices relating to special populations for educational, business, and human service organization personnel, family members, and advocates.

OLPD 5814. Developmental Writing and the College Student: Theory and Practice. (3.0 cr.; prereq Bachelor’s degree; fall, offered periodically) Basic grounding in theory/practice of college-level developmental writing instruction. History of "basic writing," development of notions of "academic discourse," error/grammar in student writing, best classroom practices, current issues.

OLPD 5815. Research in Postsecondary Developmental Education. (3.0 cr.; prereq Bachelor's degree, courses in [intro psychology, basic statistics]; fall, spring, offered periodically) Strategies for conducting three types of research that are central to developmental education: placement test validation, program evaluation, and classroom research. Students read examples and learn what constitutes best practices in each type.

OLPD 5816. Distance Learning in Adult Education and Training. (3.0 cr.; A-F or Audit; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad student; fall, spring, summer, every year) Role of educational research in professional practice. Problems of practice for research. Alternative modes of research. Synthesis/application of results of research.


OLPD 5823. Work-Based Learning Policies. (2.0 cr.; fall, summer, offered periodically) Aims/purposes of federal, state, and local policies, related to work-based learning.

OLPD 5824. Diversity and Organizational Transformation in Organizational Leadership, Policy, and Development. (3.0 cr.; spring, offered periodically) Developing models for understanding impact of diversity on individual, organizational, community outcomes. Discuss organizational change in relation to diversity.


OLPD 5829. Course Development for Business and Industry. (2.0 cr.; A-F or Audit; fall, spring, summer, every year) 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 5841. Evaluation of OLPD. (3.0 cr.; fall, spring, every year)
Designing/conducting project, program, systems evaluations in work/human resource education contexts/settings.

OLPD 5842. Global Program Delivery Techniques and Technology of Extension. (2.0 cr.; A-F for Audit; fall, offered periodically)
Special educational activities and teaching and communications methods and techniques for youth and adults, ranging from outreach to extension services, with an emphasis on youth and adult education programs in different global settings.

OLPD 5845. The Entrepreneurial Independent College. (3.0 cr.; A-F or Audit; prereq Must have completed Bachelor's degree before taking this course.; fall, spring, summer, every year)

OLPD 5851. Methods for Change in Developing Countries. (3.0 cr.; A-F or Audit; fall, offered periodically)
Sociological and cultural parameters as they pertain to the adoption of improved practices in rural, community, and agricultural development, including formal and informal education institutions. Project planning, implementation, and evaluation related to actual change and development situations in developing countries.

OLPD 5861. Instructional Methods for Business and Industry. (2.0 cr.; spring, every year)
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 5871. Teaching Entrepreneurship: Small Business Management. (3.0 cr.; fall, offered periodically)
Methods, organization, curriculum development and modification, and implementation of educational programs for entrepreneurs.

OLPD 5890. Special Topics in Organizational Leadership, Policy, and Development. (1.0-4.0 cr.; fall, spring, summer, every year)
Topics vary.

OLPD 5893. Directed Study in OLPD. (1.0-4.0 cr.; fall, spring, summer, every year)
Self-directed study, with faculty advice, in areas not covered by regular courses.

OLPD 5896. Teaching Internship: Introduction. (1.0 cr.; S-N only; prereq Admission to initial licensure program; fall, summer, every year)
Initial experiences in teaching profession. Observation of school organization/administration, seminars, relationship building with cooperating teachers, reflection on personal involvement as a beginning student teacher.

OLPD 5897. Teaching Internship: School and Classroom Settings. (2.0 cr.; prereq 5696 or WHRE 5696; fall, every year)
Part-time supervised teaching experience in school. Seminars on managing student learning in context of work/human resource education programs in contemporary schools. Becoming a reflective educator.

OLPD 5898. Teaching Internship. (3.0-8.0 cr.; prereq Admission to initial licensure program; spring, every year)
Teaching experience in a school system that provides programs for grades 5-12.

OLPD 5899. Teaching Internship: Extended. (1.0 cr.; prereq 5898 or WHRE 5698; spring, summer, every year)
Teaching experience in school system that provides programs for grades 5-12.

OLPD 5902. Leading Change in Independent Colleges. (3.0 cr.; A-F or Audit; prereq Must have Bachelor's degree awarded prior to taking this course.; fall, spring, summer, every year)
Theories of organizational change process/application for leading independent colleges with unique cultures/distinctive missions. Factors impacting change process/implications for leading independent colleges.

OLPD 8002. Critical Issues in Contemporary Education. (3.0 cr.; prereq EdD or PhD; fall, spring, every year)
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.

OLPD 8011. Doctoral Research Seminar I. (1.0 cr.; S-N or Audit; prereq EdPA or WHRE doctoral student; fall, every year)
Introduction to individual program development, preliminary examinations, and dissertation prospectus. Modes of inquiry used in current research in education, databases relating to education, recent writings on literature synthesis, key contributions to education literature.

OLPD 8012. Doctoral Research Seminar II. (1.0 cr.; S-N or Audit; prereq EdPA doctoral student; spring, summer, every year)
Introduction to qualitative/quantitative research approaches/methods. Nature of research, role of researcher, philosophical perspectives on research, ethical issues in conducting research.

OLPD 8013. Doctoral Research Seminar III. (1.0 cr.; S-N or Audit; prereq EdPA doctoral student; fall, spring, every year)
Introduction to most important quantitative/qualitative approaches employed in educational policy research.

OLPD 8014. Doctoral Research Seminar IV. (1.0 cr.; S-N or Audit; prereq EdPA doctoral student; spring, every year)
Preparation of thesis prospectus.

OLPD 8015. Research Design and Educational Policy. (3.0 cr.; A-F only; prereq [8011 or EDPA 8011], OLPD PhD student; fall, every year)
Logic of research design, from research questions and audience considerations to selecting a design for collecting/analyzing quantitative, qualitative, and mixed-method data.

OLPD 8016. Research Design and Educational Policy. (3.0 cr. [max 6.0 cr.]; prereq [8015 or EDPA 8015], CEHD doctoral student; #, fall, every year)
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.

OLPD 8020. Leadership: From Theory to Reflective Practice. (3.0 cr. or A-F or Audit; prereq [[5001 or EDPA 5001 or equiv], doctoral student] or #; fall, offered periodically)
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. (3.0 cr.; A-F or Audit; spring, every year)
Anthropological/comparative 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. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year)
Topical issues.

OLPD 8095. Problems: Organizational Leadership, Policy, and Development. (1.0-3.0 cr. [max 24.0 cr.]; fall, spring, summer, every year)
Independent study on issues of educational policy/administration. Arranged with instructor.

OLPD 8096. Internship: Organizational Leadership, Policy, and Development. (1.0-9.0 cr. [max 24.0 cr.]; fall, spring, every year)
Internship on issues of educational policy/administration. Arranged with instructor.

OLPD 8101. International Education and Development. (3.0 cr.; A-F or Audit; prereq Doctoral student or #; fall, every year)
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.

OLPD 8103. Comparative Education. (3.0 cr.; A-F or Audit; prereq Doctoral student or #; fall, every year)
OLPD 8104. Innovative Systems Thinking in Education and Culture. (3.0 cr.; fall, every year)
Critical aspects of historical/contemporary systems philosophy, thinking, and analysis. Development of concepts/skills applicable to coping with evolutionary/chaotic environments. Modeling/simulation of learning systems in rapidly changing national/international contexts.

OLPD 8121. Doctoral Seminar: Comparative and International Development Education. (1.0-6.0 cr.; S-N or Audit; prereq EdPA PhD candidate; fall, spring, every year)
Focuses on needs of students while writing the dissertation; general guidance in how to construct the thesis.

OLPD 8124. Classic Readings in Anthropology and Education. (3.0 cr.; A-F or Audit; fall, spring, offered periodically)
Major contributions to theory or working paradigms.

OLPD 8143. Integrative Seminar in Global Youth Policy and Leadership. (1.0 cr. [max 3.0 cr.]; A-F only; prereq CIDE student or #; fall, spring, every year)
Integrates ideas/concepts from 5141 and 5142 into alternative knowledge, policy, and futures profiles. Students use WebCT Vista and beyond to interact with each other, with students abroad, and with global experts to apply perspectives, theories, methods, and research to real-world situations.

OLPD 8301. Contexts of Learning. (3.0 cr.; fall, spring, offered periodically)
Study of long-term contextual understanding of education as a social institution. Development of perspective-driven explanation.

OLPD 8302. Educational Policy Perspectives. (3.0 cr.; spring, every year)

OLPD 8303. Modeling the Learning Organization. (3.0 cr. [max 4.0 cr.]; )
Computer software, perspectives on learning organization used to study global education, human service organizations.

OLPD 8304. Leadership and Ethics. (3.0 cr.; fall, spring, offered periodically)
Review of major leadership theories, their application to problems of practice in educational organizations. Studies of leadership behavior illustrate major emerging issues in educational management.

OLPD 8311. Understanding and Using Research for Educational Improvement. (3.0 cr.; A-F only; prereq Statistics; summer, odd years)
Research design principles to identify when findings best contribute to local decisions. Frameworks for evaluating/synthesizing findings to incorporate research in personal/team decision-making.

OLPD 8312. Inquiry for School Improvement Part I. (3.0 cr.; A-F only; prereq 8311 or EDPA 8311; fall, spring, summer, every year)
First of two-course sequence. How to draw upon data sources, select/design data-collection instruments, and synthesize data to guide action planning. Role of leader in creating conditions for collaborative inquiry.

OLPD 8313. Inquiry for School Improvement Part II. (3.0 cr.; A-F only; prereq 8312 or EDPA 8312; fall, spring, summer, every year)
Continuation of 8312. Data collection/analysis techniques that carry out realistically/effectively alongside improvement efforts within school/district. Role of leader in sustaining collaborative inquiry.

OLPD 8314. Data Analysis for Educational Management. (3.0 cr.; fall, spring, summer, offered periodically)
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. Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

OLPD 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year)
(No description)

OLPD 8495. Research Problems: Business and Industry. (3.0-6.0 cr.; S-N or Audit; prereq Adviser approval; fall, spring, summer, every year)
Individual research in business and industry education.

OLPD 8502. Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives. (3.0 cr.; prereq 5501 or EDPA 5501 or EPSY 5243; spring, every year)
Concepts, approaches, models, and theoretical frameworks for program evaluation that have developed since the 1960s.

OLPD 8595. Evaluation Problems. (1.0-6.0 cr. [max 24.0 cr.]; [EPSY 8295]; prereq [5501 or EDPA 5501 or EPSY 5243,]; fall, spring, summer, every year)
Independent study of an issue in theory or practice of program evaluation.

OLPD 8596. Evaluation Internship. (1.0-9.0 cr. [max 24.0 cr.]; prereq [5501 or EDPA 5501 or EPSY 5243,]; fall, spring, summer, every year)
Hands-on experience in conducting program evaluation in real-world setting under supervision of evaluation professional.

OLPD 8601. Advanced Training and Development of Human Resources. (3.0 cr.; A-F or Audit; prereq 5615 or HRD 5201; fall, offered periodically)
Personnel training/development research. Critical review of selected/innovative practices.

OLPD 8602. Advanced Organization Development. (3.0 cr.; A-F or Audit; prereq 5607 or HRD 5301; spring, offered periodically)
Organization development research. Critical review of selected, innovative practices.

OLPD 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
Pre-thesis credit

OLPD 8702. Administration and Leadership in Higher Education. (3.0 cr.; prereq [5001 or EDPA 5001]; [5701 or EDPA 5701]; fall, spring, summer, every year)
Leadership, governance, and administration in higher education through theoretical perspectives and practical analysis. Planning, change, decision making, organizational culture, budgets, conflict.

OLPD 8703. Public Policy in Higher Education. (3.0 cr.; A-F or Audit; prereq [5001 or EDPA 5001], [5701 or EDPA 5701]; fall, every year)
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.

OLPD 8721. Instruction and Learning in Higher Education. (2.0-3.0 cr.; spring, every year)

OLPD 8724. Strategic Planning in Higher Education. (2.0-3.0 cr.; prereq 5701 or EDPA 5701; fall, offered periodically)
Strategic planning principles, their application to higher education. Pitfalls encountered by planners. Tools of strategic planning/management. Case studies.

OLPD 8728. Economics of Higher Education. (2.0-3.0 cr.; fall, offered periodically)
Institutional responses to changing external economic factors. Economic effects resulting from higher education’s output in teaching, research, and service. Research on institutional and governmental policies.

OLPD 8732. Financing Higher Education. (3.0 cr.; prereq 5701; )
Theories and critical issues in financing postsecondary education. Budgeting, cost-effectiveness, state/federal funding policies, tuition policies, student financial aid, financing educational opportunity.

OLPD 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

OLPD 8800. Organizational Leadership, Policy, and Development Colloquium. (1.0-3.0 cr.; [max 12.0 cr.]; fall, spring, summer, every year)
Selected topics regarding work/human resource education professionals. Topics based on interest/demand.

OLPD 8801. Advanced Theory in Human Resource Development and Adult Education. (3.0 cr.; A-F or Audit; prereq 8801 or ADED 5001 or WHRE 5001; spring, offered periodically)
Theory of individuals/organizations as adaptive entities. Roles of human resource development and adult education in mediating complex demands.

OLPD 8811. Foundations of Inquiry in Organizational Leadership, Policy, and Development. (3.0 cr.; A-F or Audit; fall, spring, summer, every year)
Practice of inquiry in Organizational Leadership, Policy, Development. Identify research problem/research questions. Quantitative/qualitative methods of research. Issues related to ethics of research.

OLPD 8812. Quantitative Research in Education. (3.0 cr.; fall, every year)
Assumptions, procedures for, considerations in planning/conducting quantitative research in education.

OLPD 8815. Ethics and Responsible Research. (1.0 cr.; A-F or Audit; fall, spring, summer, offered periodically)
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. (3.0 cr.; fall, offered periodically)
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. (3.0 cr.; prereq 8141 or WHRE 8141; spring, offered periodically)
Looking critically across/within countries.regions at structures intended to deliver work-career-related education/training.

OLPD 8843. Contemporary Workforce and Workplace Issues. (3.0 cr.; A-F or Audit; spring, offered periodically)
Workforce preparation/retraining. Impact of cultural, political, and economic changes.

OLPD 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

OLPD 8890. Research Seminar. (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq [8911 or WHRE 8911], [8812 or OLPD 8913 or OLPD 8914 or WHRE 8912]) or #; fall, offered periodically)
Developing, reporting, and evaluating research. Participants make/react to presentations.

OLPD 8896. Internship. (1.0-10.0 cr.; S-N or Audit; fall, spring, summer, every year)
Student applies for position in professional practice; individual arrangements describe specific responsibilities during internship. Ed.D. program requirement.

Orthodontics (OTHO)

School of Dentistry

OTHO 8121. Orthodontic Seminar. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; summer, every year)
Evaluating orthodontic literature, including preparation and presentation of literature reviews.

OTHO 8122. Orthodontic Seminar. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, every year)
Evaluating orthodontic literature, including preparation and presentation of literature reviews.

OTHO 8123. Orthodontic Seminar. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, every year)
Evaluating orthodontic literature, including preparation and presentation of literature reviews.

OTHO 8131. Topics in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, summer, every year)
Theoretical aspects of kinetics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

OTHO 8132. Topics in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year)
Theoretical aspects of kinetics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

OTHO 8133. Topics in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; spring, every year)
Theoretical aspects of kinetics and biological reactions to orthodontic forces, risk management and jurisprudence, public health aspects of orthodontics, practice management.

OTHO 8141. Research in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year)
Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature.

OTHO 8142. Research in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year)
Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature.

OTHO 8143. Research in Orthodontics. (0.0-5.0 cr.; A-F or Audit; prereq Orthodontic grad student; fall, spring, every year)
Required for all degree candidates. Preparation, execution, and evaluation of all ongoing research projects and pertinent literature.

OTOL 5010. Introduction to the Basic Sciences in Otolaryngology I: Ear. (2.0 cr.; A-F or Audit; prereq Otolaryngology major or #; fall, spring, every year)
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.

OTOL 5012. Introduction to the Basic Sciences in Otolaryngology II: Head and Neck. (2.0 cr.; A-F or Audit; prereq Otolaryngology major or #; fall, spring, every year)
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.

OTOL 5993. Directed Studies. (1.0-12.0 cr.; [max 24.0 cr.]; prereq #; fall, spring, summer, every year)
Directed readings and preparation of reports on selected topics.

OTOL 8230. Clinical Otorhinolaryngology. (4.0 cr.; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)
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 practica and weekly special group conferences.

OTOL 8231. Surgery of the Ear, Nose, and Throat. (3.0 cr.; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)
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 practica and weekly special group conferences.

OTOL 8232. Maxillofacial Surgery. (1.0 cr.; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)
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.

**OTOL 8233. Plastic and Reconstructive Surgery: Head and Neck.** (1.0 cr.; A-F or Audit; prereq Otol major; fall, spring, summer, every year)

Otolaryngologic cosmetic surgery emphasizing rhinoplasty and otoplasty.

**OTOL 8234. Anatomy of the Head and Neck and Temporal Bone Dissection.** (2.0 cr.; prereq Grad otol major or #; fall, spring, summer, every year)

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.

**OTOL 8235. Roentgenology of the Head and Neck.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Principles and procedures in roentgenology for otolaryngologic and head and neck problems.

**OTOL 8236. Pharmacology in Otolaryngology.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Principles of pharmacology as they relate to otolaryngology.

**OTOL 8237. Endoscopy.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Didactic and practical instruction in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles emphasized.

**OTOL 8238. Pathology of the Ear, Nose, and Throat.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

**OTOL 8239. Oto-neurology.** (1.0-2.0 cr. [max 12.0 cr.]; prereq Grad otol major or #; fall, spring, summer, every year)

Instruction and experience in diagnosis and management of otoneurologic problems, including training in electrophysiologic analysis of vestibular function.

**OTOL 8240. Allergy.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Concepts and management of otolaryngologic allergy.

**OTOL 8241. Cancer of the Head and Neck.** (1.0 cr. [max 12.0 cr.]; A-F or Audit; prereq Grad otol major; fall, spring, summer, every year)

Clinical head and neck oncology; etiology, treatment (both surgical and nonsurgical), and other principles of management.

**OTOL 8242. Audiology and Speech Pathology.** (2.0 cr.; prereq Grad otol major or #; fall, spring, every year)

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.

**OTOL 8243. Introduction to Research Methodology.** (1.0 cr.; prereq Grad otol major or #; fall, spring, every year)

Statistical methods, experimental design, and execution of otolaryngologic research. Ethics of research with human and animal subjects.

**OTOL 8244. Seminar: Current Literature.** (1.0 cr.; prereq Grad otol major or #; fall, spring, summer, every year)

Presentation and discussion of selected articles. Required for all otolaryngology graduate students.

**OTOL 8247. Anatomy and Physiology of Hearing and Balance.** (3.0 cr.; = [NSC 8247]; prereq; #; spring, every year)

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.

**OTOL 8248. Directed Readings in Auditory Physiology.** (1.0-2.0 cr.; = [NSC 8248]; prereq; #; fall, spring, every year)

Current research on biophysics and physiology of auditory system; topics selected for each student. Written reviews prepared and discussed.

**OTOL 8249. Current Topics in Cochlear Anatomy.** (1.0 cr.; prereq; #; fall, spring, every year)

Review of current research papers concerning cochlear anatomy and pathology.

**OTOL 8250. Advanced Biochemistry of the Auditory System.** (1.0 cr.; prereq MdBc 6100, MdBc 6101 or equiv or #; fall, spring, summer, every year)

Review of recent progress in biochemical aspects of auditory end organs.

**OTOL 8251. Molecular Carcinogenesis of Head and Neck Squamous Cell Carcinoma.** (2.0 cr.; [max 6.0 cr.]; prereq MICA 8009 or &MICA 8009 or #; fall, spring, summer, every year)

Current topics in molecular carcinogenesis of head and neck squamous cell carcinoma.

**OTOL 8262. Advanced Clinical Audiology.** (2.0 cr.; prereq Grad otol major, 8242 or #; fall, spring, summer, every year)

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.

**OTOL 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**OTOL 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

**OTOL 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

Doctoral Pre-Thesis Credits

**OTOL 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

**OTOL 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

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**Pediatric Dentistry (PDEN) School of Dentistry**

**PDEN 8010. Pediatric Dentistry Diagnosis and Treatment Planning.** (1.0 cr. [max 5.0 cr.]; S-N only; fall, spring, summer, every year)

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.** (2.0 cr.; S-N only; fall, spring, summer, every year)

Independent readings from pediatric dentistry textbooks in preparation for an oral exam. May include additional clinical experiences.

**PDEN 8100. Hospital Pediatric Dentistry.** (1.0 cr.; S-N or Audit; fall, spring, summer, every year)

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.** (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, summer, every year)

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 anesthia. Pre/postoperative seminar discussion and evaluation of treatment plans.

**Periodontics (PERO)**
School of Dentistry

**PERO 5123. Practice Management Externship.** (1.0 cr.; prereq Resident in advanced education program in periodontology; spring, every year) 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.

**PERO 8000. Advanced Clinical Periodontology.** (1.0-3.0 cr.; A-F or Audit; prereq Resident in advanced education program in periodontology; fall, spring, summer, every year) Clinical training in examination, diagnosis, treatment planning, and various phases of prevention and treatment of periodontal diseases in patients.

**PERO 8200. Clinical Seminars.** (1.0 cr.; prereq Resident in advanced education program in periodontology; fall, spring, summer, every year) tbd

**PERO 8250. Anatomy of the Periodontium.** (1.0 cr.; A-F or Audit; prereq Resident in advanced education program in periodontology; spring, summer, every year) Gingival tissues, cementum, periodontal ligament, and alveolar bone discussed from histological, physiological, and pathological point of view.

**Pharmacology (PHCL)**
Medical School

**PHM 5200. New-Drug Development Process.** (1.0 cr.; fall, spring, offered periodically) New-drug development process in the U.S. pharmaceutical industry.

**PHM 8100. Seminar: Pharmacuetics.** (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad Phm major; fall, spring, every year) tbd

**PHM 8110. Readings in Pharmacuetics.** (1.0 cr. [max 4.0 cr.]; S-N or Audit; prereq Grad Phm major; fall, spring, every year) Current literature.

**PHM 8120. Readings in Central Nervous System (CNS) Drug Delivery.** (1.0 cr. [max 4.0 cr.]; S-N only; prereq #; fall, spring, every year) 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.

**PHM 8150. Pharmacokinetics Research Seminar.** (1.0 cr. [max 12.0 cr.]; S-N or Audit; [PHAR 6223]; prereq Grad Phm major; fall, spring, every year) Current concepts and literature review.

**PHM 8295. Research Problems in Pharmacuetics.** (1.0-12.0 cr. [max 72.0 cr.]; S-N or Audit; prereq #; fall, spring, summer, every year) Experimental investigation of problems in pharmacuetics.

**PHM 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**PHM 8411. Stabilization of Pharmaceuticals.** (3.0 cr.; prereq Physical and organic chem survey courses;) Application of physicochemical principles (e.g., chemical kinetics) to elucidate and minimize stability problems in pharmaceutical systems.

**PHM 8421. Advanced Pharmacokinetics.** (4.0 cr.; A-F or Audit; fall, spring, offered periodically) Topics in kinetics of drug absorption, distribution, metabolism, and excretion.

**PHM 8431. Controlled Drug and Gene Delivery: Materials, Mechanisms, and Models.** (4.0 cr.; A-F or Audit; [BMEN 8431]; prereq Differential equations course including introduction to partial differential equations or #; spring, every year) Physical, chemical, physiological, cell biological, mathematical principles underlying design of delivery systems for drugs. Small molecules, proteins, genes.

**PHM 8441. Solubility and Solid-State Properties of Drugs.** (3.0 cr.; A-F or Audit; prereq Physical chem survey course or #; fall, odd years) Physical/physicochemical properties of drugs in solid state as related to drug delivery.

**PHM 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**PHM 8481. Advanced Neuropharmaceutics.** (4.0 cr.; A-F or Audit; [NSC 8481, CMB 8481]; prereq #; fall, even years) 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.

**PHM 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined or; doctoral student admitted before summer 2007 may register up to four times, up to 40 combined cr; fall, spring, summer, every year) tbd

**PHM 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

**PHM 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year) (No description)

**PHM 8900. Spec Topics in Pharmacuetics.** (1.0-4.0 cr. [max 1.0 cr.]; A-F or Audit; )

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potential use in diagnosis/prognosis of various disease conditions, including cancers. Biography of small RNAs and their role in health and disease.

PHCL 8026. Neuro-Immune Interactions. (3.0 cr.; prerequisite MICA 8001 or equiv or #; fall, every year)
Regulatory systems (neuroendocrine, cytokine, autonomic nervous systems) linking brain/immune systems in brain-immune axis.
Functional effects of bidirectional brain-immune regulation.

PHCL 8100. Laboratory Research in Pharmacology. (4.0 cr. [max 8.0 cr.]; S-N only; prerequisite Grad student or #; fall, spring, every year)
Supervised independent research in pharmacology. Modern biomedical/pharmacology research methodology, data generation/analysis. Formulation/test of basic science hypotheses.

PHCL 8200. Seminar: Selected Topics in Pharmacology. (1.0 cr. [max 8.0 cr.]; A-F only; prerequisite 5212 or #; fall, spring, every year)
Student-presented seminars.

PHCL 8207. Seminar: Psychopharmacology. (1.0 cr.; [PSY 8070, NSC 8207]; prerequisite #; fall, spring, every year)
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. Some seminars devoted to biomedical ethics.

PHCL 8208. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; prerequisite [5212, Psy 5021, Psy 5061] or #; fall, even years)

PHCL 8209. Substance Abuse at the Bedside. (1.0 cr.; S-N only; prerequisite Grad student in any basic-science program; fall, spring, every year)
Clinical management of addictive diseases. Students discuss how observed clinical interactions can influence a basic science project in which they are involved.

PHCL 8211. Advanced Medical Pharmacology I. (5.0 cr.; A-F only; prerequisite 5110, [grad student or #]; spring, every year)
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. Prerequisite 8211 or instructor consent.

PHCL 8217. Problems in Investigative Pharmacology. (0.0 cr.; S-N or Audit; fall, every year)
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. (3.0 cr.; prerequisite #; fall, spring, offered periodically)
Course offered triennially.

PHCL 8222. Transdisciplinary Tobacco Research. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prerequisite #; fall, odd years)
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.

PHCL 8320. Readings in Neurobiology. (1.0-4.0 cr.; prerequisite #; fall, spring, every year)
Topics in neurobiology/neuropsychology.

PHCL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prerequisite Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHCL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prerequisite Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHCL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prerequisite Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; ½ 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; fall, spring, summer, every year)
TBD

PHCL 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

PHCL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

PHAR 5200. Drugs and the U.S. Health Care System. (3.0 cr.; A-F only; [PHAR 5200, PHAR 4200W, PHAR 4200]; prerequisite grad or professional student; fall, spring, every year)
How to be informed/responsible participant in debates related to medication use.

PHAR 5201. Applied Health Sciences Terminology. (2.0 cr.; prerequisite Basic knowledge of human anatomy/physiology; fall, spring, summer, every year)
Identify/describe various medical conditions/processes. Medical abbreviations, surgical procedures, medical terminology. Analyzing words at roots.

PHAR 5205. Obesity: Issues, Interventions, Innovations. (2.0 cr.; A-F only; fall, spring, summer, every year)
Information necessary for prevention, treatment, management of obesity, from individual adipose tissue to entire public health community.

PHAR 5206. Applied Health Literacy and Communication. (3.0 cr.; A-F only; [PHAR 3206]; fall, spring, summer, every year)
Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

PHAR 5207. Applied Leadership in Health Care. (3.0 cr.; A-F only; [PHAR 3207]; prerequisite advanced undergraduates or professional health care students or grad students; fall, spring, summer, every year)
Leadership skills/theories to create positive change in health care settings.

PHAR 5210. Diminishing Health Disparities Through Cultural Competence: Community Engagement. (2.0 cr.; A-F only; fall, every year)
Various dynamics of health disparities, cultural competencies. Uses sociological framework.

PHAR 5212. Survey of Pediatric Metabolic, Genetic, and Oncologic Disease. (2.0 cr.; A-F only; prerequisite Second year or higher in College of Pharmacy or #; fall, summer, every year)
Appraisal of major genetic/metabolic disorders and oncologic diseases of childhood. Disease state epidemiology, pharmacotherapy, monitoring, practical applications.

PHAR 5230. Principles of Clinical Pharmacology Research. (2.0 cr.; A-F only; prerequisite 3rd Year Pharmacy Student or #; fall, every year)
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.

PHAR 5270. Therapeutics of Herbal and Other Natural Medicinals. (2.0 cr.; A-F or Audit; prerequisite organic chemistry, pathophysiology of disease states, 3rd or 4th yr PHAR; spring, every year)
Herbal products/supplements. Pharmacology/clinical indications/drug interactions of common products in nontraditional complementary
courses listed in this catalog are current as of december 12, 2014. for up-to-date information, visit www.catalogs.umn.edu

philosophy (phil)
college of liberal arts

phil 5010. ancient philosophers. (3.0 cr.; [max 6.0 cr.]; prereq 3001 or #; spring, offered periodically) major work of selected ancient philosophers (e.g., plato's Parmenides, plato's sophist, aristotle's metaphysics). works discussed vary.

phil 5040. rationalists. (3.0 cr. [max 6.0 cr.]; prereq 3005 or #; fall, spring, offered periodically) 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 5050. empiricists. (3.0 cr. [max 6.0 cr.]; prereq 3005 or #; fall, spring, offered periodically) major work of selected early modern empiricists (e.g., locke's essay concerning human understanding, berkeley's principles of human knowledge, hume's treatise of human nature). works discussed may vary from offering to offering.

phil 5085. wittgenstein. (3.0 cr.; [phil 4085]; prereq 3005 or 4231 or #; fall, spring, offered periodically) major work (e.g., philosophical investigations).

phil 5201. symbolic logic I. (4.0 cr.; prereq 1001 or #; fall, spring, every year) 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.

phil 5202. symbolic logic II. (4.0 cr.; prereq 5201 or #; spring, every year) 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.

phil 5211. modal logic. (4.0 cr.; prereq 5201 or #; spring, even years) axiomatic and semantic treatment of propositional and predicate modal logics; problems of interpreting modal languages.

phil 5221. philosophy of logic. (3.0 cr.; prereq 5202 or #; ) 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).

phil 5222. philosophy of mathematics. (3.0 cr.; prereq college level logic or mathematics course or #; fall, spring, offered periodically) 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, browerk, godel, quine.

phil 5323. education and social change. (4.0 cr.; A-F or Audit; [phil 4325]; fall, offered periodically) connections between education, social change. theories of democratic/popular education, their application through in-depth practicum in community education setting.

phil 5326. lives worth living: questions of self, vocation, and community. (4.0 cr.; [phil 4326]; prereq #; summer, offered periodically) 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? what experiences of community are desirable in a life? each student creates a life-hypothesis for a life worth living.

phil 5330. catching lives worth living: participation in the growth of a living-learning community. (1.0-3.0 cr. [max 6.0 cr.]; prereq application; #; summer, every year) 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.

phil 5415. philosophy of law. (3.0 cr.; prereq 1003 or 1004 or 3302 or social science major or #; spring, offered periodically) analytical accounts of law and legal obligation.

phil 5510. philosophy of the individual arts. (3.0 cr.; [phil 4510]; prereq 3502; fall, spring, offered periodically) aesthetic problems that arise in studying or practicing an art.

phil 5601. history of the philosophy of science. (3.0 cr.; prereq #; fall, spring, offered periodically) 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.

phil 5602. scientific representation and explanation. (3.0 cr.; prereq #; ) contemporary issues concerning representation and explanation of scientific facts.

phil 5603. scientific inquiry. (3.0 cr.; spring, offered periodically) 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. (3.0 cr.; [phil 4605]; prereq courses in [philosophy or physics] or #; ) philosophical problems concerning nature/structure of space, time, and space-time.

phil 5606. philosophy of quantum mechanics. (3.0 cr.; ) 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 5622. philosophy and feminist theory. (3.0 cr.; [phil 4622, GWSS 4122, GWSS 5122]; prereq 8 crs in [philosophy or women's studies] or #; ) encounters between philosophy/feminism. gender's influence in traditional philosophical problems/methods. social role of theorist/theorizing as they relate to politics of feminism.

phil 5760. selected topics in philosophy. (3.0 cr. [max 9.0 cr.]; prereq 3xxx-5xxx course in phil or #; fall, spring, offered periodically) philosophical problems of contemporary interest. topics specified in class schedule.

phil 5993. directed studies. (1.0-3.0 cr. [max 6.0 cr.]; prereq #, %, @; fall, spring, summer, every year) guided individual reading or study.

phil 8010. workshop in history of philosophy. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx hist of phil course; #; fall, spring, every year) topics vary by offering.

phil 8080. seminar: history of ancient and medieval philosophy. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, every year) topics vary by offering.

phil 8081. seminar: history of philosophy--ancient philosophers. (3.0 cr.; ) major developments in ancient Greek philosophical thought; methods and role of history of philosophy in discipline of philosophy.

phil 8085. seminar: history of philosophy--modern philosophers. (3.0 cr.; prereq #; ) major developments in modern philosophic thought; methods and role of history of philosophy in discipline of philosophy.

phil 8090. seminar: history of modern philosophy. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, every year) topics vary by offering.
PHIL 8100. Workshop in Epistemology and Metaphysics. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx [epistemology or metaphysics] course; #; fall, spring, every year)
Topics vary by offering.

PHIL 8110. Seminar: Metaphysics. (3.0 cr. [max 6.0 cr.]; prereq 4101 or #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8130. Seminar: Epistemology. (3.0 cr. [max 6.0 cr.]; prereq 4105 or #; fall, spring, every year)
Problems in the theory of knowledge. Topics specified in [Class Schedule].

PHIL 8131. Epistemology Survey. (3.0 cr.; )
Survey, against background of traditional issues, of contemporary developments in theory of knowledge.

PHIL 8133. Feminist Theories of Knowledge. (3.0 cr.; fall, offered periodically)
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. (3.0 cr. [max 6.0 cr.]; prereq 4231 or #; fall, every year)
Topics vary by offering.

PHIL 8182. Formal Semantics of Natural Language. (3.0 cr.: A-F or Audit; =LING 8221); prereq Phil 5201 or #; )
Truth-conditional model-theoretic semantics applied to treatment of opacity, intensionality, quantification, and related phenomena in natural language.

PHIL 8200. Workshop in Logic and Philosophy of Mathematics. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx logic or 4xxx phil of math]; #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8210. Seminar: Logical Theory. (3.0 cr. [max 6.0 cr.]; prereq [5201, 5205] or #; fall, spring, every year)
Topics vary by offering.

PHIL 8220. Seminar: Philosophy of Mathematics. (3.0 cr. [max 6.0 cr.]; prereq 5202 or [4xxx or 5xxx] math course or #; fall, spring, every year)
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.

PHIL 8300. Workshop in Moral and Political Philosophy. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx moral phil or 4xxx pol phil] #; fall, spring, every year)
Topics vary by offering.

PHIL 8310. Seminar: Moral Philosophy. (3.0 cr. [max 9.0 cr.]; prereq 4310 or 4320 or 4330 or #; fall, spring, every year)
Concepts/problems relating to ethical discourse.

PHIL 8320. Seminar on Medical Ethics. (3.0 cr. [max 6.0 cr.]; prereq [4xxx or 5xxx] ethics course or #; spring, offered periodically)
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.

PHIL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHIL 8410. Seminar: Philosophy of Law. (3.0 cr. [max 6.0 cr.]; prereq 5415 or #; fall, spring, every year)
Primarily for law students and advanced political science, history, or sociology majors or minors.

PHIL 8420. Seminar: Political Philosophy. (3.0 cr. [max 6.0 cr.]; prereq 4321 or 4414 or #; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

PHIL 8500. Workshop in Aesthetics. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx aesthetics course; #; fall, spring, every year)
Topics vary by offering.

PHIL 8510. Seminar: Aesthetics Studies. (3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Topics vary by offering.

PHIL 8550. Seminar: Philosophy of Religion. (3.0 cr. [max 6.0 cr.]; prereq 4521 or #; fall, spring, every year)
Topics vary by offering.

PHIL 8600. Workshop in the Philosophy of Science. (1.0 cr. [max 4.0 cr.]; prereq & 4xxx phi of sci course; #; fall, spring, every year)
Topics vary by offering.

PHIL 8606. Seminar: Philosophy of Medicine and the Biomedical Sciences. (3.0 cr.; fall, spring, every year)
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. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, offered periodically)
Topics specified in [Class Schedule].

PHIL 8620. Seminar: Philosophy of the Biological Sciences. (3.0 cr. [max 6.0 cr.]; fall, every year)
Topics vary by offering.

PHIL 8640. Seminar: Philosophy of the Cognitive Sciences. (3.0 cr. [max 6.0 cr.]; =[CGSC 8000]; prereq #; spring, even years)
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.

PHIL 8660. Seminar: Social and Cultural Studies of Science. (3.0 cr. [max 6.0 cr.]; =SST 8420]; fall, spring, offered periodically)
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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

PHIL 8670. Seminar: Philosophy of Science. (3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, every year)
Topics vary by offering.

PHIL 8710. Seminar: Feminist Philosophy. (3.0 cr. [max 6.0 cr.]; prereq 4622 or 5622 or WoSt 4122 or WoSt 5122 or #; fall, offered periodically)
Topics vary by offering.

PHIL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)
(No description)

PHIL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)
(No description)

PHIL 8993. Directed Study. (1.0-3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, summer, every year)
Tbd

PHIL 8994. Directed Research. (1.0-3.0 cr. [max 6.0 cr.]; prereq #; fall, spring, every year)
Tbd

Physical Medicine and Rehabilitation (PMED)

PMED 8200. Physical Medicine and Rehabilitation Service. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8207. Basic and Applied Psychiatry. (1.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

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PMED 8210. Research in Physical Medicine. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, every year)

PMED 8212. Electromyography. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8214. Readings in Electromyography. (1.0-3.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

PMED 8220. Seminar: Physical Medicine and Rehabilitation. (1.0-15.0 cr.; prereq enrolled in PMed residency training program; fall, spring, summer, every year)

TBD

Physical Therapy (PT)

Medical School

PT 8131. Research Seminar I. (1.0 cr.; S-N or Audit; prereq Grad PT major; fall, every year) Scientific thinking in physical therapy. Preparation to execute research project or literature review. Analysis of current literature. Basic features of research design. Elements of evaluating treatment efficacy. Students interact with their research adviser and with research faculty in various specialties.

PT 8132. Research Seminar II. (1.0 cr.; A-F or Audit; prereq 8131, grad PT major; fall, spring, every year) Scientific thinking in physical therapy. Preparation for research project or literature review. Current literature. Features of research design. Evaluating treatment efficacy. Students interact with research adviser and faculty in various specialties.

PT 8193. Research Problems in Physical Therapy. (1.0-7.0 cr.; A-F or Audit; prereq Grad PT major; fall, spring, summer, every year) Process of developing/completing a scholarly research project or literature review related to rehabilitation science. Type of research experience is determined by adviser.

PT 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PT 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

Physics (PHYS)

Institute of Technology


PHYS 5002. Quantum Mechanics II. (4.0 cr.; prereq 5001 or equiv; spring, every year) 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.

PHYS 5011. Classical Physics I. (4.0 cr.; prereq 4001, 4002 or #; fall, every year) Classical mechanics: Lagrangian/Hamiltonian mechanics, orbital dynamics, rigid body motion, special relativity.

PHYS 5012. Classical Physics II. (4.0 cr.; prereq 5011 or #; spring, every year) Classical electromagnetism: electrostatics, magnetostatics, Maxwell’s equations, electromagnetic waves, radiation, interaction of charged particles with matter.


PHYS 5041. Mathematical Methods for Physics. (4.0 cr.; prereq 2601 or grad student; fall, every year) Survey of mathematical techniques needed in analysis of physical problems. Emphasizes analytical methods.

PHYS 5042. Analytical and Numerical Methods of Physics II. (4.0 cr.; prereq 5041 or #) Survey of mathematical techniques, both analytic and numerical, needed for physics. Application to physical problems.

PHYS 5071. Physics for High School Teachers: Experimental Foundations and Historical Perspectives. (3.0 cr.; prereq Gen physics, #; no cr for physics grad or grad physics minor; ) 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.

PHYS 5072. Best Practices in College Physics Teaching. (1.0-3.0 cr. [max 5.0 cr.]; fall, spring, every year) Pedagogies for introductory physics classes. Topics from educational research/practice as applied to classroom.

PHYS 5081. Introduction to Biopolymer Physics. (3.0 cr.; [PHYS 4911]; prereq working knowledge of thermodynamics, statistical mechanics;) Introduction to biological and soft condensed matter physics. Emphasizes physical ideas necessary to understand behavior of macromolecules and other biological materials.


PHYS 5401. Physiological Physics. (4.0 cr.; prereq One semester of introductory calculus-based physics, such as PHYS1301W. Students not sure if they meet prerequisites should consult instructor.; fall, every year) Musculoskeletal system, circulatory system/membrane transport, biological control systems, propagation/action potential in nervous system, biomagnetism, electromagnetism at cellular level.

PHYS 5402. Radiological Physics. (4.0 cr.; prereq Two semesters of introductory calculus-based physics, such as PHYS1302W. Students not sure if they meet prerequisites should consult instructor.; spring, odd years) Signal analysis, medical imaging, medical x-rays, tomography, radiation therapy, nuclear medicine, MRI, similar topics.

PHYS 5621. Introduction to Plasma Physics. (3.0 cr.; prereq CSE grad student, working knowledge of waves/electromagnetism; fall, offered periodically) Basic properties of collisionless, magnetized plasmas, single particle motion, plasmas as fluids, magnetohydrodynamics, waves in plasmas, equilibrium, instabilities, kinetic theory/shocks.

PHYS 5701. Solid-State Physics for Engineers and Scientists. (4.0 cr.; prereq Grad or advanced undergrad in physics or engineering or the sciences; fall, spring, offered periodically) Crystal structure and binding; diffusion; phonons; thermal and dielectric properties of insulators; free electron model; band structure; semiconductors.

PHYS 5702. Solid State Physics for Engineers and Scientists. (4.0 cr.; prereq 5701 or #) diamagnetism and paramagnetism; ferromagnetism and antiferromagnetism; optical phenomena; lasers; superconductivity; surface properties; ferroelectricity.

PHYS 5950. Colloquium Seminar. (1.0 cr.; S-N or Audit; prereq [Grad student or advanced undergrad in physics]; #; fall, spring, every year) Colloquium of School of Physics and Astronomy.

PHYS 5970. Physics Journal Club. (1.0-3.0 cr.; S-N only; prereq 2601, 2605 or equiv; intended for 2nd-yr grad students in physics; fall, spring, every year) Weekly student-led presentation, discussion, and critical analysis of important papers.

PHYS 5980. Introduction to Research Seminar. (1.0 cr. [max 3.0 cr.]; S-N or Audit;
Experimental data summarized and compared with theoretical predictions.

**PHYS 8200. Seminar: Cosmology and High Energy Astrophysics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Current topics in cosmology and high energy astrophysics.

**PHYS 8300. Seminar: Biological and Medical Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Current research in biological and medical physics.

**PHYS 8301. Symmetry and Its Application to Physical Problems.** (3.0 cr.; prereq 5002 or #;) 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, molecular, nuclear, condensed-matter, and elementary particle physics.

**PHYS 8311. Biological Physics of Single Molecules.** (3.0 cr.; prereq [5201 or Chen 4707], 5011) or #; spring, every years) 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.

**PHYS 8312. Biological Physics of Macroscopic Systems.** (3.0 cr.; prereq [5201 or Chen 4707], 5011) or #; spring, odd years) 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.

**PHYS 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**PHYS 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

**PHYS 8500. Plan B Project.** (4.0 cr.; prereq #; may be taken once to satisfy Plan B master's project requirement; no cr toward PhD; fall, spring, summer, every year) Project topic arranged between student and instructor. Written report required.

**PHYS 8501. General Relativity and Cosmology I.** (3.0 cr.; prereq 5012 or #; spring, offered periodically) 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, Reisner-Nordstom, and Kerr solutions.

**PHYS 8502. General Relativity and Cosmology II.** (3.0 cr.; prereq 8501 or #;) 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.

**PHYS 8600. Seminar: Space Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; fall, spring, every year) Current topics in space physics and plasma physics.

**PHYS 8601. Plasma Physics I.** (3.0 cr.; prereq 4621, 5012 or #;) Theory of plasma waves and instabilities in plasmas, magnetohydrodynamics, nonlinear waves in plasmas, wave propagation in inhomogeneous plasmas.

**PHYS 8602. Plasma Physics II.** (3.0 cr.; prereq 8601 or #;) Theory of plasma waves and instabilities, collisions, radiation, transport, nonlinear wave-particle and wave-wave interactions, instabilities in inhomogeneous plasmas.

**PHYS 8611. Cosmic Rays and Plasma Astrophysics.** (3.0 cr.; prereq 5012 or #; fall, spring, offered periodically) 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.

**PHYS 8650. Advanced Topics in Space and Plasma Physics.** (3.0 cr.; [max 9.0 cr.]; prereq 8602 or 8611 or #;) Topics in plasma waves and instabilities, solar physics, cosmic ray physics, atmospheric physics or planetary physics.

**PHYS 8666. Doctoral Pre-Thesis Credits.** (1.0-9.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

**PHYS 8700. Seminar: Condensed Matter Physics.** (1.0 cr. [max 6.0 cr.]; S-N or Audit; prereq #; fall, spring, every year) Current research.

**PHYS 8702. Statistical Mechanics and Transport Theory.** (3.0 cr.; prereq 5201 or #; spring, every year) Equilibrium properties of macroscopic classical and quantum systems. Phase transitions and Renormalization Group. Transport theory. Applications to soft condensed matter systems.


**PHYS 8712. Solid-State Physics II.** (3.0 cr.; prereq 8711 or #; spring, every year)
PHYS 8750. Advanced Topics in Condensed Matter Physics. (3.0 cr.; [max 9.0 cr.; prereq 8712 or #])
Sample research topics: magnetism, superconductivity, low temperature physics, superfluid helium.

PHYS 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)

PHYS 8800. Seminar: Nuclear Physics. (1.0 cr. [max 6.0 cr.;] S-N or Audit; fall, spring, every year)
Current research topics.

PHYS 8801. Nuclear Physics I. (3.0 cr.; prereq 5001, 5002, 5011, 5012, 5201; AST 4001 recommended; fall, spring, offered periodically)

PHYS 8802. Nuclear Physics II. (3.0 cr.; prereq 8801 or #)
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.

PHYS 8850. Advanced Topics in Nuclear Physics. (3.0 cr. [max 9.0 cr.;] prereq 8802 or #; fall, odd years)
Research topics.

PHYS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.;] No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
No description.

PHYS 8900. Seminar: Elementary Particle Physics. (1.0 cr. [max 6.0 cr.;] S-N or Audit; fall, spring, every year)
Elementary particle physics, high energy physics, particle astrophysics and cosmology.

PHYS 8901. Elementary Particle Physics I. (3.0 cr.; prereq 8801 or #; fall, every year)

PHYS 8902. Elementary Particle Physics II. (3.0 cr.; prereq 8901 or #; spring, every year)

PHYS 8911. Introduction to Supersymmetry. (3.0 cr.; A-F only; prereq 8011 or #; spring, odd years)

PHYS 8950. Advanced Topics in Elementary Particle Physics. (3.0 cr. [max 9.0 cr.;] prereq 8902 or #)
Research topics.

PHYS 8994. Research in Physics. (1.0-12.0 cr. [max 24.0 cr.;] prereq #; fall, spring, summer, every year)
Research under faculty direction.

PHYS 5061. Principles of Physiology for Biomedical Engineering. (4.0 cr.; prereq Biomedical engineering grad, one yr college chem and physics and math through integral calculus; fall, every year)
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.

PHSL 5094. Research in Physiology. (1.0-5.0 cr. [max 20.0 cr.;] prereq #; fall, spring, every year)
Independent lab research project in physiology supervised by physiology faculty.

PHSL 5095. Problems in Physiology. (1.0-5.0 cr. [max 20.0 cr.;] prereq #; fall, spring, summer, every year)
Individualized study in physiology. Students address selected problem through library or lab research supervised by physiology faculty.

PHSL 5096. Integrative Biology and Physiology Research Advances. (1.0 cr. [max 4.0 cr.;] S-N only; prereq #; fall, spring, every year)
Attendance/participation in IBP Fall/Spring seminar series. Seminars given by faculty, invited speakers, students. Exposure to key topics. How to present seminars.

PHSL 5101. Human Physiology. (5.0 cr.; prereq Grad student; spring, every year)

PHSL 5115. Clinical Physiology I. (3.0 cr.; A-F or Audit; prereq #; fall, every year)
Cellular mechanisms, disease states and clinical applications of excitable tissues: cellular transport, neurophysiology, skeletal muscle physiology, cardiovascular physiology.

PHSL 5116. Clinical Physiology II. (3.0 cr.; A-F or Audit; prereq #; spring, every year)
Cellular mechanisms, disease states and clinical applications of excitable systems: respiratory physiology, renal physiology, acid base physiology, metabolism, gastrointestinal physiology, endocrine physiology, physiology of pregnancy and labor.

PHSL 5197. Stress Physiology. (1.0 cr.; A-F only; prereq #, grad student standing or physiology undergraduate major are recommended. Undergraduates are strongly encouraged to have taken 3061 or equivalent; spring, every year)

PHSL 5201. Computational Neuroscience I: Membranes and Channels. (3.0 cr.; [NSC 5201]; prereq calculus through differential equations; fall, every year)
Neural excitation (ion channels, excitation models, effects of neural morphology) using UNIX workstations to simulate empirical results. Includes the Hodgkin-Huxley model, nonlinear dynamic systems analysis, voltage and ligand gated ion channels, ion transport theories, and impulse initiation and propagation.

PHSL 5350. Humans in Extreme Environments. (2.0 cr.; prereq [3061 or equival]; #; spring, every year)
Physiological systems, human factors, psychological reactions. Countermeasures to enhance performance and prevent negative health consequences. Readings, required paper, final exam.

PHSL 5444. Muscle. (3.0 cr.; [BIOC 5444]; prereq 3061 or 3071 or 5061 or BioC 3021 or BioC 4331 or #; spring, every year)

PHSL 5510. Advanced Cardiac Physiology and Anatomy. (2.0-3.0 cr.; prereq #; spring, every year)
Fundamental concepts, advanced topics related to clinical/biomedical cardiac physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

PHSL 5511. Advanced Neuromuscular Junction Physiology. (2.0-3.0 cr.; max 2.0 cr.; prereq #; summer, every year)
Fundamental concepts and advanced topics related to clinical/biomedical aspects
of neuromuscular junction physiology. Lectures, laboratories, workshops, anatomical dissections. Intense, one week course.

PHSL 5525. Anatomy and Physiology of the Pelvis and Urinary System. (1.0-2.0 cr.; A-F only; [ANAT 5525]; prereq One undergard anatomy course, one undergard physiology course, #; spring, every year)

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.

PHSL 5540. Advanced Exercise Medicine: Physiology and Bioenergetics. (1.0-2.0 cr.; A-F only; prereq [Grad student or practicing health professional]; #; )

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.

PHSL 5700. Cell Physiology. (4.0 cr.; A-F only; prereq [Two semesters of physics/chemistry, calculus, one semester of systems-level physiology] or #; fall, every year)

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.

PHSL 5701. Physiology Laboratory. (1.0-2.0 cr.; A-F or Audit; prereq #; fall, spring, every year)

Experiments in physiology. Emphasizes quantitative aspects, including analysis of organ systems.

PHSL 8216. Selected Topics in Autonomic and Neuroendocrine Regulation. (1.0 cr.; S-N or Audit; )

Advanced seminar.

PHSL 8222. Central Regulation of Autonomic Function. (3.0 cr.; A-F or Audit; prereq NSC 5561 or #; )

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. Offered fall of odd-numbered years.

PHSL 8232. Critical Reading of Journal Articles in Physiology. (2.0 cr. [max 4.0 cr.]; A-F only; prereq &PHSL 5101; #; spring, every year)

Integrative physiology, critical reading of current scientific literature related to lecture topics in the Human Physiology course.

PHSL 8242. Professional Skills Development For Biomedical Scientists. (1.0 cr.; A-F only; prereq #; spring, every year)

Strategies/mechanics of writing grant proposal. NIH study section of grant review. Scientific presentations, dissecting scientific literature, PubMed/NIHReporter tools.

PHSL 8294. Research in Physiology. (1.0-18.0 cr.; prereq Grad cellular and integrative Phsl major, #; fall, spring, summer, every year)

Directed laboratory research.

PHSL 8310. Advanced Topics in Cellular Physiology. (1.0 cr. [max 4.0 cr.; prereq #; fall, spring, every year)

Discussion of primary research publications. Topics vary by semester.

PHSL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

PHSL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

PHSL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

TBD

PHSL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

(No description)

PHSL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

Plant Biological Sciences (PBS)

PBS 8081. Integrative Plant Biology: Connecting Molecules to Ecosystems. (3.0 cr.; A-F only; prereq Plant biological sciences grad student or #; fall, every year)


PBS 8082. Current Topics in Plant Biology: Structure-Evolution-Ecology. (1.0 cr.; S-N or Audit; spring, every year)

Background information and review of selected current literature. For first-year students in plant biological sciences and other biological science graduate programs.

PBS 8123. Research Ethics in the Plant and Environmental Sciences. (0.5 cr.; S-N or Audit; prereq Grad student in [applied plant sciences or plant pathology or plant biological sciences or soil science]; spring, every year)


PBS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)

FTE: Master's

PBS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

PBS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

Doctoral Pre-Thesis Credits

PBS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)

Thesis Credits: Master's

PBS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Passed prelim oral or adviser approval; fall, spring, summer, every year)

Thesis credit: doctoral.

PBS 8900. Seminar. (1.0-2.0 cr. [max 4.0 cr.]; S-N or Audit; fall, spring, every year)

Current scientific research.

PBS 8901. Preparation of Research Proposals. (1.0 cr.; S-N only; prereq Plant biological sciences PhD student; fall, every year)

Grant writing process. Strategies and ethical standards for research proposal preparation/review. Students prepare an original proposal and critique work of others.

PBS 8910. Journal Club. (1.0 cr.; Max 4.0 cr.; S-N or Audit; fall, spring, summer, offered periodically)

Critical evaluation of selected current literature.

PBS 8993. Directed Studies. (1.0-5.0 cr. [max 15.0 cr.]; prereq PBio grad student, #; fall, spring, summer, every year)

Directed Studies

PBS 8994. Research. (1.0-5.0 cr. [max 10.0 cr.]; prereq PBio grad student, #; fall, spring, summer, every year)
Independent research determined by student's interests, in consultation with faculty mentor.

**Plant Biology (PBIO)**

College of Biological Sciences

**PBIO 5109. Current Questions in Fungal Biology.** (2.0 cr.; A-F or Audit; )
Diversity of fungi and their interactions with other organisms. Pathogenic/multiairial interactions with animals/plants. Use of fungal systems for drug discovery and understanding pathogenicity, signal transduction, morphogenesis, and evolution.

**PBIO 5301. Plant Genomics.** (3.0 cr.; =PLPA 5301); prereq [Intro course in genetics, intro course in biochemistry] or #; fall, every year)
Introduction to genomics. Emphasizes plants and relevant model organisms. DNA marker/sequencing technology, comparative genomics, whole genome sequencing, DNA chips/microarrays, EST libraries and SAGE analysis, genome-knockout systems, genome databases, sequence comparison/clustering algorithms, visualization tools.

**PBIO 5412. Plant Physiology.** (3.0 cr.; prereq Biol 2022 or Biol 3002 or Biol 3007, Biol/Bioc 3021 or BioC 4331; fall, every year)
Physiological and biochemical bases of plant systems with emphasis on higher plants.

**PBIO 5514. Plant Molecular Genetics and Development.** (3.0 cr.; prereq BIOC 3021 or BIOL 3021 or BIOL 4003 or BIOC 4332 or equiv; fall, every year)
Survey topics in plant molecular biology. How advances in molecular/genomic biology are used to understand plant physiology and developmental biology. Uses of transgenic plants in research/biotechnology.

**PBIO 5516. Plant Cell Biology.** (3.0 cr.; =PBIO 4516W); prereq [Biol 2022 or Biol 3007 or Biol 3022], [Biol 3021 or BioC 3021 or Biol 4003]; }
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.

**PBIO 5601. Topics in Plant Biochemistry.** (3.0 cr.; A-F or Audit; prereq [Biol 1002 or Biol 1009 or Biol 2003], CHEM 2301; spring, every year)

**Plant Pathology (PLPA)**

College of Food, Agricultural and Natural Resource Sciences

**PLPA 5003. Diseases of Forest and Shade Trees.** (3.0 cr.; spring, every year)
Diseases of trees in urban and forested areas. Biology, ecology, and control of tree diseases.

Identifying disease agents, integrated control procedures. Laboratory.

**PLPA 5090. Issues in Plant Pathology.** (1.0-4.0 cr.; fall, spring, summer, every year)
See Class Schedule or department for current offerings.

**PLPA 5103. Plant-Microbe Interactions.** (3.0 cr.; prereq Intro course in plant pathology or molecular biology or equiv; fall, every year)

**PLPA 5202. Field Plant Pathology.** (2.0 cr.; summer, every year)
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.** (3.0 cr.; prereq BIOL 1009 or equiv; fall, every 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.

**PLPA 5300. Current Topics in Molecular Plant Pathology.** (1.0-2.0 cr.; S-N only; prereq #; fall, every year)
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).

**PLPA 5301. Plant Genomics.** (3.0 cr.; =PLPA 5301); prereq Intro course in genetics or #; fall, every year)
Plants and model organisms. DNA sequencing, comparative genomics, genome structure and function, DNA chips/microarrays, RNA expression, gene-knockout systems, genome databases, sequence comparison/clustering algorithms, and visualization tools.

**PLPA 5444. Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions.** (3.0 cr.; A-F or Audit; prereq Intro plant pathology or advanced biology coursework recommended; fall, every year)
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.

**PLPA 5480. Principles of Plant Pathology.** (3.0 cr.; prereq BIOL 1009 or equiv; fall, every year)
Diseases that affect plants, microbiology and microbial and plant interactions. 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. Lecture and Lab.

**PLPA 5560. Plant Disease Resistance and Applications.** (3.0 cr.; A-F only; prereq 2001, BIOL 4003; spring, every year)
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.

**PLPA 5999. Special Topics in Plant Pathology.** (1.0-8.0 cr.; fall, spring, summer, every year)
Workshops on topics in plant pathology. See Class Schedule or department for current offerings.

**PLPA 8005. Supervised Classroom or Extension Teaching Experience.** (2.0 cr.; S-N or Audit; =BBE 8005, SOIL 8005, AGRO 8005, LAAS 8005, HORT 8005); prereq #; fall, every year)
Teaching experience in one of the following departments: Biosystems and Agricultural Engineering; Agronomy and Plant Genetics; Horticultural Science; Soil, Water, and Climate; or Plant Pathology. Discussions about effective teaching to strengthen skills and develop a personal teaching philosophy.

**PLPA 8090. Advanced Procedures and Research in Plant Pathology.** (1.0-8.0 cr.; fall, spring, summer, every year)
Special assignment in lab and field problems in pathological research.

**PLPA 8103. Plant-Microbe Interactions.** (3.0 cr.; prereq Intro course in plant pathology or molecular biology or equiv; fall, every year)

**PLPA 8104. Plant Virology.** (2.0 cr.; A-F only; prereq 5480; spring, every year)
Characteristics, biology, epidemiology, and control of plant diseases caused by viruses.

**PLPA 8105. Plant Bacteriology.** (2.0 cr.; prereq 5480; spring, every year)
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.

**PLPA 8123. Research Ethics in Plant and Environmental Sciences.** (0.5 cr.; S-N or Audit; =SOIL 8123, APSC 8123; prereq Enrolled in a plant/environmental grad research program; spring, every year)

PLPA 8200. Seminar. (1.0 cr.; A-F only; fall, spring, every year) Critical review and presentation of current problems and progress in plant pathology.

PLPA 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PLPA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year) (No description)

PLPA 8500. Perspectives in Plant Pathology. (2.0 cr. [max 4.0 cr.]; S-N or Audit; fall, every year) Integrative overview of the field. For Ph.D. students nearing end of formal classroom experience.

PLPA 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; % 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; fall, spring, summer, every year) TBD

PLPA 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

PLPA 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)


POL 5252. Renaissance, Reformation, and Revolution: Early Modern Political Thought. (3.0 cr.; spring, every year) Thinkers, themes, and discourses from the Renaissance to the French Revolution. Renaissance Humanists; Machiavelli; More; Reformation; Luther; Calvin; Natural Law; Grotius; Divine Right; Common Law; Bacon; English Revolutionaries; Hobbes; Locke; Astell; Enlightenment; Rousseau; French Revolutionaries; Hume; Burke; Wollstonecraft.

POL 5253. Modernity and its Discontents: Late Modern Political Thought. (4.0 cr.; =[POL 4253]; prereq = 3253; spring, odd years) Theoretical responses to and rival interpretations of Western economy, society, politics, and democratic culture in the modern age; theories of history; class struggle; end of metaphysics and death of God; technology and bureaucracy; psychology of culture in Hegel, Marx, Tocqueville, Mill, Nietzsche, Weber, Freud.

POL 5275. Contemporary Political Thought. (3.0 cr.; prereq = 4275; grad student; 1201 recommended; fall, spring, every year) 20th-century crisis of Western humanism in major works of contemporary political thought from World War II to present. Force and freedom. Ideology and truth. Authority and resistance. Thinkers may include Arendt, Camus, Beauvoir, Fanon, Foucault, Habermas, Rawls, Sartre, Said. Ideas may include communitarianism, feminism, postcolonialism, postmodernism, socialism.

POL 5280. Topics in Political Theory. (3.0-4.0 cr. [max 3.0 cr.]; prereq = 4280; grad student; ) Topics in historical, analytical, or normative political theory. Topics vary, see Class Schedule.

POL 5306. Presidential Leadership and American Democracy. (3.0 cr.; =POL 3306; prereq grad student or #; ) 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.

POL 5308. Congressional Politics and Institutions. (3.0 cr.; =POL 4308, POL 3308; prereq grad student or #; fall, spring, every year) Origin/development of U.S. congressional institutions, parties, committees, leaders, lobbying/elections, and relations between Congress/executive branch. Relationship of campaigning/governing, nature of representation, biases of institutional arrangements.

POL 5309. Justice in America. (3.0 cr.; prereq = 4309; [1001 or 1002]; [non-pol sci grad major or equiv] or #; ) American judiciary, selection of judges, how/why these individuals/institutions behave the way they do. What influences judicial decisions.

What impact decisions have. Why people comply with them.

POL 5310. Topics in American Politics. (3.0 cr.; prereq grad student or #; fall, spring, every year) See Class Schedule for description.

POL 5315. State Governments: Laboratories of Democracy. (4.0 cr.; =[POL 4315W]; prereq grad student or #; ) Political behavior, governmental institutions, and public policies in American states. Comparison among states, between state and national government. Emphasizes Minnesota.

POL 5322. Rethinking the Welfare State. (3.0-4.0 cr. [max 3.0 cr.]; prereq = 4322; grad student; ) 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.

POL 5327. Politics of American Cities and Suburbs. (3.0 cr.; prereq = 4327; [[1001 or 1002], [non-pol sci grad major or equiv]] or #; ) Development/role of American local government. Forms and structures. Relationships with states and federal government. Local politics and patterns of power/influence.

POL 5331. Thinking Strategically in Domestic Politics. (3.0-4.0 cr. [max 3.0 cr.]; prereq = 4331; grad student; ) Applications of rational-choice and game theories to important features of domestic politics in the United States and elsewhere.


POL 5410. Topics in Comparative Politics. (3.0 cr.; prereq grad student; fall, spring, every year) Topics of current analytical or policy importance. Topics vary, see Class Schedule.

POL 5461W. European Government and Politics. (4.0 cr.; =POL 4461W; prereq grad student or #; spring, every year) European political institutions in their social settings. Power and responsibility. Governmental stability. Political decision making. Government and economic order.

POL 5465. Southeast Asian Politics. (3.0 cr.; fall, spring, odd years) U.S. involvement in region. Progress toward and resistance to democratic political systems and economic development.

POL 5473. Chinese Politics. (3.0 cr.; prereq = 4473, EAS 4473; grad student; ) Fundamental conflicts in Chinese society. Democracy movement, human rights, class divisions, gender struggles, environmental
issues, capitalist vs socialist development strategies. Secondary topics include Chinese foreign relations and domestic/foreign political issues in Taiwan.

POL 5477. Strategies and Issues in the Middle East. (4.0 cr.; prereq =: 4477; 1054 or 3051 or non-pol sci grad student or #; ) Turkey, Iran, Israel, and selected Arab states. Domestic politics of religious/secular, ethnic, economic, environmental, and other policy/identity issues. Regional politics of water access, Israeli/Palestinian/Arab world relationships, oil and Persian/Arabian Gulf, human rights.

POL 5478. Contemporary Politics in Africa and the Colonial Legacy. (4.0 cr.; =:[AFRO 4478W, POL 4478W, AFRO 5478]; prereq grad student or #; fall, spring, offered periodically) How current politics in mainly, though not exclusively, sub-Saharan Africa have been shaped by pre-colonial/colonial processes. Reality of independence, recurrent political/ economic crises. Global context and prospects for effective democracy.


POL 5481. Governments and Markets. (3.0-4.0 cr.; =:[POL 4481]; prereq 1054 or 3051 or non-pol sci grad student or #; fall, spring, offered periodically) Connection between democracy and markets. Focuses on countries in North America, Europe.


POL 5487. Struggle for Democratisation and Citizenship. (4.0 cr.; =:[POL 4501W]; prereq grad student; fall, spring, every year) History of democratic movement from its earliest moments in history to present. Attempts to draw balance sheet. Emphasizes how disenfranchised fought to become included.

POL 5501. Supreme Court and Constitutional Interpretation. (3.0 cr.; prereq grad student or #; fall, every year) Historical/analytical approaches to Court's landmark decisions. Theory/techniques of judicial review. Court's authority related to wider political/social context of American government.

POL 5502. Supreme Court, Civil Liberties, and Civil Rights. (3.0 cr.; prereq =: 4502; 1001 or 1002 or equiv or non-pol sci grad student or #; spring, every year) Supreme Court's interpretation of Bill of Rights, 14th amendment. Freedom of speech, press, religion. Crime/punishment. Segregation/de segregation, affirmative action. Abortion/privacy.

POL 5525. Federal Indian Policy. (3.0 cr.; A-F or Audit; prereq =: 4525, Amin 4525; grad student; ) Formulation, implementation, evolution, comparison of Indian policy from pre-colonial times to self-governance of new millennium. Theoretical approaches to federal Indian policy. Major federal Indian policies. Views/attitudes of policy-makers, reactions of indigenous nations to policies. Effect of bodies of literature on policies.

POL 5561. Comparative Legal Systems. (3.0 cr.; =:[POL 4561]; prereq grad student or #; ) Survey of principal legal systems of Western world. Role of legal system in relation to various political/economic systems. Contrast between common law and civil law traditions.


POL 5766. American Political Culture and Values. (3.0-4.0 cr. [max 3.0 cr.]; prereq =: 4766; 1001 or equiv or non-pol sci grad student or #; ) Individualism, freedom, equality. Dominant beliefs about democratic principles, materialism, capitalism, citizenship, patriotism/heroism.

POL 5767. Public Opinion and Voting Behavior. (3.0 cr.; =:[POL 3769]; prereq grad student or #; fall, spring, every year) Major factors influencing electoral decisions. Political attitude formation/change. Data analysis lab required.

POL 5810. Topics in International Politics and Foreign Policy. (3.0 cr. [max 6.0 cr.]; prereq Grad student or advanced undergrad; fall, spring, every year) Selected issues in contemporary international relations. Topics vary, see Class Schedule.

POL 5833. The United States in the Global Economy. For Econ Policy. (3.0-4.0 cr. [max 3.0 cr.]; prereq =: 4833; grad student; 3835 recommended; ) Domestic/international politics of United States. Foreign economic policy (trade, aid, investment, monetary, migration policies). Effects of policies and international economic relations on U.S. economy/politics.

POL 5883. Global Governance. (3.0 cr.; prereq =: 4883; 3835 or non-pol sci grad student or #; fall, spring, summer, offered periodically) Rise/role of inter-governmental organizations such as United Nations, non-governmental organizations. Peacekeeping, trade development, human rights, security and arms control, self-determination, refugees, health, environment. Seminar discussions, class simulations.

POL 5885. International Conflict and Security. (3.0 cr.; =:[POL 4885W]; prereq grad student; ) Alternative theories of sources of militarized international conflict. Theories applied to past conflicts. Theories' relevance to present.

POL 5887. Thinking Strategically in International Politics. (3.0 cr.; A-F or Audit; prereq =: 4887; grad student; fall, spring, odd years) Applications of game theory to international politics. Conflict/cooperation, global environmental commons, deterrence/reputation.

POL 5970. Individual Reading and Research. (1.0-4.0 cr.; max 8.0 cr.; ) Guided individual reading or study. Prereq instr consent, dept consent, college consent.

POL 8060. Research Proseminar in Political Science. (2.0 cr. [max 4.0 cr.]; S-N only; prereq Pol sci grad student; fall, spring, every year) Readings, discussion, guest speakers. Topics vary by semester.

POL 8070. Advanced Research and Writing in Political Science. (2.0 cr. [max 4.0 cr.]; S-N only; fall, spring, every year) 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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, every year) History, scope, and methods of political science as a discipline; current subfields; major research programs (including statism, pluralism, institutionalism, realism, behavioralism, rational choice, and critical theory); problems of theory, interpretation, concept-formation, comparison, measurement and experimentation; designs for research.

POL 8104. Professional Development I. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Pol student, ABD status; fall, every year) Research ethics. Completion of dissertation prospect or early dissertation chapters.

POL 8105. Professional Development II. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Pol sci student, ABD, %; spring, every year) Research ethics. Skills for teaching undergraduate courses in political science. Completion of dissertation prospect or early chapters.

POL 8106. Quantitative Research I. (3.0 cr.; prereq pol sci grad major or #; fall, every year) 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.
POL 8107. Quantitative Political Science II. (3.0 cr.; A-F only; prereq Political science grad major or #; spring, every year) 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.

POL 8120. Core Course in Political Methodology: Modeling Political Processes. (3.0 cr.; prereq Pol sci grad major or #; fall, spring, odd years) 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.

POL 8122. Positive Theory. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Survey of positive political theory and rational-choice models. Information and transaction costs; institutions; models of elections, voting, coalitions.

POL 8124. Game Theory. (3.0 cr.; prereq [8122, grad pol sci major] or #; spring, every year) Application of noncooperative game theory in political science. Equilibrium concepts, bargaining, repeated games, games of incomplete information, signaling games, reputation, learning in games.

POL 8125. Dynamic Analysis. (3.0 cr.; prereq Pol sci grad student or #; fall, spring, offered periodically) Time series method, its application in political science.

POL 8126. Qualitative Methods. (3.0 cr.; prereq Grad student; fall, spring, even years) Qualitative methods in social science. Hands-on training through fieldwork projects. Interviewing, participant observation, narrative interpretation, ethical problems. Issues of gender/race in fieldwork.

POL 8127. Survey Research Methods: Measuring Public Opinion. (3.0 cr.; prereq Pol sci grad major; fall, spring, even years) 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.

POL 8131. Advanced Methods and Models. (3.0 cr.; prereq Grad pol sci major, 6 cr 81xx seminars or #; fall, every year) 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.

POL 8160. Topics in Models and Methods. (3.0 cr. [max 12.0 cr.]; prereq Grad pol sci major or #; fall, spring, every year) Seminars on selected topics, as specified in Class Schedule.

POL 8201. Understanding Political Theory. (1.5 cr.; prereq Grad student or #; fall, spring, every year) Key concepts/major approaches.

POL 8215. Philosophy of Political Inquiry. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8225. American Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8235. Democratic Theory. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8251. Ancient and Medieval Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) Politics and ethics in Greece, Rome, Christendom: Thucydides, Socrates, Plato, Aristotle, Cicero, Augustine, Aquinas, Marsilius.

POL 8252. Early Modern Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8253. Late Modern Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) 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, Freud.

POL 8260. Topics in Political Theory. (3.0 cr. [max 6.0 cr.]; prereq Grad pol sci major or #; fall, spring, every year) Readings and research in special topics or problems.

POL 8275. Contemporary Political Thought. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8301. American Politics. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8302. Public Opinion and Political Behavior. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8303. Political Parties. (3.0 cr.; prereq Grad pol sci major or #; fall, every year) 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.

POL 8305. Interest Groups and Social Movements. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) 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.

POL 8307. Proseminar in Political Psychology I. (2.0 cr.; S-N or Audit; =[PSY 8211]; prereq Grad pol sci major or pol psych minor or #; fall, every year) Readings, discussion, and guest speakers. Topics vary by semester.

POL 8308. Proseminar in Political Psychology II. (2.0 cr.; S-N or Audit; =[PSY 8212]; prereq Grad pol sci major or pol psych minor or #; spring, every year)
Readings, discussion, and guest speakers. Topics vary by semester.

POL 8311. Political Psychology and Socialization. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or pol psych minor or #; fall, spring, every year)
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.

POL 8312. Legislative Process. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, every year)
Introduction to study of legislative politics; theories of legislative institutions and individual behavior; congressional elections; congressional committees, parties, and leaders.

POL 8313. Executive Process. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
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.

POL 8314. Judicial Process. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
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.

POL 8320. Social Psychology of Prejudice and Intergroup Relations. (3.0 cr.; A-F or Audit; fall, every year)
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. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, every year)
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.

POL 8325. State Politics and Intergovernmental Relations. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
Theoretical approaches to comparative study of state politics; study of political culture and behavior, governmental institutions, and public policy at state level; federalism.

POL 8331. Constitutional Law. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
Overview of substantive and theoretical debates in American constitutional law; role of law and constitutional interpretation in shaping American political institutions and American politics.

POL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

POL 8335. Public Policy. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
Theoretical approaches: incrementalism, innovation and policy learning, comparative policy outputs, policy process models, interest groups, and selected areas of public policy.

POL 8337. Welfare State Theories and American Social Policy. (3.0 cr.; prereq Grad pol sci major or #; fall, every year)
Rival theoretical explanations for cause and nature of welfare state development in context of four American social policies: social security, welfare, education, and healthcare.

POL 8360. Topics in American Politics. (3.0 cr.; max 9.0 cr.; prereq Grad pol sci major or #; fall, spring, every year)
Readings/research in special topics or problems.

POL 8401. International Relations. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically)
Basic theories/approaches to study of international politics. Surveys representative work/central issues of scholarship.

POL 8402. International Security. (3.0 cr.; prereq Grad pol sci major or #; spring, even years)
Introduction to contending theories of international conflict/security.

POL 8403. International Norms and Institutions. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically)
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.

POL 8404. International Hierarchy. (3.0 cr.; prereq Grad pol sci major or #; fall, offered periodically)
Asymmetric structures and processes of international relations; systemic conditions and implications of informal empire and structures of hegemony; cultural productions of difference and inequality.

POL 8405. International Political Economy. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically)
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.

POL 8406. Politics of International Finance. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically)
Relationship between workings of the international political system and that of international markets for currency and capital.

POL 8407. Morality in World Politics. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically)
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).

POL 8408. International Relations of the Environment. (3.0 cr.; prereq Grad pol sci major or #)
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.

POL 8411. Political Psychology and Foreign Policy. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically)
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.

POL 8412. American Foreign Policy. (3.0 cr.; prereq 8410 or #; fall, spring, offered periodically)

POL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

POL 8460. Topics in International Relations. (3.0 cr.; max 6.0 cr.; prereq Grad pol sci major or #; fall, spring, every year)
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. (3.0 cr.; prereq Grad pol sci major; fall, spring, offered periodically)
Main theoretical approaches and issues: comparative method, the state and class; political culture; development, democratization, rational choice, social movements.

POL 8602. Families, Children, and the State. (3.0 cr.; A-F or Audit; fall, offered periodically)
POL 8603. European Government and Politics. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8605. Government and Politics in Africa. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8608. Government and Politics of Russia and the Commonwealth of Independent States. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8611. Chinese Politics. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) 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.

POL 8615. The Political Economy of Contemporary Japan. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Major bodies of theory on development, democracy and redemocratization, social movements, civil society, the state, and transnational linkages.

POL 8632. Comparative Sociopolitical Change. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Critical evaluation of literature and theoretical perspectives; comparative examination of social and political change and interrelationship between both processes; structure/agency nexus.

POL 8637. Comparative Political Economy. (3.0 cr.; prereq Grad pol sci major or #; fall, spring, offered periodically) Connections between democracy and markets, emphasizing experiences of countries in North America and Europe.

POL 8641. Comparative Mass Political Behavior. (3.0 cr.; A-F or Audit; prereq Grad pol sci major or #; fall, spring, even years) 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.

POL 8643. Comparative Political Institutions. (3.0 cr.; A-F or Audit; prereq Pol sci grad student or #; fall, spring, offered periodically) 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.

POL 8660. Topics in Comparative Politics. (3.0 cr.; max 9.0 cr.; prereq Grad pol sci major or #; fall, spring, every year) Readings in advanced topics or problems. Supervised research/training. Topics specified in Class Schedule.

POL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. max 12.0 cr.; No Grade Associated; 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; fall, spring, summer, every year) TBD

POL 8777. Thesis Credits: Master's. (1.0-18.0 cr. max 50.0 cr.; No Grade Associated; prereq Master's student or problematics such as (post-)colonialism or Luso-Brazilian modernities.

PORT 5930. Topics in Brazilian Literature. (3.0 cr.; max 9.0 cr.; fall, every year) Major issues of Brazilian literature; focuses on important authors, movements, currents, genres. Problems, socioeconomic questions, literary techniques related to Brazilian themes. Topics specified in Class Schedule.

PORT 5970. Directed Readings. (3.0 cr.; max 9.0 cr.; fall, spring, summer, every year) Lusophone studies (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 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) Graduate-level research in literatures and cultures of the Portuguese-speaking world. Topics vary. Prereg Grad student or instr consent.

PORT 8777. Thesis Credits: Master's. (1.0-18.0 cr. max 50.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) TBD

PORT 5520. Portuguese Literary and Cultural Studies. (3.0 cr. max 9.0 cr.; prereq Grad student or #; offered periodically) 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.

PORT 5530. Brazilian Literary and Cultural Studies. (3.0 cr. max 9.0 cr.; prereq Grad student or #; fall, spring, offered periodically) 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.

PORT 5540. Literatures and Cultures of Lusophone Africa. (3.0 cr. max 9.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Origins/development of Lusophone Africa (Angola, Mozambique, Cape-Verde, Guinea-Bissau, Sao Toma, Principe). Literature, cultural/literary criticism, history, sociology, media (film, art, music).

PORT 5910. Topics in Lusophone Cultures and Literatures. (3.0 cr. max 9.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Cultural 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.
Postsecondary Teaching and Learning (PSTL)

College of Education and Human Development

PSTL 5001. Modeling Instruction: Introductory Science Courses. (3.0 cr.; prerequisite: Teaching or preparing to teach) Introduces science courses; fall, spring, summer, every year)

Use of model-centered, guided inquiry method of learning introductory science. Making better use of resources for science education. Strengthening local institutional support for participants as learning community of leaders in disseminating standards-based reform.

PSTL 5010. Diverse Learners in Postsecondary Education. (1.0-3.0 cr. [maximum 6.0 cr.]; fall, spring, every year)

Theories of teaching, learning, student development to diverse student populations in post-secondary settings.

PSTL 5020. Directed Study: Postsecondary Teaching and Learning. (1.0-6.0 cr. [maximum 12.0 cr.]; fall, spring, summer, every year)

Directed study in postsecondary teaching and learning.

PSTL 5050. Reflecting on Professional Development Through Facilitating Peer Learning Groups. (1.0 cr.; S-N or Audit; prerequisite: 90 cr.; fall, every year)

Personal/professional development that occurs through facilitating peer learning groups. Power of peer learning environments on students and those who serve as facilitators. Direct instruction, directed learning tasks, intense reflective activities.

PSTL 5015. Increasing Access and Success in Undergraduate Classrooms. (3.0 cr.; A-F or Audit; fall, spring, summer, every year)

Fundamentals and best practices for promoting student access, persistence, and retention within classroom. Focuses on traditionally under-represented/served populations.

PSTL 5016. Multicultural Teaching and Learning in Diverse College Contexts. (3.0 cr.; A-F only; prerequisite: Grad student; fall, every year)

Theory/pedagogy for culturally responsive teaching from perspectives of teachers/learners in postsecondary settings. Critical multicultural education, universal instructional design, integrated multicultural instructional design.

PSTL 5196. Supervised Practicum in Multicultural Postsecondary Teaching and Learning. (3.0 cr.; S-N only; prerequisite: Grad student in PSTL certificate program or admitted to PSTL master's program; fall, spring, summer, every year)

Postsecondary teaching experience in supervised settings. Weekly group supervision session. Classroom experiences, learning centers, and other postsecondary teaching venues.

PSTL 5206. Action Research Methods to Improve College Teaching and Learning. (3.0 cr.; A-F or Audit; prerequisite: Grad student; spring, every year)

Action research as method of improving teaching/learning at postsecondary level. Experience doing research in college classrooms. Relative strengths/challenges of different approaches to classroom research. Ethical issues.

PSTL 5212. Multicultural Theories of College Student Development Applied to Teaching and Learning. (3.0 cr.; A-F only; prerequisite: Grad student; fall, spring, summer, every year)

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.

PSTL 8010. Special Topics: Postsecondary Teaching and Learning. (1.0-3.0 cr. [maximum 6.0 cr.]; fall, spring, summer, every year)

Special topics on current research/best practices in postsecondary education contexts.

PSTL 8296. Supervised Internship in Postsecondary Teaching and Learning. (3.0-6.0 cr.; S-N only; prerequisite: 5196, graduate student admitted to master's program in multicultural college teaching/learning; fall, spring, summer, every year)

Classroom-based or online group supervision. Weekly supervised experiences. Internship settings based on students' interests/goals.

PSTL 8315. Plan B Capstone Seminar. (3.0 cr.; S-N only; prerequisite: 5206, graduate 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; fall, spring, summer, every year)

Determining topic, creating timeline, and initiating project in conjunction with year 2 internship.

PSTL 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prerequisite: Master's student, adviser consent, DGS consent; fall, spring, summer, every year)

FTE: master’s.

PSTL 8777. Thesis Credits: Master's. (1.0-18.0 cr. [maximum 50.0 cr.; No Grade Associated; fall, spring, summer, every year])

Thesis credits: master’s.

Preventive Science Minor (PREV)

College of Education and Human Development

PREV 8001. Prevention Science Core. (3.0 cr.; prerequisite: Student Option No Audit; prerequisite: Grad student; spring, every year)


PREV 8005. Prevention Science Capstone Course. (1.0 cr.; prerequisite: Student Option No Audit; prerequisite: 8001; fall, every year)

Topics for preservation research project. Students discuss possible projects with faculty/peers. Students present final proposal for research project.

Product Design (PDES)

College of Design

PDES 5170. Topics in Product Design. (1.0-4.0 cr. [maximum 8.0 cr.]; A-F or Audit; prerequisite: Jr or Sr or grad student; fall, spring, summer, every year)

In-depth investigation of specific topic, announced in advance.

PDES 5193. Directed Study in Product Design. (1.0-4.0 cr. [maximum 8.0 cr.]; A-F or Audit; prerequisite: Grad; fall, spring, summer, every year)

Independent study in product design under tutorial guidance.

PDES 5701. Creativity, Idea Generation, and Innovation. (3.0 cr.; A-F only; fall, every year)

Half-semester course. Introduction to a variety of creativity and idea generation tools with emphasis on innovative product concept development. Students apply different tools 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. (3.0 cr.; A-F only; fall, every year)

Sketching and marker 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 5703. Product Form and Model Making. (4.0 cr.; A-F only; fall, every year)


PDES 5704. Innovative Computer Modeling and Rendering for Design. (3.0 cr.; A-F only; prerequisite: =PDES 3704; prerequisite: Senior or grad student; spring, every year)

Overview of how to make well-modeled, properly illuminated, and carefully composed digital models of existing/conceptual objects.

PDES 5711. Toy Product Design. (4.0 cr.; A-F only; spring, every year)

Product design process with a focus on creativity and designing for play. Project-centric. Students work in small teams of 5-6 members to design and prototype new toys with the help of local industry and children.

PDES 8192. Readings in Product Design. (1.0-3.0 cr. [maximum 6.0 cr.]; A-F or Audit; prerequisite: Grad; fall, spring, every year)

Independent study; review of books and periodicals under tutorial guidance.

PDES 8193. Directed Study in Product Design. (1.0-4.0 cr. [maximum 8.0 cr.; A-F or Audit; prerequisite: Grad; fall, spring, summer, every year)
PSY 5012. Learning and Cognition in Animals. (4.0 cr.; prereq 3011 or 4011 or honors or grad student or #; fall, every year) Review/evaluation of key questions, methods, theories, and data about forms of learning and elementary cognitive processes. Emphasizes animal models. Implications for human learning/behavior.

PSY 5014. Psychology of Human Learning and Memory. (3.0 cr.; prereq 3011 or 3051 or honors or grad student; spring, even years) Human memory encoding/retieval. How we adaptively use memory. Brain systems that support memory. Episodic/semantic memory. Working/short-term memory. Procedural memory. Repetition priming. Prospective remembering. Autobiographical memory.

PSY 5015. Cognition, Computation, and Brain. (3.0 cr.; prereq [Honors or grad] or [jr or sr], [3011 or 3031 or 3051 or 3061]) or #; spring, odd years) Human cognitive abilities (perception, memory, attention) from different perspectives (e.g., cognitive psychological approach, cognitive neuroscience approach).

PSY 5018H. Mathematical Models of Human Behavior. (3.0 cr.; A-F only; prereq Math 1271 or #; fall, offered periodically) 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.

PSY 5031W. Perception. (3.0 cr.; prereq 3031 or 3051 or #; fall, odd years) 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.

PSY 5036W. Computational Vision. (3.0 cr.; prereq [3031 or 3051], [Math 1272 or equiv]) or #; fall, even years) Applications of psychology, neuroscience, computer science to design principles underlying visual perception, visual cognition, action. Compares biological/physical processing of images with respect to image formation, perceptual organization, object perception, recognition, navigation, motor control.

PSY 5037. Psychology of Hearing. (3.0 cr.; prereq [MATH 1271, 3031 or 3051 or 3061]) or grad student; fall, offered periodically) Biological and physical aspects of hearing, auditory psychophysics, theories and models of hearing, perception of complex sounds including music and speech. Clinical/other applications.

PSY 5038W. Introduction to Neural Networks. (3.0 cr.; prereq [[3061 or NSC 3102], [MATH 1282 or 2243]) or #; fall, odd years) 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.

PSY 5054. Psychology of Language. (3.0 cr.; prereq Grad or [jr or sr], [3011 or 3031 or 3051 or 3061] or #; fall, every year) Theories/experimental evidence in past/present conceptions of psychology of language.

PSY 5062. Cognitive Neuropsychology. (3.0 cr.; prereq Grad or [jr or sr], [3011 or 3031 or 3051 or 3061] or #; fall, every year) 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. Minimal amount of brain anatomy.

PSY 5063. Introduction to Functional MRI. (3.0 cr.; A-F only; prereq Jr or sr or grad or #; fall, every year) 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/acquire and analyze their own functional MRI data. Lectures/lab exercises.

PSY 5064. Brain and Emotion. (3.0 cr.; A-F or Audit; prereq 3061 or 5061 or #; spring, even years) 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.

PSY 5065. Functional Imaging: Hands-on Training. (3.0 cr.; prereq [3801 or equiv], [3061 or NSCI 3101], #; spring, every year) Basic neuroimaging techniques/functional magnetic resonance imaging (fMRI). First half of semester covers basic physical principles. Second half students design/executes fMRI experiment on Siemens 3 Tesla scanner.

PSY 5011. Personality Psychology. (3.0 cr.; [PSY 3101]; prereq [3001W or equiv]; [honors undergrad or grad student]; spring, even years) Current theory and research on personality functioning and personality structure. Descriptive, biological, evolutionary, cognitive, developmental, cultural, and narrative perspectives on personality.

PSY 5135. Psychology of Individual Differences. (3.0 cr.; [PSY 3135]; prereq [3001W or equiv] or [5862 or equiv] or #; spring, offered periodically) 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.

PSY 5136. Human Abilities. (3.0 cr.; prereq [3001W or 3011V], [3135 or 5135], [5862 or equiv] or #; spring, every year) Theory, methods, and applications of research in human abilities. Intelligence, aptitude, achievement, specific abilities, information processing/learning and intelligence, aptitude/treatment interactions, and quantitative measurement issues.

PSY 5137. Introduction to Behavioral Genetics. (3.0 cr.; prereq 3001W or equiv or #; fall, every year) 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.

PSY 5202. Attitudes and Social Behavior. (3.0 cr.; prereq 3201 or #; spring, offered periodically) Theory/research on social psychology of beliefs/attitudes. Persuasion principles.

PSY 5204. Psychology of Interpersonal Relationships. (3.0 cr.; A-F only; prereq Honors or grad student or #; fall, offered periodically) Introduction to interpersonal relationship theory/research findings.

PSY 5205. Applied Social Psychology. (3.0 cr.; prereq 3201 or grad student or #; spring, even years) Applications of social psychology research/theory to domains such as physical/mental health, education, the media, desegregation, the legal system, energy conservation, public policy.

PSY 5206. Social Psychology and Health Behavior. (3.0 cr.; A-F only; prereq 3201 or grad student or #; spring, offered periodically) Survey of social psychological theory/research pertaining to processes by which people develop beliefs about health/illness. Relationship between these beliefs, adoption of health-relevant behavior. Effect of psychological factors on physical health.

PSY 5207. Personality and Social Behavior. (3.0 cr.; A-F or Audit; prereq 3101 or 3201 or honors or grad student or #; fall, every year) Conceptual/methodological strategies for scientific study of individuals and their social worlds. Applications of theory/research to issues of self, identity, and social interaction.

PSY 5501. Vocational and Occupational Health Psychology. (3.0 cr.; prereq 3001W or equiv or #; spring, every year) 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/assessment, career decision-making/counseling, person-environment fit.
PSY 5707. Personnel Psychology. (4.0 cr.; [PSY 5701]; prereq [3001W or equiv]; 3711 or #; fall, every year) 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.

PSY 5708. Organizational Psychology. (3.0 cr.; [PSY 5702, PSY 5705]; prereq [3001W, 3711] or psy grad or #; spring, every year) 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. (3.0 cr.; prereq 3801H or MATH 1271 or grad student; fall, every year) Types of measurements (tests, scales, inventories) and their construction. Theory/measurement of reliability/validity.


PSY 5960. Topics in Psychology. (1.0-4.0 cr. [max 8.0 cr.]; prereq PSY 1001, [Ir or sr or grad student]; fall, spring, summer, offered periodically) Special course or seminar. Topics listed in Class Schedule.

PSY 5993. Research Laboratory in Psychology. (3.0 cr. [max 15.0 cr.]; prereq #; fall, spring, every year) Laboratory instruction and seminars in faculty research areas.

PSY 8004. Philosophical Psychology. (3.0 cr.; S-N or Audit; prereq Grad student or #; spring, offered periodically) Selected philosophical/methodological problems.

PSY 8010. Advanced Topics in Learning. (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq 5012 or #; spring, offered periodically) Contemporary topics in learning and behavior theory.

PSY 8026. Neuro-Immune Interactions. (3.0 cr.; [NSC 8026]; prereq MCB 4131 or equiv, NSC 5111 or equiv;) Regulatory systems (neuroendocrine, cytokine, and autonomic nervous systems) linking brain and immune systems in brain-immune axis. Functional effects of bidirectional brain-immune regulation.


PSY 8036. Topics in Computational Vision. (3.0 cr. [max 12.0 cr.]; prereq 5031 or 5036 or equiv or #; spring, every year) Recent research in visual psychophysics, visual neuroscience, and computer vision.


PSY 8041. Seminar in Perception. (3.0 cr.; A-F or Audit; prereq Psy grad student or #; fall, odd years) 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.

PSY 8042. Seminar in Cognition, Brain, and Behavior . (3.0 cr.; A-F or Audit; prereq Psy grad student or #; fall, even years) Advanced topics in cognition, brain, and behavior. Lecture, discussion, and student-led presentations of research papers on core topics of attention, memory, emotion, categorization, thinking, and language, and intersections between these areas.

PSY 8055. Seminar: Cognitive Neuroscience. (3.0 cr.; prereq 5015 or #; spring, even years) Recent advances in analysis of neural bases of cognitive functions.

PSY 8056. Seminar: Psychology of Language. (3.0 cr.; A-F or Audit; prereq Grad psych major or #; fall, spring, offered periodically) Selected topics in psycholinguistics.

PSY 8061. Neuropsychopharmacology. (3.0 cr.; A-F or Audit; [CMB 8208]; prereq 5xxx coursework in biological psych or neuroscience or pharmacology or #; fall, even years) Relationships between biochemical, neurophysiological, psychological, and behavioral effects of drugs. Research in neuropsychopharmacology, behavioral pharmacology, and pharmacology of addiction.

PSY 8070. Seminar: Psychopharmacology. (1.0-3.0 cr. [max 12.0 cr.]; [NSC 8207, PHCL 8207]; #; fall, spring, every year) Basic issues, contemporary research. Lectures, student presentations.

PSY 8111. Biological, Cognitive, Affective, Social, Developmental and Historical Aspects of Psychopathology. (4.0 cr.; A-F or Audit; prereq Clinical psych grad student; #; fall, every year) Descriptive psychopathology. Theory/research. Evaluation of current experimentation in various behavior disorders.

PSY 8201. Social Cognition. (3.0 cr.; A-F or Audit; prereq Psych PhD candidate; fall, offered periodically) Social psychological theory/research on social inference and reasoning processes. Psychology of prejudice/stereotyping.

PSY 8202. Close Relationships. (3.0 cr.; prereq 5204 or #; spring, offered periodically) Classic/contemporary theory/research on close relationships. Emphasizes romantic relationships.

PSY 8203. Impression Management. (3.0 cr.; prereq Grad psych major; 8208 recommended; #; fall, offered periodically) Classic and contemporary theory and research concerning interpersonal strategies of impression management and interplay between private and public self.

PSY 8204. Social Psychology of Prejudice and Intergroup Relations. (3.0 cr.; A-F or Audit; fall, offered periodically) 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. (3.0 cr. [max 15.0 cr.]; prereq Psy PhD student; fall, every year) Contemporary theoretical positions and related research.

PSY 8206. Seminar in Social Psychology. (1.0 cr. [max 5.0 cr.]; S-N only; prereq [PSY 8205, Social Psych PhD student] or #; spring, every year) Current research topics in social psychology.

PSY 8208. Social Psychology: The Self. (3.0 cr.; A-F or Audit; prereq Psych background especially in personality and soc psych; spring, every year) Social psychological theory and research concerning the self and social behavior.


PSY 8210. Law, Race, and Social Psychology. (3.0 cr.; A-F only; prereq 2nd or 3rd yr law student or PhD student in social science doctoral program; fall, offered periodically) 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.

PSY 8211. Seminar in Political Psychology I. (1.0 cr.; S-N or Audit; [POL 8307]; prereq Political Psychology grad minor; fall, spring, offered periodically) Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8212. Seminar in Political Psychology II. (1.0 cr.; S-N or Audit; [POL 8308]; prereq Political Psychology grad minor; fall, spring, offered periodically)
Readings, discussion, and guest speakers. Topics vary each semester.

PSY 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PSY 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PSY 8501. Counseling Psychology: History and Theories. (3.0 cr.; prereq Counseling psych grad student or #; fall, every year) 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.

PSY 8502. Assessment in Counseling Psychology. (3.0 cr.; prereq Counseling psych grad student or #; spring, every year) Principles and practice. Emphasizes psychometric assessment. History, foundations in measurement, basic methods, survey of instruments, test interpretation evaluation, ethics.

PSY 8503. Interviewing and Intervention. (3.0 cr.; prereq Counseling Psy grad student or #; fall, every year) Skills-based course: conceptualization of counseling process, stages of counseling, development of counseling skills, and strategies for behavior change.

PSY 8510. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; S-N only; prereq Counseling Psy grad student; fall, every year) Beginning applied experiences in counseling psychology settings.

PSY 8511. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; [max 18.0 cr.]; S-N only; prereq Counseling Psy grad student; spring, every year) Beginning applied experiences in counseling psychology settings.

PSY 8512. Counseling Psychology Beginning Practicum: General. (1.0-6.0 cr.; [max 18.0 cr.]; S-N only; prereq Counseling Psy grad student; summer, every year) Beginning applied experiences in counseling psychology settings.

PSY 8514. University Counseling Practicum I. (4.0-6.0 cr.; S-N only; prereq Counseling Psy grad student, instr consent; fall, every year) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clientele.

PSY 8515. University Counseling Practicum II. (4.0-6.0 cr.; S-N only; prereq Counseling Psy grad student; spring, every year) Integrates science with supervised practice in University Counseling and Consulting Services (UCCS) involving career, academic, and personal counseling clientele.

PSY 8541. Multicultural Psychology. (3.0 cr.; prereq #: spring, even years) 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.

PSY 8542. Professional Standards and Ethics in Clinical Psychology. (3.0 cr.; S-N or Audit; prereq Counseling or clinical psych grad student or #: fall, every year) Ethical principles/codes of conduct for psychologists. Ethical dilemmas faced by researchers, practitioners, teachers.

PSY 8544. Vocational and Occupational Health Psychology Research. (3.0 cr.; prereq [8501, 8502, 8503] or equiv), counseling psy grad student, #: spring, every years) Research problems specific to special populations, vocational research, assessment/testing, findings in these areas useful to counseling psychology practice.

PSY 8545. Counseling Psychology Process and Outcome Research. (3.0 cr.; prereq [8501, 8502, 8503] or equiv), counseling psy grad student, #: fall, every 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.

PSY 8560. Counseling Psychology Advanced Practicum I: General. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #: fall, every year) Applied practice experience in counseling psychology settings and seminars. May include guest speakers, readings, and student presentations.

PSY 8561. Counseling Psychology Advanced Practicum II: General. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #: spring, every year) 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.

PSY 8562. Counseling Psychology Advanced Practicum III: General. (1.0-3.0 cr.; S-N only; prereq Counseling psy grad student, #: summer, every year) Applied practice experience in counseling psychology settings and seminars that may include guest speakers, readings, and students presentations on topics relevant to clients and settings of practice experiences.

PSY 8563. Counseling Psychology Advanced Practicum I: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #: spring, every year) Field experience in professional work in clinical settings.

PSY 8564. Counseling Psychology Advanced Practicum II: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #: summer, every year) Field experience in professional work in clinical settings.

PSY 8565. Counseling Psychology Advanced Practicum III: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #: fall, every year) Field experience in professional work in clinical settings.

PSY 8566. Counseling Psychology Advanced Practicum I: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #: summer, every year) Field experience in professional work in clinical settings.

PSY 8567. Counseling Psychology Advanced Practicum II: Career Counseling and Assessment Clinic. (1.0-6.0 cr.; S-N only; prereq Counseling psy grad student, #: spring, every year) Field experience in professional work in clinical settings.
PSY 8622. Theories and Methods of Effective Intervention. (3.0 cr.; A-F or Audit; prereq 8111, CSPR grad student; spring, odd years)
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.

PSY 8664. Personality Assessment. (3.0 cr.; prereq Psy grad student or #; spring, odd years)
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.

PSY 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

PSY 8701. Seminar in Industrial and Organizational Psychology I. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically)
Application of research and theory in psychological measurement and individual differences to problems in job analysis, personnel selection and classification, performance assessment, and individual training.

PSY 8702. Seminar in Industrial and Organizational Psychology II. (3.0 cr.; A-F or Audit; prereq #; fall, offered periodically)
Determinants of behavior, performance, job satisfaction that can be influenced after an individual enters an organization. Application of research/theory in attitudes, motivation, leadership, group/team dynamics, and job design to enhancement of job performance/satisfaction.

PSY 8703. Seminar in Industrial and Organizational Psychology III. (3.0 cr.; A-F or Audit; prereq #; spring, offered periodically)
Developing issues/trends in current research, research methodological advances, and implementation practices. Recent important/controversial developments.

PSY 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)

PSY 8814. Analysis of Psychological Data. (4.0 cr.; prereq Undergrad course in statistics, grad student in psychology, #; fall, every year)

PSY 8815. Analysis of Psychological Data. (4.0 cr.; prereq 8814, #; spring, every year)

PA 5001. Intellectual Foundations of Public Action. (1.5 cr.; fall, spring, offered periodically)
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; prereq Major or minor in public policy or science/technology/environmental policy or #; fall, spring, every year)
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; prereq Public policy major/minor or major in development practice, public affairs or liberal studies or grad nonprofit mgmt cert or #; fall, spring, every year)

PA 5004. Introduction to Planning. (3.0 cr.; A-F or Audit; prereq Major/minor in urban/regional planning or #; fall, spring, every year)
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.

PA 5011. Management of Organizations. (3.0 cr.; A-F or Audit; prereq Major/minor in public policy or #; fall, spring, every year)
Challenges facing higher-level managers in public/nonprofit organizations in mixed economy/democratic republic. Distinctive features of public/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. (3.0 cr.; A-F or Audit; prereq Major or minor in political science or [sci, tech, and environ policy] or public affairs PhD or #; spring, every year)
Stages of policy making from agenda setting to implementation. Role/behavior of political institutions, citizens, social movements, 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; prereq Major or minor in urban/regional planning or #; fall, every year)
Role of law in regulating/shaping urban development, land use, environmental quality, local/regional governmental services. Interface between public/private sector.
PA 5021. Economics For Policy Analysis and Planning I. (3.0 cr.; A-F or Audit; prereq [Econ 1101 or equiv], major or minor in public policy or science/technology/environmental policy or #; fall, every year) Introduction to tools useful for public policy. Intermediate microeconomics, macroeconomics, concepts of international trade.

PA 5022. Economics For Policy Analysis and Planning II. (1.5-3.0 cr.; [max 4.5 cr.;] A-F or Audit; prereq [[5021 or equiv], public policy major or #; spring, every year) Application of economic reasoning to various public policy issues. Cost-benefit analysis, nonmarket valuation, and tax analysis.


PA 5032. Regression Analysis. (2.0 cr.; A-F or Audit; prereq [5031 or equiv], major or minor in public policy or science/technology/environmental policy or #; spring, every year) Bivariate/multivariate models of regression analysis, assumptions behind them. Problems using these models when such assumptions are not met.

PA 5033. Multivariate Techniques. (2.0 cr.; A-F or Audit; prereq [5032 or equiv], major/minor in pub policy or sci/tech/env policy or #; May fulfill stats requirements in other programs.; spring, every year) Public affairs topics using maximum-likelihood estimation approaches.

PA 5035. Survey Research and Data Collection. (1.5 cr.; A-F only; prereq [5031 or equiv], [major in publ policy or sci, tech, environ policy or urban/regional planning] or #; fall, every year) 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 5038. Analytics for Leaders I. (3.0 cr.; A-F only; prereq Major in public affairs or public affairs leadership certificate or #; fall, spring, every year) Skills to do basic quantitative analyses, evaluate research, develop evidence-based policy, and lead data-driven organizations. Descriptive statistics, research design. Ethical issues in interpretation, analysis, and use.

PA 5039. Analytics for Leaders II. (3.0 cr.; A-F only; prereq 5038; fall, spring, every year) Builds on 5038. Skills to do basic quantitative analyses, evaluate research, develop evidence-based policy, and lead data-driven organizations. Descriptive statistics, research design. Ethical issues in interpretation, analysis, and use.

PA 5041. Qualitative Methods for Policy Analysts. (4.0 cr.; A-F only; prereq Major or minor in public policy or science/technology/environmental policy or #; fall, every year) Qualitative analysis techniques, examples of application. Meet with researcher. Hands-on experience in designing, gathering, analyzing data.

PA 5042. Urban and Regional Economics. (2.0 cr.; A-F only; prereq [Major or minor in urban and regional planning, microeconomics course] or #; spring, every year) 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.

PA 5043. Economic and Demographic Data Analysis. (2.0 cr.; A-F only; prereq Major or minor in urban/regional planning or #; spring, every year) Economic/demographic data analysis techniques for planning. Exposure to most important data sources. Conceptual understanding of range of methods/hands-on experience in applying these methods.

PA 5044. Regression Analysis, Accelerated. (2.0 cr.; A-F only; prereq Major or minor in public policy or sci, tech, and environ policy, [5031 or equiv or #]; spring, every year) Bivariate/multivariate models used in regression analysis, including assumptions behind them/problems that arise when assumptions are not met. Course covers similar topics as PA5032 but uses more mathematical notation/delves deeper into theory/application of methods.

PA 5051. Cohort Leadership I. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr; fall, every year) Leadership theories, tools, and strategies in global context for the mid-career student.

PA 5052. Cohort Leadership II. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5052 must be taken in same academic yr; spring, every year) Leadership theories, tools, and strategies in global context for the mid-career student.

PA 5053. Cohort Policy Analysis I. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5051-5054 must be taken in same academic yr; fall, every year) Process of public policy analysis, including problem formulation, problem-solving, and communication of findings. Commonly used analytical methods. Use of multimedia mini-cases, including readings, cases, and simulation exercises.

PA 5054. Cohort Policy Analysis II. (2.0 cr.; A-F only; prereq Major in public affairs (cohort) or public affairs certificate (cohort); 5053-5054 must be taken in same academic yr; spring, every year) Continues 5053. Process of public policy analysis, including problem formulation, problem-solving, and communication of findings. Commonly used analytical methods. Use of multimedia mini-cases, including readings, cases, and simulation exercises.


PA 5056. Cohort Analytics for Leaders II. (2.0 cr.; A-F only; prereq Major in public affairs or public affairs certificate, [5055-5056 must be taken in same academic yr]; spring, every year) Problem-based learning approach to quantitative analysis. Frequency distributions, descriptive statistics, elementary probability, statistical inference. Hypothesis testing. Cross-tabulation, analysis of variance, correlation. Simple/multiple regression analysis. Data set development.

PA 5057. Executive Leadership I. (6.0 cr.; A-F only; prereq Executive Leadership postbaccalaureate certificate student; spring, every year) Institutional leadership, management, interdisciplinary studies. Emerging issues/public policy to develop executive leaders. Opportunities for practicing/reassessing leadership inside/outside workplace. Field-based management issues.

PA 5058. Executive Leadership II. (6.0 cr.; A-F only; prereq Executive leadership postbaccalaureate certificate; summer, every year) Institutional leadership, management, interdisciplinary studies. Emerging issues/public policy to develop executive leaders. Opportunities for practicing/reassessing leadership inside/outside the workplace. Field-based management issues.

PA 5080. Capstone Preparation Workshop. (1.0 cr.; S-N only; prereq &8081; fall, spring, summer, every year) 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; prereq Major in development practice, public affairs, public policy, urban and regional planning, or sci, tech, and environ policy; fall, every year) Principles/skills necessary to create high-performing multi-disciplinary/multi-cultural teams.
PA 5101. Management and Governance of Nonprofit Organizations. (3.0 cr.; prereq Grad student or #; fall, every year) 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.


PA 5103. Leadership and Change in an Innovation Society. (3.0 cr.; prereq Grad student or #; spring, odd years) Models of change/leadership. How leaders can promote personal, organizational, and societal change. Case studies, action research. Framework for leadership/change in an innovation society.

PA 5104. Strategic Human Resource Management. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year) 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.

PA 5105. Integrative Leadership Seminar. (3.0 cr.; Student Option No Audit: [MGMT 6402, PA 5130, OLDP 6402]; prereq Grad student or #; fall, every year) Basic concepts, practices, people, and organizations associated with integrative leadership. Case materials, related readings, presentations, and interactive discussion.

PA 5106. Government, Ethics and the Public Will. (1.0-3.0 cr.; Student Option No Audit; prereq Grad student or #; spring, every year) Links between core ethical values/formulation 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.

PA 5107. Leadership, Reflective Practice, and Critical Theory: A Practicum. (2.0 cr.; prereq Grad student or #; fall, every year) 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.

PA 5108. Board leadership development. (1.5 cr.; S-N only; prereq Grad student or #; fall, every year) Nonprofit board governance. Governance models, roles/responsibilities, ethics/dynamics. Current research/concepts along with students' current board experiences to illuminate challenges/explore solutions that build board leadership competencies.


PA 5113. State and Local Public Finance. (3.0 cr.; prereq Grad or #; spring, every year) 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.

PA 5122. Law and Public Affairs. (3.0 cr.; prereq Grad or #; spring, every year) 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.


PA 5132. Mediation Training. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically) Creating an arena for mediation. Skills/experiences needed to mediate disputes between individuals, among groups: balanced (peer or colleague), imbalanced (power differentials). Role playing, group debriefing, critique. Cases.

PA 5144. Social Entrepreneurship. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically) Introduction to field of social entrepreneurship. Prepares current/future managers/leaders to create, develop, lead socially entrepreneurial organizations/initiatives.

PA 5145. Civic Participation in Public Affairs. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) 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.
regulation. Overview of development process from private/public perspective.

PA 5231. Transit Planning and Management. (3.0 cr.; prereq Grad student or #; fall, every year)

PA 5222. Transportation Policy, Planning, and Deployment. (4.0 cr.; =CE 5212; prereq Sr or grad student or #; fall, odd years)
Development of transportation policy, making of transportation plans, deployment of transportation technologies. Lectures, interactive case studies, role playing.

PA 5233. Sustainable Transportation. (2.0 cr.; A-F or Audit; prereq Grad or #; spring, even years)

PA 5242. Environmental Planning, Policy, and Decision Making. (3.0 cr.; A-F only; prereq Grad or #; spring, offered periodically)
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.

PA 5251. Strategic Planning and Management. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, offered periodically)
Theory/practice of strategic planning/management for public/nonprofit organizations/networks. Strategic planning process, management systems; stakeholder analyses. Tools/techniques such as purpose expansions, SWOT analyses, oval mapping, portfolio analyses, and logic models.

PA 5253. Designing Planning and Participation Processes. (3.0 cr.; A-F only; prereq Major or minor in urban/regional planning or #; fall, every year)

PA 5261. Housing Policy. (3.0 cr.; A-F or Audit; =HSG 5463; prereq Grad or #; spring, every year)

PA 5271. Geographic Information Systems: Applications in Planning and Policy Analysis. (3.0 cr.; prereq Major in urban/regional planning or #; fall, every year)

PA 5281. Immigrants, Urban Planning and Policymaking in the U.S. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, every year)

PA 5290. Topics in Planning. (1.0-4.0 cr.; max 12.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Selected topics.

PA 5301. Population Methods & Issues for the United States & Global South. (3.0 cr.; =SOC 5511; prereq Grad student or #; spring, offered periodically)

PA 5311. Program Evaluation. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
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.

PA 5390. Topics in Advanced Policy Analysis Methods. (1.0-4.0 cr.; max 9.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Topics in advanced policy analysis methods.

PA 5401. Poverty, Inequality, and Public Policy. (3.0 cr.; prereq Grad or #; fall, every year)
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.

PA 5405. Public Policy Implementation. (3.0 cr.; A-F or Audit; spring, even years)
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.

PA 5412. Aging and Disability Policy. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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.

PA 5413. Early Childhood and Public Policy. (3.0 cr.; prereq Grad or #; fall, every year)

PA 5414. Child Human Rights: Work and Education. (3.0 cr.; prereq Grad student or #; spring, offered periodically)
International child labor issues. Options for improving child well-being, including policies/programs that have potential to affect the lives of millions of children.

PA 5421. Racial Inequality and Public Policy. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
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.

PA 5422. Diversity and Public Policy. (3.0 cr.; A-F only; prereq Grad student or #; fall, offered periodically)

PA 5431. Public Policies on Work and Pay. (3.0 cr.; =HRIR 5655; prereq [PA 5031 or equiv], grad student or #; spring, every year)
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.

PA 5441. Education Policy and the State Legislature. (3.0 cr.; =HRIR 5655; prereq [PA 5031 or equiv], grad student or #; spring, every year)

PA 5442. Policy Design for Education and Human Development. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)
Designing effective educational policies. Using interdisciplinary approaches to identify/understand core variables (economic, psychological, etc). Work on policy design.

PA 5451. Immigrant Health Issues. (3.0-4.0 cr.; A-F only; =PUBH 6281; prereq Grad student or #; fall, every year)
How to access demographic, health, background information on U.S. immigrants. Characteristics and health needs of immigrants. Designing culturally competent health programs. How to advocate for change.
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

PA 5452. Immigration and Public Policy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
How to employ an analytical framework to analyze a current immigration policy proposal. Topics vary (e.g., president's guest worker proposal, democratic alternative proposals).

PA 5480. Topics in Race, Ethnicity, and Public Policy. (1.0-3.0 cr. [max 9.0 cr.]; prereq Jr or Sr or grad student or #; fall, spring, offered periodically)
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.

PA 5490. Topics in Social Policy. (1.0-4.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Selected topics.

PA 5501. Theories and Policies of Development. (3.0 cr.; prereq Grad student or #; fall, every year)
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.

PA 5503. Economics of Development. (3.0 cr.; A-F or Audit; prereq PA 5501 or &PA 5501; fall, every year)
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.

PA 5511. Community Economic Development. (3.0 cr.; prereq Grad or #; fall, every year)
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.

PA 5521. Development Planning and Policy Analysis. (4.0 cr.; prereq 5031 or equiv recommended or #; spring, every year)
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.

PA 5522. International Development Policy, Families, and Health. (3.0 cr.; prereq Grad student or #; spring, offered periodically)

PA 5561. Gender and International Development. (3.0 cr.; prereq Grad or #; spring, offered periodically)
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).

PA 5590. Topics in Economic and Community Development. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Selected topics.

PA 5601. Global Survey of Gender and Public Policy. (3.0 cr.; prereq Grad or #; fall, offered periodically)
Examine gender equality/public policy from local, national, global perspectives. Policy areas include women's human rights, girls' education, gender/military service, electoral systems.

PA 5621. Board Service in Women and Public Policy. (1.0 cr.; S-N only; prereq #; fall, spring, offered periodically)
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.

PA 5690. Topics in Women and Public Policy. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Selected topics.

PA 5701. Science and State. (3.0 cr.; prereq Grad or #; fall, spring, offered periodically)

PA 5711. Science and Technology Policy. (3.0 cr.; prereq Grad student or #; fall, every year)
Effect of science/technology on relations among nations in such matters as autonomy, national security, economic strength, environment, cultural identity, and international cooperation. Negotiating international agreements with S&T implications.

PA 5715. Survey of Current Issues in Science, Technology, and Environmental Policy. (1.5 cr.; A-F only; prereq Grad or #; spring, every year)
Current topics in science, technology, and environmental policy.

PA 5721. Energy and Environmental Policy. (3.0 cr.; prereq Grad or #; fall, spring, every year)
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. Environmental and Resource Economics Policy. (3.0 cr.; =APEC 5651; prereq [Intermediate microeconomics, intermediate policy analysis, grad student] or #; fall, every year)

PA 5723. Water Policy. (3.0 cr.; WR 5101; prereq Grad student or #; spring, every year)
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.

PA 5731. Emerging Technologies and Society. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically)
Legal, public policy, social, economic, and ethical implications of emerging technologies (such as nanotechnology). Perspective of stakeholders (federal agencies, public, industry, environment, international organizations) and public policies. Statutory objectives/regulatory. Diversity of policy problems. Research methodologies.

PA 5741. Risk Analysis and Policy. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically)
Interplay between risk analysis, decision making, and risk policy. Role of S&T. 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.

PA 5751. Urban Infrastructure Systems for Sustainable and Healthy Cities. (3.0 cr.; A-F or Audit; prereq Grad student or #; summer, every year)
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.

PA 5790. Topics in Science, Technology, and Environmental Policy. (1.0-3.0 cr. [max 9.0 cr.]; prereq Grad or #; fall, spring, offered periodically)
Selected topics.

PA 5801. Global Public Policy. (3.0 cr.; prereq Grad or #; spring, every year)

PA 5802. Global Economic Policy. (3.0 cr.; prereq Major in [public affairs or public policy] or #; fall, every year) 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.

PA 5821. Humanitarianism. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Foundations, logic, dynamics, dilemmas, and consequences of humanitarianism, a form of governance that operates in the name of--and for--the international community.


PA 5841. Women, Violence, and Armed Conflict. (3.0 cr.; A-F only; prereq Grad student or #; fall, spring, offered periodically) 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.

PA 5880. Exploring Global Cities. (1.0-3.0 cr. [max 6.0 cr.]; Student Option No Audit; prereq Grad student or #; spring, every year) 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 5890. Topics in Foreign Policy and International Affairs. (1.0-5.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) Selected topics.

PA 5910. Developing Your Public Service Career. (1.0 cr.; S-N or Audit; prereq [Major in [public affairs or public policy or urban/ regional planning] or [science, technology/ environmental policy] or development practice] or #; fall, every year) 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.

PA 5912. Politics of Public Affairs and Civic Engagement. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) Potential for public affairs professionals to be agents/architects of democracy in a radically changing, diverse, global landscape of governance.

PA 5920. Skills Workshop. (0.5-4.0 cr. [max 12.0 cr.]; prereq Grad student or #; fall, spring, every year) Topics on public policy or planning skills. Topics specified in Class Schedule.

PA 5924. Intercultural Competence. (3.0 cr.; A-F only; prereq Grad student or #; spring, every year) 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.

PA 5925. Creating a Professional Online Portfolio. (1.0 cr.; S-N only; prereq [MDP, MPA, MS-STEP, MURP] or #; spring, every year) Build electronic portfolio reflecting knowledge/skills learned in coursework, internships, intern/efforts, leadership roles, research activities. Promote professional selves using social networking platform.

PA 5941. Leadership for the Common Good. (3.0 cr.; A-F only; prereq Major in development practice or public affairs or public affairs leadership certificate or minor in integrative leadership or #; fall, spring, every year) Personal, team, organizational, visionary, political, ethical aspects of leadership. Building/ experiencing learning community.

PA 5952. Global Commons Seminar II. (2.0 cr.; A-F only; prereq HHH International fellow; spring, every year) Research/presentations related to professional development projects. Each week selected students assign readings, deliver a presentation on their professional development project, and distribute a summary of the talk. Presentations are developed in collaboration with at least one faculty specialist in the subject area.

PA 5950. Topics in American Election Administration. (0.5-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; summer, offered periodically) Research/presentations related to professional development projects. Each week selected students assign readings, deliver a presentation on their professional development project, and distribute a summary of the talk. Presentations are developed in collaboration with at least one faculty specialist in the subject area.

PA 5980. Topics in Public Affairs--General Topics. (0.0-3.0 cr. [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically) General topics in public policy.

PA 8001. Transforming Public Policy. (3.0 cr.; A-F only; prereq 5941 or #; fall, spring, every year) Development of interdisciplinary understanding of one or more policy areas through explorations of theory, readings, cases, and model-building exercises. Articulating policy/system improvements and leadership implications for formulating/implementing them.

PA 8003. Integrative Doctoral Seminar in Public Affairs I. (3.0 cr.; [max 6.0 cr.]; A-F only; prereq Public Affairs doctoral student; fall, every year) 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.

PA 8004. Integrative Doctoral Seminar in Public Affairs II. (3.0 cr.; A-F only; prereq Public Affairs doctoral student; spring, every year) 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.

PA 8081. Capstone Workshop. (3.0 cr. [max 6.0 cr.]; A-F only; prereq Grad major in public affairs or public policy or [urban and regional planning] or [science, technology, and environment policy] or development practice. Completion of core courses or #; fall, spring, every year) 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.

PA 8082. Working Group. (3.0 cr.; A-F or Audit; prereq [Grad major in [public policy or [urban and regional planning] or [science, technology, and environment policy]] completion of core courses) or #; fall, spring, every year) Facilitates completion of research paper on current issue in public policy and management. Students apply interdisciplinary methods, approaches, and perspectives studied in core courses. Written report includes analysis of issue, policy recommendations. Concentration/ topic vary term-to-term.

PA 8190. Advanced Topics in Public and Nonprofit Leadership and Management. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically)
Selected topics.

PA 8201. Environment and Infrastructure Planning. (4.0 cr.; A-F or Audit; prereq [Urban and regional planning] grad student or #; fall, every year) Relationship between infrastructure, human settlement design. Natural resource systems as foundation of infrastructure provision. Environmental basis of, and political/legal/ institutional frameworks for, land-use planning. Parallel computer lab, practicum assignment.

PA 8202. Networks and Places: Transportation, Land Use, and Design. (4.0 cr.; A-F or Audit; prereq [urban and regional planning] grad student or #; spring, every year) Relationship between land use and transportation. Developing synthetic design skills for linking land use transportation in urban/regional settings. Economic, political, legal, institutional frameworks for planning. Parallel practicum assignment.

PA 8203. Neighborhood Revitalization Strategies and Theories. (4.0 cr.; A-F or Audit; prereq [Urban and regional planning] grad student or #; fall, every year) Policy making/politics of planning in housing, community development, social policy. Connecting policy to local/regional politics. Role of institutional decision-making structures on policy outcomes. Importance of citizens, social movements, interest groups in policymaking process.

PA 8204. Creating Good Work: Economic and Workforce Development. (4.0 cr.; A-F or Audit; spring, every year) 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 8290. Advanced Topics in Planning. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.


PA 8312. Analysis of Discrimination. (4.0 cr.; fall, spring, offered periodically) 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 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

PA 8390. Advanced Topics in Advanced Policy Analysis Methods. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) FTE: Doctoral

PA 8490. Advanced Topics in Social Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8590. Advanced Topics in Economic and Community Development. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8686. Feminist Organizations. (3.0 cr.; A-F or Audit; spring, offered periodically) 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. (3.0 cr.; A-F or Audit; ) Political science and women's studies literature on American women and electoral politics.

PA 8690. Advanced Topics in Women and Public Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required; Plan A only; fall, spring, summer, every year) (No description)

PA 8790. Advanced Topics in Science, Technology, and Environmental Policy. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8811. Strategic Issues in International Economic Policy. (3.0 cr.; fall, spring, offered periodically) Compares/contrasts experiences of industrial/ developing countries in trade, investment, exchange rates, and immigration.

PA 8821. National Security Policy. (3.0 cr.; fall, every year) 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. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq [Max 18 cr per semester or summer] 24 cr required; fall, spring, summer, every year) Doctoral thesis credit.

PA 8890. Advanced Topics in Foreign Policy and International Affairs. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, offered periodically) Selected topics.

PA 8921. Master's: Professional Paper (Individual Option). (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Masters of public policy majors work under guidance of paper adviser to complete their Professional Paper (individual option).

PA 8922. Master's Paper: Plan B. (1.0-3.0 cr.; prereq #; fall, spring, summer, every year) Masters of science in science, technology, and environmental policy majors work under guidance of paper adviser to complete their Plan B.

PA 8991. Independent Study. (0.5-3.0 cr. [max 6.0 cr.]; prereq Limit of 3 credits applied toward a Humphrey School of Public Affairs degree or certificate program; #; fall, spring, summer, every year) Independent study.

Public Health (PUBH)
School of Public Health

PUBH 5230. Topics: Public Health Practice. (2.0 cr. [max 4.0 cr.]; Student Option No Audit; fall, spring, summer, every year) Topics.

PUBH 5231. Emergency Preparedness: A Public Health Perspective. (2.0 cr.; A-F only; 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.; Spring, every year) 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.

PUBH 8100. Topics: Applied Analyses of Occupational Health Data. (1.0-4.0 cr. [max 80.0 cr.]; prereq Doctoral student in occupational health studies. Prior coursework in epidemiology, statistics; fall, spring, summer, every year) New course offerings or topics of interest in environmental health.

PUBH 8120. Occupational Health and Safety Research Seminar. (1.0 cr. [max 12.0 cr.]; S-N or Audit; prereq [6120, [6330 or 6341], 6450, environmental health major, [OIPRPT specialty or equiv] or #; fall, spring, summer, every year) Facilitates student research training in occupational injury prevention. Roundtable discussions, interdisciplinary involvement.

PUBH 8140. Validity Concepts in Epidemiologic Research. (2.0 cr.; S-N only; fall, every year) 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.** (2.0 cr. [max 20.0 cr.]; S-N or Audit; fall, spring, every year) Fundamentals of epidemiologic inference. Methods for designing, analyzing, and interpreting epidemiologic studies.

**PUBH 8142. Epidemiologic Uncertainty Analysis.** (2.0 cr.; S-N only; prereq 8140; spring, every year) 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.

**PUBH 8160. Advanced Toxicology.** (2.0 cr.; A-F only; prereq 6160, one course in biochem, one course in molecular bio, #; fall, every year) 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.

**PUBH 8161. Current Literature in Toxicology.** (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq 6160; fall, spring, every year) Modern methods in toxicology, critical thinking skills. Topics vary each semester. Students read/discuss topical literature.

**PUBH 8162. Chemical Carcinogenesis and Chemoprevention.** (3.0 cr.; A-F or Audit; =NUTR 8617); prereq [BioC 3001, BioC 3021, BioC 4331] or equiv)., [Chem 2302 or equiv.]; Fundamental background in chemical carcinogenesis, carcinogen activation/deactivation, carcinogen-DNA adduct formation, cellular oncogenesis, cancer chemoprevention, nutrition/cancer. Topics integrated/interrelated.

**PUBH 8163. Toxicology.** (5.0 cr.; A-F only; prereq Enrolled in toxicology concentration of environmental health PhD program; fall, every year) Biological/physiological principles that govern toxicological methods.

**PUBH 8165. Current Topics in Toxicology.** (1.0 cr. [max 2.0 cr.]; S-N only; prereq [Environmental health PhD, toxicity concentration] student or #; fall, spring, every year) Seminars presented by students/faculty in toxicology grad program.

**PUBH 8166. Experiences in Toxicology Research.** (3.0 cr.; A-F only; prereq Environmental health PhD student in toxicology concentration; spring, every year) Students complete research projects in labs of toxicology program graduate faculty members.

**PUBH 8170. Advanced Industrial Hygiene Applications.** (2.0 cr.; A-F or Audit; prereq 5170, eh grad major; ) 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.

**PUBH 8194. Directed Research: Environmental Health.** (1.0-6.0 cr.; prereq #; fall, spring, summer, every year) Research, with direction from faculty member, in environmental/occupational stresses on human health.

**PUBH 8300. Topics: Epidemiology.** (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically) New course offerings or topics of interest in epidemiology.

**PUBH 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)


**PUBH 8342. Advanced Epidemiologic Methods: Applications.** (3.0 cr.; prereq 8341 or equiv or #; spring, every year) Applied methodology course designed for students in the Epi PhD program. Examples/readings are aimed at clinical/biological and social/behavioral track students.

**PUBH 8392. Readings in Clinical Research.** (1.0-4.0 cr.; prereq Clinical research major, #; fall, spring, summer, every year) Current readings in clinical research.

**PUBH 8393. Directed Study: Clinical Research.** (1.0-4.0 cr. [max 20.0 cr.]; prereq Clinical research major, #; fall, spring, summer, every year) Directed research or field practice in clinical research.

**PUBH 8394. Culminating Experience: Clinical Research.** (1.0-10.0 cr.; S-N only; prereq Clinical Research master's student; fall, spring, summer, every year) Directed research toward completion of culminating experience project in clinical research.

**PUBH 8400. Topics: Biostatistics.** (0.5-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically) Topics of interest.

**PUBH 8401. Linear Models.** (4.0 cr.; prereq [7405, &STAT 8101] or #, calculus, familiar with matrix/linear algebra; fall, every year) Theory/application of statistical techniques for regression analysis. Computing for linear models. Modeling, computation, data analysis.

**PUBH 8403. Research Skills in Biostatistics.** (1.0 cr.; S-N only; 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.; fall, every year) Introduction to statistical problems arising in molecular biology. Problems in physical mapping (data hybrid mapping, DDP),
genetic mapping (pedigree analysis, lod scores, TDT), biopolymer sequence analysis (alignment, motif recognition), and micro array analysis.

PUBH 8446. Advanced Statistical Genetics and Genomics. (3.0 cr.; prereq [7445, statistical theory at level of STAT 5101-2; college-level molecular genetics course is recommended] or #: spring, every year) 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/proteomic data. Multiple comparison and gene network modeling.

PUBH 8452. Advanced Longitudinal Data Analysis. (3.0 cr.; prereq [Stat 5102, Stat 8311, experience with [SAS or S+], advanced [biostats or stat] student] or #: spring, every year) 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.


PUBH 8472. Spatial Biostatistics. (3.0 cr.; prereq [STAT 5101, STAT 5102] or [STAT 8101, STAT 8102]; some experience with S-plus; STAT 8311 recommended; fall, spring, offered periodically) 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.

PUBH 8475. Statistical Learning and Data Mining. (3.0 cr.; prereq [[[6450, 6451, 6452] or STAT 5303 or equiv], [biostatistics or statistics PhD student]] or #: spring, offered periodically) 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.

PUBH 8482. Sequential and Adaptive Methods for Clinical Trials. (3.0 cr.; prereq Stat 8101-8102 or equivalent; [students should be comfortable with the multivariate normal distribution, fall, spring, every year] Statistical methods for design/analysis of sequential experiments. Wald theorems, stopping times, martingales, Brownian motion, dynamic programming. Compare

Bayesian/frequentist approaches. Applications to interim monitoring of clinical trials, medical surveillance.

PUBH 8492. Theories of Hierarchical and Other Richly Parametrized Linear Models. (3.0 cr.; A-F only; prereq [8401 or STAT 8101], [STAT 8101, STAT 8102] or equiv], [biostatistics or statistics PhD student] or #: spring, every year) Linear richly-parameterized models. Hierarchical/dynamic/linear/linear mixed models. Random regressions. Smoothers, longitudinal models. Schemes for specifying/fitting models. Theory/computing for mixed-linear-models. Richly parameterized models and the odd/surprising/undesirable results in applying them to data sets. Lectures, class project.

PUBH 8494. Directed Research: Biostatistics. (1.0-4.0 cr.; S-N only; prereq #: fall, spring, summer, every year) Research, with direction from a faculty member, in biostatistics.

PUBH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

PUBH 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

PUBH 8800. Topics in Health Services Research and Policy. (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, offered periodically) Topics and credit vary by instructor.


PUBH 8802. Health Services Policy Analysis: Applications. (2.0 cr. A-F or Audit; prereq [6835, 8801] or #: spring, every year) 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. (2.0 cr.; prereq Grad-level health-care policy course or #: spring, offered periodically) Long-term care 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.

PUBH 8804. Advanced Quantitative Methods Seminar. (3.0 cr. [max 6.0 cr.]; A-F or Audit; 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 #: spring, every 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.

PUBH 8805. Sociological Theory in Health Services Research. (3.0 cr.; fall, every year) 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. (3.0 cr.; prereq HsPr& grad major or #: fall, spring, every year) 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.

PUBH 8810. Research Studies in Health Care. (3.0 cr. [max 6.0 cr.]; prereq [Grad or professional school] student or #: fall, every year) Introduction to philosophy of science, conceptual modeling, experimental design, survey/sample design, issues relevant to health services research.

PUBH 8811. Research Methods in Health Care. (3.0 cr.; prereq [8810, [grad or professional school] student] or #: fall, every year) Research methods commonly used in analysis of health services research and health policy problems.

PUBH 8813. Measurement of Health-Related Social Factors. (3.0 cr.; A-F or Audit; prereq Intro stat course, understanding of simple correlations or #: fall, spring, every year) How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.

PUBH 8820. Health Economics I. (3.0 cr.; A-F or Audit; prereq One course each in intermediate microeconomics, calculus, intro to linear algebra; spring, every year) Application of microeconomic theory to healthcare decisions of consumers and producers under different assumptions about market structure and behavior.
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PUBH 8821. Health Economics II. (3.0 cr.; A-F or Audit; prereq 8820 or #: fall, spring, every year)
Examines application of microeconomic theory to health services research through selected reading from published and unpublished health economics literature.

PUBH 8830. Writing for Research. (2.0 cr.; Student Option No Audit; prereq HSRPA Ph.D. student or #: fall, every year)
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.

PUBH 8831. Writing for Research. (2.0 cr.; Student Option No Audit; prereq 8830; spring, every year)
Second of two course sequence. Writing research proposals and scholarly papers. How to review, synthesize, and critique papers and research proposals.

PUBH 8836. Integration of Public Health Research Methods in Health Services Research and Policy. (2.0 cr.; prereq Professional school or grad student or #:)
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.

PUBH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; 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.; fall, spring, every year)
(No description)

PUBH 8893. Directed Study: Health Services Research, Policy, and Administration. (1.0-3.0 cr.; prereq HSRPA grad student; #: fall, spring, every year)
tbd

PUBH 8894. Directed Research: Health Services Research, Policy, and Administration. (1.0-8.0 cr.; prereq HSRPA grad student; #: fall, spring, every year)
tbd

Radiation Therapy (RTT)

College of Continuing Education

RTT 5281. Scientific Foundations. (3.0 cr.; A-F or Audit; [RSC 5281, PT 6281]; prereq Registered rehab science or PT student; )

Radiology (RAD)

Medical School

RAD 8200. Nuclear Medicine. (1.0-15.0 cr.; fall, spring, summer, every year)

RAD 8210. Fundamentals of Nuclear Medicine. (1.0 cr.; prereq 1st-yr resident; fall, spring, summer, every year)

RAD 8250. Research: Nuclear Medicine. (1.0-15.0 cr.; fall, spring, summer, every year)

RAD 8450. Research: Radiation Biology. (1.0-15.0 cr.; )

RAD 8550. Research: Radiological Physics. (1.0-15.0 cr.; )

Recreation, Park, and Leisure Studies (REC)

College of Education and Human Development

REC 5111. Sports Facilities. (3.0 cr.; A-F or Audit; prereq Kin or Rec major or #: fall, spring, summer, offered periodically)
Steps in planning and building facilities for athletics, physical education, and sport for college, professional, and public use.

REC 5115. Event Management in Sport. (3.0 cr.; A-F or Audit; prereq Kin 5115; Grad student; #: spring, summer, every year)
Techniques/principles of planning, funding, and managing sport events. Collegiate championships, non-profit events/benefits, professional events.

REC 5371. Sport and Society. (3.0 cr.; A-F or Audit; prereq [3126W, grad student] or #: fall, offered periodically)
Sport, sporting processes, social influences, systems, and structures that have affected and exist within/among societies, nations, and cultures. Issues concerning social differentiation. Social concerns such as violence and honesty.

REC 5421. Sport Finance. (3.0 cr.; A-F or Audit; prereq Grad student or #: fall, every year)
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.

REC 5461. Foundations of Sport Management. (3.0 cr.; A-F or Audit; prereq Kin or rec or postbac or grad student or #: fall, spring, summer, every year)
Theories/techniques in administering/managing sport enterprises. Organizational theory/policy. Practical examples of sport management skills/strategies.

REC 5511. Sport and Gender. (3.0 cr.; A-F only; [Kin 5511]; fall, even years)
Critically examines women's involvement in/ contributions to sport, physical activity, and leisure.

REC 5601. Sport Management Ethics and Policy. (3.0 cr.; A-F or Audit; prereq Grad student or #:)
Ethical concepts that underpin or inform sport policies. Evaluating sport policies from a normative point of view. Selected sport policy issues are used to illustrate relevance of ethical considerations in policy development, ethical implications of sport policy.

REC 5631. Programming and Promotion in Sport. (3.0 cr.; A-F or Audit; prereq Kin or Rec grad student or #: fall, spring, every year)
Introduction to marketing concepts as they apply to sport industry. Consumer behavior, market research, marketing mix, corporate sponsorship, licensing concepts. Discussion, practical application.

REC 5701. Positive Youth Development Programming. (3.0 cr.; A-F only; prereq Upper div undergrad or grad student or #: spring, every year)

REC 5801. Legal Aspects of Sport and Recreation. (4.0 cr.; A-F orAudit; prereq 3551 or 5461 or #: fall, spring, summer, every year)
Legal issues related to recreation, park, and sport programs/facilities with public/private sectors.

REC 5981. Research Methodology in Kinesiology, Recreation, and Sport. (3.0 cr.; A-F or Audit; [Kin 5981]; prereq MED or grad student or #: fall, spring, summer, every year)
Defines/reviews various types of research in exercise and sport science, physical education, and recreation studies. Qualitative research, field studies, and retrospective research strategies as alternatives to traditional scientific paradigm.

REC 5992. Readings: Recreation. (1.0-9.0 cr.; A-F only; prereq REC major; #: fall, spring, summer, every year)
Independent study under tutorial guidance by faculty member on topic(s) not covered in regular coursework.

REC 5995. Problems in Recreation, Park, and Leisure Studies. (1.0-9.0 cr.; A-F only; prereq [REC MED or grad student]; #: fall, spring, summer, every year)
Independent study of leisure service programs, systems, facilities, or policies. Focuses on conduct of recreation programs. Scholarly projects (e.g., library or field research) or demonstration projects.

Rehabilitation Science (RSC)

Medical School

RSC 5058. Anatomy for Rehabilitation Science. (6.0 cr.; A-F or Audit; prereq Student enrolled in Rehabilitation Science Program, #:; summer, every year)
Study of gross human anatomy through lecture/laboratory experiences that include cadaver dissection of extremities, head, neck, back, abdomen, thoracic, pelvic regions with correlation to clinical conditions.

RSC 5100. Hot Topics in the Biology of Aging. (1.0 cr.; prereq #:; spring, odd years)
Biological research in aging. Student-faculty-led discussions on select research topics that are highly relevant to the field of biogerontology research, along with seminars on scientific integrity. Students lead discussions focused on their area of research expertise, using review/research articles and case studies of scientific misconduct. Tour of laboratory/discussion of literature published by lab dealing with aging and/or proteomics.
RSC 5101. Mathematical Tools for Research Applications in Health, Rehab, and Human Movement Sciences. (1.0 cr.; A-F or Audit; prereq Basic algebra, trigonometry, and geometry. Pre-calculus or calculus is helpful but not required; fall, spring, summer, every year) 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.

RSC 5135. Advanced Biomechanics I: Kinematics. (3.0 cr.; A-F or Audit; prereq #; fall, odd years) How to describe/measure movement. Basic/applied biomechanics, pathokinesiology, and rehabilitation literature. Lecture, lab, seminar discussion. Meets with RSC 8135.

RSC 5200. Introduction to Transcranial Magnetic Stimulation. (3.0 cr.; A-F or Audit; fall, even years) Theory/application of transcranial magnetic stimulation (TMS) to measure corticospinal excitability. Must sign consent form. Resting/active motor thresholds, single hemispheric paired-pulse testing, bilateral interhemispheric inhibition paired-pulse testing, input-output recruitment curves, cortical silent periods, H reflex testing.

RSC 5206. Academic Ethics. (1.0 cr.; A-F or Audit; prereq Rehabilitation Science student or #; spring, offered periodically) 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. (2.0-5.0 cr.; A-F or Audit; prereq Graduate physical therapy student or #; fall, every year) 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.

RSC 5235. Advanced Biomechanics II: Kinetics. (3.0 cr.; A-F or Audit; prereq # or equiv; fall, spring, even years) Forces that create human motion and are produced within body as a result of motion. 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 kinematics. Lectures, lab, discussion.

RSC 5281. Scientific Foundations: Exercise Theory. (3.0 cr.; A-F only; [RTT 5281, PT 6281]; prereq Rehabilitation Science grad student; fall, every year) In-depth presentation of fundamental concepts in exercise physiology/exercise biochemistry related primarily to skeletal muscle, secondary to cardiovascular system/connective tissue. Exercise/performance-enhancing ergogenic aids.

RSC 5294. Independent Study in Rehabilitation Science. (1.0-3.0 cr. [max 9.0 cr.]; prereq Rehabilitation science student or program approval; fall, spring, summer, every year) Independent exploration into topics related to rehabilitation science.

RSC 5814. Age, Exercise, and Rehabilitation. (2.0 cr.; prereq Rehabilitation science student or program permission; fall, every year) 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.

RSC 5841. Rehabilitation Science Instrumentation and Methodology. (4.0 cr.; A-F or Audit; prereq [PhyS 1031, PhyS 1032] or equiv)., #, [rehabilitation science student or program permission]; fall, spring, summer, offered periodically) Theory/application of kinesiological EMG and other common instruments used to measure human motion.

RSC 5901. Scholarly Inquiry in Health Sciences. (4.0 cr.; A-F or Audit; prereq Three credits of undergraduate statistics. #, %; spring, every year) How research evidence is developed, disseminated, utilized in health sciences. Qualitative/quantitative scholarly project proposal. Critique studies/peer proposals. Explore conduct of research.

RSC 8022. Fostering a Career in Aging Research. (1.0 cr.; S-N only; #GERO 8022); prereq #; spring, even years) Platform for preparing pre-doctoral students/post-doctoral fellows for next step in academic career. Combination of student/faculty led discussions.

RSC 8188. Teaching Practicum. (1.0-5.0 cr.; A-F or Audit; prereq Rehabilitation science student or program permission); fall, spring, summer, every year) 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.

RSC 8192. Research Design in Rehabilitation Science. (4.0 cr.; A-F or Audit; prereq #; fall, every year) Critical appraisal of current medical literature. Fundamentals of research design, data analysis, and medical writing.

RSC 8206. Grant Writing. (2.0 cr.; A-F or Audit; prereq # or student in University of Minnesota Rehabilitation Science Program; fall, offered periodically) Process of applying for individual National Institutes of Health (NIH) pre-doctoral research training fellowship. Overview of NIH Program Announcement PA-11-111/NH/NIH SF424 individual fellowship application guide required for application will be included. Substantive writing of components of NIH fellowship.

RSC 8235. Human Kinetics. (3.0 cr.; A-F or Audit; prereq [5135 or equiv] or #; spring, even years) 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.

RSC 8282. Problems in Human Movement. (4.0 cr.; A-F or Audit; prereq [Rehabilitation science student or program permission]; #, spring, every year) Fundamental principles of neurophysiology, neurology, motor control, and motor learning as a basis for therapeutic intervention in motor dysfunction.

RSC 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

RSC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser
and DGS consent; fall, spring, summer, every year)
(No description)

**RSC 8666. Doctoral Pre-Thesis Credits.**
(1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

**RSC 8777. Thesis Credits: Master’s.**
(1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**RSC 8888. Thesis Credit: Doctoral.**
(1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; RSC doctoral student who has successfully passed the prelim written exam, %; fall, spring, summer, every year) Thesis credit: doctoral.

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**Religious Studies (RELS) College of Liberal Arts**

**RELS 5001. Theory and Method in the Study of Religion: Critical Approaches to the Study of Religion.**
(3.0 cr.; = [RELS 3001W]; prereq Sr or grad student or #; spring, every year)
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.

**RELS 5070. Topics in Religious Studies.**
(3.0 cr. [max 18.0 cr.]; fall, spring, summer, offered periodically)
Topics specified in Class Schedule and Course Guide.

**RELS 5071. Greek and Hellenistic Religions.**
(3.0 cr.; = [CNES 5071, RELS 3071, CNES 3071]; spring, offered periodically)

**RELS 5072. The New Testament.**
(3.0 cr.; fall, spring, offered periodically)

**RELS 5073. Roman Religion and Early Christianity.**
(3.0 cr.; spring, offered periodically)

**RELS 5076. Apostle Paul: Life, Letters, and Legacy.**
(3.0 cr.; fall, spring, odd years)
How/what we can know about Paul. What his message was. What he was fighting. How he was later understood by friends/foes.

**RELS 5077. Religious Violence in the Early Roman Empire: Jews, Christians, and Pagans.**
(3.0 cr.; = [CNES 3077, CNES 5077, RELS 3077, RELA 3077, RELS 3077]; spring, even years)
Methodological strategies for understanding discourses of violence. Ways religious traditions shaped ethnic identity/practices and views of sacrifice, martyrdom, spectacles of violence, apocalyptic ideologies of violence, state persecution, texts/terror, and holy war.

**RELS 5080. New Testament Proseminar.**
(3.0 cr. [max 18.0 cr.]; prereq 1082 or RELA 1082 or 3072 or equiv; fall, spring, offered periodically)

**RELS 5111. Problems in Historiography and Representation of the Holocaust.**
(3.0 cr.; prereq 3521 or 3541 or JWST 3521 or #; spring, every year)

**RELS 5115. Midrash: Jewish Biblical Interpretation.**
(3.0 cr.; = [RELS 3115, JWST 3115, CNES 5115, CNES 3115, JWST 3115]; fall, spring, offered periodically)
Jewish law studies as mirror of society and as way to actualize its value. Original socio-religious contexts, current applications. Selections include biblical interpretations addressing moral, theological, legal, and literary problems.

**RELS 5204. Dead Sea Scrolls.**
(3.0 cr.; = [JWST 5204, JWST 3204, RELS 3204, CNES 5204, CNES 3204]; spring, even years)
Introduction to Dead Sea Scrolls and Qumran. Contents of Dead Sea Scrolls, significance for development of Bible. Background of Judaism and Christianity. Archaeological site of Qumran.

**RELS 5252. Art and Archaeology of Early Christianity and the Late Roman Empire.**
(3.0 cr.; = [ARTH 5188]; fall, spring, offered periodically)

**RELS 5255. Archaeology of Religion.**
(3.0 cr.; fall, odd years)
Evidence for origins of religion, its diverse roles in human societies over millennia. What constitutes religion, why it is constantly present in human history. How archaeologists reconstruct beliefs/practices of past peoples.

**RELS 5325. The Art of the Aztec Empire.**
(3.0 cr.; = [ARTH 5325, ANTH 5325]; spring, every year)
Art/architecture of Nahua-speaking Aztecs of Central Mexico, from first appearance in archaeological record until Spanish invasion in 1521. Major scholarly problems, theoretical/methodological approaches. Analysis of scholarly writing.

**RELS 5326. Art of the Inka and their Ancestors.**
(3.0 cr.; = [ARTH 5802, AMIN 5802, ANTH 5802]; prereq Jr. or Sr. or grad student; spring, every year)

**RELS 5503. History and Development of Israelite Religion I.**
(3.0 cr.; fall, every year)
Survey of the evolution of Israelite religion. Cultic practices, law and religion, prophecy, religion and historiography. Relationship to surrounding religious systems.

**RELS 5504. Development of Israelite Religion II.**
(3.0 cr.; fall, offered periodically)
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.**
(3.0 cr.; A-F or Audit; = [JWST 5513W, CNES 8513, CNES 5513W]; prereq At least one upper level course (3xxx or higher) in academic biblical or religious studies; spring, even years)

**RELS 5533. Death and the Afterlife in the Ancient World.**
(3.0 cr.; A-F only; fall, even years)
Beliefs, attitudes, and behaviors related to death and afterlife found in cultures of ancient Mediterranean and Near East. Literature, funerary art/epitaphs. Archaeological evidence for burial practices and care of dead.

**RELS 5612. Baroque Rome: Art and Politics in the Papal Capital.**
(3.0 cr.; = [ARTH 5355, HIST 3706, ARTH 3335, RELS 3612]; fall, even years)
Rome as city of spectacle/pageantry. Urban development. Major works in painting, sculpture, and architecture. Ecclesiastical/private patrons who transformed Rome into one of world’s great capitals.

**RELS 5614. Medieval Church.** (3.0 cr.; fall, spring, offered periodically) 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.

**RELS 5621. The Christian Right and Left in America: Protestant Liberals, Evangelicals, and Fundamentalists.** (3.0 cr.; =[RELS 3621]; spring, odd years) Religious, historical, social, and scientific thought/practice across three main U.S. Protestant groups since 1820. Historical processes that brought about diverse understandings of Christianity, theologies, and worship. Theological left/right views of views of society, history, and science that influence public debates.

**RELS 5671. Hinduism.** (3.0 cr.; =HIST 3492, ALL 3671, RELS 3671, ALL 5671); fall, spring, offered periodically) Development of Hinduism. Sectarian trends, modern religious practices, myths/rituals, pilgrimage patterns, religious festivals. Interrelationship between Indian social structure and Hinduism.

**RELS 5993. Directed Studies.** (1.0-4.0 cr. [max 24.0 cr.]; prereq #; fall, spring, every year) TBD

**RELS 8190. Comparative Seminar in Religions in Antiquity.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq Grad student in relevant field; spring, even years) Topics vary, see Class Schedule. Major cultural movement as it developed over several centuries. Draws on evidence in literature, archival records, inscriptions, documentary papyri, and archaeological remains. Artistic media such as wall painting, architectural ornament, funerary sculpture, or manuscript illumination.

**Retail Merchandising (RM)**
College of Design

**RM 5170. Topics in Retail Merchandising.** (1.0-4.0 cr. [max 32.0 cr.]; A-F or Audit; prereq Jr or sr or grad student; fall, spring, summer, every year) In-depth investigation of single specific topic, announced in advance.

**Russian (RUSS)**
College of Liberal Arts

**RUSS 5404. Tolstoy in Translation.** (3.0 cr.; =RUSS 3404); spring, odd years) Novels, stories, and philosophical writings of Leo Tolstoy.

**RUSS 5407. Stories and Plays of Anton Chekhov in Translation.** (3.0 cr.; =RUSS 3407); spring, every year) Study of literary devices and themes in selected stories and major plays using the intrinsic approach.

**RUSS 5411. Dostoevsky in Translation.** (3.0 cr.; =RUSS 3411); spring, odd years) Novels, stories, and other writings of Fyodor Dostoevsky.

**RUSS 5421. Literature: Middle Ages to Dostoevsky in Translation.** (3.0 cr.; =RUSS 3421); fall, every year) 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.** (3.0 cr.; =RUSS 3422); spring, every year) 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.** (1.0-4.0 cr. [max 3.0 cr.]; prereq 1102 for language topics) Variable topics in Russian language, literature, and culture.

**RUSS 5993. Directed Studies.** (1.0-4.0 cr. [max 16.0 cr.]; fall, spring, every year) Guided individual study. Prereq instr consent, dept consent, college consent.

**Scandinavian (SCAN)**
College of Liberal Arts

**SCAN 5501. Scandinavian Mythology.** (3.0 cr.; ) Study of Scandinavian mythology based on primary sources represented by Saxo Grammaticus, Snorri Sturluson’s Edda and Ynglinga Saga, and the Poetic Edda. Myths are analyzed using contemporary critical approaches. All readings in translation.

**SCAN 5502. The Icelandic Saga.** (3.0 cr.; ) 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 5505. The Scandinavian Short Story.** (3.0 cr.; =SCAN 3605); fall, spring, even years) Short stories by 19th-20th century authors from all five Scandinavian countries. Genre theory/practical criticism. Readings in English for non-majors.

**SCAN 5513. Contemporary Scandinavian Literature.** (3.0 cr.; ) 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 5565. The Scandinavian Short Story.** (3.0 cr.; =SCAN 3605); fall, spring, even years) Short stories by 19th-20th century authors from all five Scandinavian countries. Genre theory/practical criticism. Readings in English for non-majors.

**SCAN 5561. Blood on Snow: Scandinavian Thrillers in Fiction and Film.** (3.0 cr.; =SCAN 3614); fall, spring, offered periodically) 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 5615. Ibsen and the Beginnings of Modern Drama.** (3.0 cr.; fall, offered periodically) Close reading of Ibsen’s modern tragedies, from A Doll’s House (1879) to When We Dead Awaken (1899). Focus is on the dialectics between Ibsen and his society, and dramatic structure and staging conventions in the context of modern theater. Readings in English for non-majors.

**SCAN 5634. Scandinavian Women Writers.** (3.0 cr.; =SCAN 3634); fall, spring, even years) 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 5670. Topics in Scandinavian Studies.** (3.0 cr. [max 9.0 cr.]; fall, spring, offered periodically) Topic may focus on a specific author, group of authors, genre, period, or subject matter. Topics specified in Class Schedule. Readings in English for non-majors. May meet with 3670.

**SCAN 5701. Old Norse Language and Literature.** (3.0 cr.; fall, every year) Acquisition of a reading knowledge of Old Norse; linguistic, philological and literary study of Old Norse language and literature.

**SCAN 5710. Topics in Old Norse Literature.** (3.0 cr. [max 9.0 cr.]; prereq 5701 or equiv; spring, every year) 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.

**SCAN 5993. Directed Studies.** (1.0-4.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) Guided individual reading and study. Prereq instr consent, dept consent, college consent.

**SCAN 8500. Seminar in Medieval Scandinavian Languages and Literature.** (3.0 cr. [max 9.0 cr.]; spring, offered periodically) Sample topics: [Volsunga Saga], studies in Snorri Sturluson’s [Edda], dialogue analysis in the Icelandic saga.

**SCAN 8994. Directed Research.** (1.0-3.0 cr. [max 12.0 cr.]; prereq #; may be taken as tutorial with #; %; fall, spring, every year) TBD

**Scientific Computation (SCIC)**
Institute of Technology

**SCIC 8001. Parallel High-Performance Computing.** (3.0 cr.; prereq Undergrad degree in field using sci comp or #; fall, every year) Interdisciplinary overview of computer science aspects of scientific computation, both hardware and techniques. Parallel computing, architectures, programming, and algorithms; restructuring compilers and data structures.

**SCIC 8011. Scientific Visualization.** (3.0 cr.; prereq Undergrad degree in field using sci comp or #; spring, every year)


SCIC 8041. Computational Aspects of Finite Element Methods. (3.0 cr.; prereq Undergraduate degree in field using sci comp or IT grad student or #; ) 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.

SCIC 8095. Problems in Scientific Computation. (1.0-3.0 cr. [max 9.0 cr.; prereq Undergraduate degree in field using sci comp or #; ] Selected topics in interdisciplinary aspects of scientific computing.

SCIC 8190. Supercomputer Research Seminar. (1.0 cr. [max 3.0 cr.; prereq Undergraduate degree in field using sci comp or #; ] fall, spring, offered periodically) Series of seminars by distinguished lecturers.

SCIC 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SCIC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SCIC 8594. Scientific Computation Directed Research. (1.0-4.0 cr. [max 9.0 cr.; prereq Undergraduate degree in field using sci comp or #; fall, spring, summer, every year) tbd

SCIC 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) tbd

ST 8010. Cybersecurity Foundations - Technology, Risk & Communication. (2.0 cr.; A-F only; fall, every year) Explore cyber security risks through evaluation of consumer driven technology concepts/their applicability to enterprise. Core technology concepts that face both consumers/businesses. How technology works, how to understand/communicate risks to business management, deliver actionable risk mitigation approaches. Security standards/benchmarks that guide industry.

ST 8110. Security Science and Technology Foundations. (3.0 cr.; A-F only; prereq Admitted student in security technologies program; summer, every year) 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.

ST 8111. Methods, Theory, and Applications. (2.5 cr.; A-F only; fall, every year) 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. (2.0 cr.; A-F only; fall, every year) 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. (2.0 cr.; A-F only; prereq MSST grad program student; spring, every year) 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.

ST 8200. Special Topics in Security Technologies. (0.5 cr.; A-F only; fall, spring, every year) Leaders in the field related to security technologies. Special speakers.


ST 8221. Communications of Risk and Security. (1.0 cr.; A-F only; prereq MSST grad student; fall, every year) 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.

ST 8330. Critical Infrastructure Protections. (3.0 cr.; A-F only; prereq MSST grad student; summer, every year) 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.

ST 8331. Dynamic Systems Modeling and Simulation Tools. (2.0 cr.; A-F only; fall, every year) 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 interintra system modeling. Variety of modeling approaches. How systems can be characterized focusing on the parameters that are important for...
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

ST 8440. Security Practicum. (0.5-2.0 cr.; A-F only; prereq Admitted to MSST grad program; summer, every year)
Seminars and focused workshops on selected areas of security science and technology.

ST 8441. Internship (optional). (0.5 cr. [max 1.0 cr.; A-F only; fall, spring, every year)
Summer internship opportunities at the university centers, companies, state, and federal agencies.

ST 8510. Psychology/Behavior Intelligence for Homeland Security. (2.0 cr.; A-F only; summer, every year)
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. (1.0 cr.; A-F only; fall, every year)
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. Legislative, policy, and organizational issues facing U.S. intelligence, business, academic, and S&T communities. Students reflect on how these issues relate to their own professional roles/experiences, as well as stakeholder communities with which they work. Consider a specific piece of security-related legislation/analyze associated policy problems and how they relate to security risks. Historical and contemporary examples used to illustrate related public policy questions.

ST 8512. Partnership in Conflict Management: Security/Privacy Law, Social Responsibility and Ethics. (2.0 cr.; A-F only; prereq MSST grad student; spring, every year)
An exploration of challenges to American civil liberties and national security in times of terrorism.

ST 8620. Capstone. (0.5-2.0 cr.; A-F only; prereq MSST grad program student; spring, summer, every year)
The Capstone project is an independent, original, and applied investigation on a relevant subject, problem, or issue in the area of security technologies and homeland security.

ST 8660. Independent Study. (1.0-4.0 cr.; A-F only; fall, spring, summer, every year)
Focused study in security science, technology, business, policy or law, with a deliverable project report/presentation.

SW 5051. Human Behavior and the Social Environment. (2.0-3.0 cr.; A-F or Audit; prereq Grad student or 8 cr social sciences or #; fall, spring, every year)
Social, psychological, biological, and cultural factors of individual and group development as applied to social work practice. Behavior and life-cycle development focusing on diversity and each stage of life. Discuss development in terms of the individual, and in terms of overlapping social systems such as the multigenerational family, culture, community, and society.

SW 5101. Historical Origins and Contemporary Policies and Programs in Social Welfare. (3.0-4.0 cr.; A-F or Audit; prereq Grad or 8 sem cr of social sciences; fall, spring, every year)
Contemporary policies and programs in social welfare are examined in light of their historical origins and evolution. A framework is then developed for analysis of concepts and principles in contemporary social policy for social welfare programs and services. The emergence of the profession of social work also examined.

SW 5105. Women and Public Policy. (3.0 cr.; )
Study of feminist organizations; issues and conflicts within organizations and movements; methods and sources for studying feminism.

SW 5309. Case Management with Special Populations. (3.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, offered periodically)
Examine concepts and principles of case management practice with special populations such as older adults, persons with developmental disabilities, and persons with serious and persistent mental illness. The core functions of case management practice in a range of settings are addressed in relationship to issues of diversity, vulnerability, and empowerment.

SW 5312. Children With Sexual Behavior Issues. (1.0 cr.; summer, every year)

SW 5313. Social Work with Older Adults. (2.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, offered periodically)
The practice components of social work with older adults including assessment, intervention, and case management. Taught from the perspective of bio-psycho-social strengths and challenges and within the context of current social policy and delivery systems.

SW 5316. Brief Treatment and the Task-Centered Approach. (2.0 cr.; prereq Grad student or non-degree seeking student or #; spring, offered periodically)
Advent/prominence of brief-treatment models in work with individuals, families, and groups. Theoretical/empirical bases. Practice with diverse populations in managed care. Skill training, supervised practice.

SW 5318. Family Centered Home Based Services. (2.0 cr.; prereq =: 8314; grad or non-degree seeking student or #; fall, offered periodically)
Ecological, multisystems approach focusing on the family system. Triadic theory, meta-neutrality, strengths-focus, case management and team treatment. Family-based services evaluated for high-risk, multi-problem families and as an alternative to foster placement.

SW 5319. Adolescents: Norms, Culture, and Health. (2.0 cr.;)
Relationships among familial, social, societal, political, economic, environmental, psychosocial, and cultural determinants of adolescent behavior that affect health; major public health issues and problems of adolescents.

SW 5482. Child Abuse Prevention II: Program Development, Evaluation, and Advocacy. (3.0 cr.; prereq 5481; )
Design and evaluation of policies and programs of interventions to prevent child abuse. This is the second course in the Level I Child Abuse Certificate program.

SW 5483. Child Abuse Prevention III: Skill Building I–Cultural and Legal Issues. (3.0 cr.; prereq Bachelor's degree or #; fall, offered periodically)
Risk factors, protective factors, resilience in cultural settings. Identifying/designing strategies appropriate to cultural characteristics. First course for level II child abuse prevention certification.

SW 5484. Child Abuse Prevention IV: Skill Building II–Risk Assessment and Interviewing. (3.0 cr.; prereq Bachelor's degree or #; fall, spring, offered periodically)

SW 5512. Developing and Managing an Agency Budget. (1.0 cr.; prereq MSW student or #; spring, summer, every year)
Preparing-monitoring agency budgets, interpreting/utilizing financial reports. Information systems. Fiduciary responsibilities geared to ethics, organizational mission, and positive client outcomes.

SW 5513. Grant Writing and Fund-raising. (1.0 cr.; prereq MSW student or #; fall, summer, every year)
Procuring/managing financial resources ethically in human services settings. Designing a strategic fund-raising plan. Researching sources of support, developing relationships with grant makers, preparing/submitting grant requests.

SW 5514. Strategic Risk Management in Agencies. (1.0 cr.; prereq MSW student or #; spring, summer, every year)
Strategies to minimize risk to agency, its assets, and its resources. Relationship between mission, risk management, and board role. Agency internal systems, controls, and
SW 5602. Global Social Work and Social Development. (3.0 cr.; fall, every year)
Theories/strategies of social work and social development in industrial/developing countries. Applying international perspective and comparative framework to analyze basic human needs, social problems, and social work and social development strategies in different countries.

SW 5601. Policies and Programs in American Social Welfare. (2.0 cr.; A-F or Audit; fall, every year)
Major policies and programs of social welfare, distinguishing between programs of social insurance and public assistance. Develops skills for analyzing social problems/policies that respond to those problems. Concepts for defining and measuring poverty and social disparity.

SW 5802. Social Welfare History. (1.0 cr.; A-F or Audit; spring, every year)
Policies/programs in social welfare. Historical evolution, along with themes that have shaped development over time. Contributions of population subgroups to the development of the welfare state, and the impact of policies and programs on such groups. History of social work profession.

SW 5810. Seminar: Special Topics. (1.0-4.0 cr. [max 10.0 cr.]; fall, spring, summer, every year)
Topics specified in Class Schedule.

SW 5813. Child Welfare and the Law. (2.0 cr.; prereq 2nd yr MSW or advanced standing or #; fall, spring, offered periodically)
Social work practice in juvenile court. Child abuse/neglect reporting laws, risk assessment, reasonable efforts, case plan, custody proceedings, permanency planning, termination of parental rights, child testimony, social worker testimony, adoption laws.

SW 5803. Substance Abuse and Social Work. (2.0 cr.; prereq Grad student or %; spring, every year)
Students gain skills in eliminating the detrimental impact of substance use disorders at multiple levels (families, groups, organizations, and communities) through an ability to identify, assess, intervene, and evaluate those struggling with substance abuse and dependency throughout the life span.

SW 5804. Facilitation & Conflict Mgmt: Humanistic Approach. (2.0 cr.; fall, spring, summer, every year)
Humanistic approach to facilitating meetings in small human service organizations and units within large bureaucratic structures. Managing conflict among individuals, groups, and communities in multiple settings.

SW 5805. Permanency in Child Welfare. (2.0 cr.; prereq Grad student or %; spring, every year)
Depth/breadth in knowledge/skill acquisition in achieving permanency for children receiving services within public, tribal, and private child welfare systems. Out-of-home/permanency placements, specific permanency interventions, and child/family responses to different permanency options.

SW 5906. Advanced Ethical Decision Making. (1.0 cr.; prereq Grad student or %; spring, every year)
Identify ethical issues, resolve ethical dilemmas, make ethical decisions when confronted with conflicting duties/choices that occur within the context of professional social work at all levels of practice.

SW 5907. Social Work Social Work. (1.0 cr.; prereq Grad student or %; fall, spring, summer, every year)
Apply social work knowledge/skills in school settings through prevention, assessment, intervention, and evaluation from an ecological multilevel approach focused on students, families, and the school community.

SW 5908. Technology and Communication in Social Work. (1.0 cr.; prereq Grad student or %; spring, every year)
Online course explores the influence of technology in social work practice/society. Appropriate community or direct interventions using new technologies. Introduction to effective communication and public relations.

SW 5909. Social Work With Involuntary Clients. (2.0 cr.; prereq Grad or non-degree seeking student or #; fall, spring, summer, every year)
Includes theory, ethics, effectiveness, and intervention methods for work with client systems that experience involuntary contact with a social worker. Interventions at micro, mezzo, and macro levels are included. Practice in varied settings such as child welfare, mental health, corrections, and public schools as well as practice related to organizational responses to change.

SW 5912. Grief & Loss in Social Work Practice. (1.0 cr.; fall, spring, summer, every year)
Review current concepts of grief/floss. Historical/modern views, symptoms of grief, implications of diverse losses, including expected, sudden, or traumatic losses, ambiguous grief.

SW 5913. Working with Immigrant Populations. (2.0 cr.; fall, spring, summer, every year)

SW 5914. Independent Study in Social Work. (1.0-4.0 cr.; fall, spring, summer, every year)
Independent study in areas of special interest to students and faculty.

SW 8010. Seminar: Field Practicum I. (1.0-8.0 cr.; S-N or Audit; prereq 8201; fall, spring, summer, every year)
Integrates classroom learning with direct experience of a social work field internship. Professional support/learning groups focus on student-and facilitator-identified issues. Students discuss professional/personal biases, ethical dilemmas, and supervisory issues. Cross-cultural understanding, implications of cross-cultural practice.

SW 8020. Field Practicum II. (1.0-6.0 cr.; S-N or Audit; prereq 8010; fall, spring, summer, every year)
Integrates classroom learning within a concentration with the direct experience of an internship. Students expand competency in cross-cultural practice.

SW 8030. Advanced Standing Social Work Practicum. (1.0-8.0 cr.; S-N or Audit; prereq Adv standing; fall, spring, summer, every year)
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.

SW 8041. Specialized Field Placement. (1.0-4.0 cr.; S-N only; prereq [8020 or 8030], #; fall, spring, summer, every year)
Field placement added to required foundation/concentration field placements (or to concentration placement for advanced standing students).

SW 8051. Psychopathology and Social Work Practice. (3.0 cr.; A-F only; prereq All foundation courses for full program or advanced standing or #; fall, summer, every year)
Psychopathology from ecosystemic perspective. Biopsychosocial influences on incidence, course, treatment of common mental disorders diagnosed from infancy through adulthood. Differential effects on populations at risk. Diagnostic skills, alternative intervention strategies, social work roles.

SW 8052. Resilience and Risk. (3.0 cr.; A-F only; prereq [Foundation coursework, adv standing] or #; fall, every year)
Applying theories of human development to issues confronting children, families, and social workers. Identifying strengths-based resources within ecologies of families. Mobilizing resources to empower clients to cope with, adapt to, and overcome adversities.

SW 8010. Economic Security of Disadvantaged Populations. (3.0 cr.; A-F only; prereq [8211, advanced standing] or #; spring, every year)
Impact of social policy and macro economic trends on economic security of disadvantaged populations. Focuses on anti-poverty/welfare programs in the United States, although international perspective is used as well.

SW 8015. Special Topics in Social Policy. (1.0-9.0 cr.; )

SW 8015. Social Work Methods: Practice With Individuals and Systems. (2.0 cr.; A-F
or Audit; prereq MSW student or #; fall, every year)
Develops foundation knowledge and skills for social workers to work with individuals and systems.

SW 8152. Social Work Practice Methods: Families and Groups. (2.0 cr.; A-F or Audit; prereq MSW student or #; fall, every year)
Develops 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.

SW 8153. Models of Community Intervention. (1.0 cr.; A-F or Audit; prereq MSW student or #; fall, spring, every year)
Models of community intervention as integral to social work profession's role in community/policy practice. Multi-modes of community intervention. How they are practiced at neighborhood, community, and legislative levels.

SW 8154. Organizations and Policy Advocacy. (1.0 cr.; A-F or Audit; prereq 5101 or #; spring, every year)
Community practice as it relates to human service agencies and organizations. Builds upon theoretical approaches to human service organizations/ agencies and their distinct attributes. Key practice knowledge, skills, and values that promote, develop, and maintain human service organizations that effectively meet community/client needs.

SW 8211. Macro Social Work Practice and Policy Advocacy. (3.0 cr.; A-F or Audit; prereq 5101 or #; spring, every year)
Policy analysis, development, implementation, community development, social action, social planning. Ecological, problem-solving, empowerment perspectives, policy/methods. Theories of organizational/community development/change.

SW 8251. Social Work Practice in Health, Disabilities, and Aging. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or #; fall, every year)
Social work practice in health/disabilities/aging. History in social work, practice contexts/settings, service delivery systems. Practice/population overlaps, distinctions, co-operations.

SW 8252. Advanced Interventions and Issues in Health, Disabilities, and Aging (HDA). (3.0 cr.; A-F or Audit; prereq [8251 or &8251], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)

SW 8261. Advanced Social Work Practice in Health Care. (3.0 cr.; A-F only; prereq [5051, 5101, 8151, 8152, 8841] or MSW Adv Standing or #; fall, spring, summer, every year)

SW 8262. Empowerment Practice With Persons With Disabilities. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)
Models of disability, types of disability, common social work practices. Knowledge/skills for use across lifespan/cultures/various settings.

SW 8263. Advanced Direct Practice and Community-Based Interventions in Gerontology. (3.0 cr.; A-F or Audit; prereq [8251 or &8251], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year)

SW 8312. Advanced Social Work Practice With Groups. (3.0 cr.; prereq [8201, 8202, adv standing] or #; )
Advanced clinical social work practice with groups. How to differentiate among available models of group work and select an appropriate model based on needs of client population and on context in which they are served.

SW 8313. Professional Practice in Interdisciplinary Teams and Collaboratives. (3.0 cr.; prereq [Foundation curriculum, advanced standing or grad student in health and human service or in educational professional program)] or #; fall, spring, every year)
Principles of interdisciplinary/interorganizational collaboration in human services, health, and educational settings. Team building, decision-making models, engaging value differences, managing conflict on team, role/status disparities, relational communications. Emerging approaches to interorganizational collaboration.

SW 8315. Mood Disorders: New Directions in Clinical Care. (2.0 cr.; prereq [Foundation coursework, advanced standing] or #; spring, offered periodically)

SW 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

SW 8451. Assessment and Engagement in Clinical Social Work Practice. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8154] or MSW Adv Standing or #; fall, summer, every year)

SW 8452. Core Concepts in Clinical Social Work Practice. (3.0 cr.; A-F or Audit; prereq [8451 or &8451], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, spring, every year)
Interpersonal process skills. Developing/maintaining effective therapeutic alliances/positive intervention outcomes with diverse populations.

SW 8461. Advanced Clinical Social Work Practice with Adults. (3.0 cr.; A-F or Audit; prereq [8451 or &8451], [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, every year)
Research-informed clinical interventions for adults with mental health distress. Application of cognitive behavioral/psychodynamic psychotherapies through brief/long-term models across diverse populations.

SW 8462. Advanced Clinical Practice With Children and Adolescents. (3.0 cr.; A-F

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or Audit; prereq [5351 or &351] or [8451 or 8451]; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: fall, every year) 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.

SW 8463. Social Work Practice With Severe and Persistent Mental Illness and Severe Emotional Disturbance. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: spring, every year) Integrated social work approach to assessing/working with individuals with SPMI, SED. Integrated social work approach to assessing/working with individuals with SPMI, SED. Advanced mediator skills for social workers; appropriateness of mediation for conflicts that frequently confront social work practitioners, such as divorce, neighborhood disputes, and conflicts between parents and adolescents, between spouses, and between crime victims and offenders.

SW 8525. Global Perspectives on Social Welfare, Peace, and Justice. (3.0 cr.; A-F only; prereq [8211, advanced standing] or #: spring, offered periodically) Role of international social welfare in meeting basic human needs and promoting human rights, social justice, and peace. Theories, models, and strategies of social welfare in different economic/political systems. Emphasizes Third World nations. Skills for social workers and other professionals in the helping professions.

SW 8551. Advanced Community Practice: Assessment, Organizing, and Advocacy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: fall, every year) Community practice, including community organizing, policy advocacy, social service/ change leadership.

SW 8552. Advanced Community Practice: Leadership, Planning, and Program Development. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: fall, every year) Advanced community practice knowledge/skills. Strategic planning, program design, organizational leadership/management, work groups.

SW 8561. Human Resources Management in Human Services Agencies. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: fall, every year) 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.

SW 8562. Human Services Finances. (2.0 cr.; prereq [5051, 5801, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: spring, every year) Contexts, purposes, principles, strategies associated with human services financing. Acquiring, allocating, managing, reporting public/private funding. Financial policy, mission. Short/long term agency sustainability.

SW 8563. Advanced Policy Advocacy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: fall, every year) 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.

SW 8602. Direct Practice Evaluation. (2.0 cr.; A-F only; prereq 8601 or equiv or #: fall, spring, every year) 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.

SW 8603. Program Evaluation. (2.0 cr.; A-F only; prereq 8601 or equiv or #: fall, every year) 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.

SW 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.] No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to 4 times, up to 60 combined cr; fall, spring, summer, every year) TBD

SW 8693. Directed Study. (1.0-6.0 cr.; prereq #: fall, spring, summer, every year) Independent study under tutorial guidance.

SW 8694. Directed Research. (1.0-6.0 cr.; prereq #: fall, spring, summer, every year) Independent 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.

SW 8801. Social Work Ethics and Legal Issues. (3.0 cr.; prereq =: 5811; foundation courses or adv standing or #: fall, spring, offered periodically) 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.

SW 8804. Child Welfare Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #: spring, every year) Develops advanced policy knowledge/skills for social workers practicing in or collaborating with public or private child welfare services.

SW 8805. Aging and Disability Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151,
SW 8806. Health and Mental Health Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year) Critical thinking in health and mental health policy debate, analysis, development, implementation.

SW 8807. International and Comparative Social Welfare Policy. (3.0 cr.; A-F or Audit; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; spring, every year) 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.

SW 8821. Social Work and Difference, Diversity and Privilege. (2.0 cr.; A-F only; prereq [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, summer, every year) Essential knowledge/awareness/skills to support culturally competent social work practice.

SW 8841. Social Work Research Methods. (2.0 cr.; A-F or Audit; prereq MSW student or #; fall, spring, every year) Develops foundational research methods knowledge/skills fundamental to evidence-based social work practice.

SW 8842. Advanced Social Work Evaluation. (1.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; [5051, 5101, 8151, 8152, 8153, 8841] or MSW Adv Standing or #; fall, spring, summer, every year) Students design/carry out 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.

SW 8851. Social Welfare History and Historical Research Methods. (3.0 cr.; A-F only; prereq Completed research courses for soc work PhD student or [equiv research methods courses, grad student]); spring, offered periodically) Methods of historical research in, and survey of, history/evolution of social welfare/work, using primary/secondary source materials.

SW 8855. Social Policy Formulation and Analysis. (3.0 cr.; A-F only; prereq Soc wk PhD student or #; fall, offered periodically) Application of theoretical perspectives, conceptual frameworks, and research methodologies to analysis of social issues and analysis/formulation of social welfare policy.

SW 8861. Theory and Model Development in Social Work. (3.0 cr.; A-F only; prereq Soc wk PhD student or #; fall, offered periodically) 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.

SW 8863. Social Work Teaching Methods and Educational Issues. (3.0 cr.; A-F only; prereq Soc wk PhD student or #; fall, offered periodically) 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.

SW 8871. Social Work Research Seminar I. (3.0 cr.; A-F only; prereq Soc wk PhD student or #; fall, every year) 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.

SW 8872. Social Work Research Seminar II. (3.0 cr.; A-F only; prereq 8871 or #; spring, every year) Methods/design of quasi-experiments, surveys, descriptive research. Grounded theory. Analysis of quantitative/qualitative data.

SW 8875. Research Practicum. (2.0 cr. [max 6.0 cr.]; S-N or Audit; prereq Soc wk PhD student or #; fall, spring, every year) Experience in conduct of research, following completion of 8871 and 8872. Students work under faculty direction.

SW 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

SW 8901. Assessment and Treatment of Trauma. (2.0 cr.; prereq Advanced Standing or students who have completed entire foundation curriculum including SW 8010 or #; spring, every year) 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.

SW 8902. Social Work Supervision, Consultation, and Leadership. (2.0 cr.; prereq Advanced Standing or students who have completed entire foundation curriculum including SW 8010 or #; spring, offered periodically) 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.

SAPH 5100. Pro-Seminar. (1.0 cr.; A-F or Audit; fall, every year) History, foundational frameworks, and key research domains for social and administrative pharmacy through examining landmark literature. Students think critically, reflect on important works, and create a cognitive map of the discipline and their own focus for study.

SAPH 5610. Pharmacoeconomics. (2.0 cr. [max 3.0 cr.]; A-F only; fall, odd years) Application of epidemiologic principles to study/use. Beneficial/adverse outcomes of drugs in human populations.

SAPH 8054. Advanced Studies in Pharmaceutical Care Practice. (3.0 cr.; A-F or Audit; fall, spring, every year) Analyzing practice/implementation of pharmaceutical care. Students confront their assumptions about pharmacy profession, pharmacy practice, and pharmaceutical care. Discussions, guest speakers, intensive literature searches/evaluation.

SAPH 8100. Seminar. (1.0 cr. [max 8.0 cr.]; A-F only; prereq Grad SAPh major or #; fall, spring, every year) Contemporary issues and research problems in sociobehavioral pharmacy, pharmacoconomics and policy, and clinical research.

SAPH 8173. Principles and Methods of Implementing Research. (3.0 cr.; = [NURS 8173]; prereq Two grad stat courses; fall, every year) Integrates scientific, statistical, and practical aspects of research. Interrelationships among design, sample selections, subject access, human subjects requirements, instrument selection and evaluation, data management, analyses plans, grant writing, and research career issues. Field experiences.

SAPH 8200. Research Problems. (1.0-8.0 cr. [max 16.0 cr.]; prereq Grad SAPh major or #; fall, spring, summer, every year) Individually designed research experience directed at contemporary problems related to drug use process.

SAPH 8235. Pharmaceutical Economics and Policy. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; fall, every year) Economic analysis of pharmaceutical sector of health care systems. Problems of pricing production and distribution of pharmaceuticals. Domestic or international policy issues relevant to price and access of pharmaceuticals.

SAPH 8255. Pharmaceutical Marketing. (3.0 cr.; A-F or Audit; prereq Grad SACP major or #; fall, spring, offered periodically) Historical development of distributive systems, marketing channels, institutions, policies, and practices as they relate to pharmaceutical industry. Contemporary issues/theory related to pharmaceutical marketing. Pharmaceutical proportion, especially directed to consumer advertising.

SAPH 8270. Clinical Conferences. (2.0 cr.; prereq Grad SAPh major or #; fall, every year)

SAPH 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master’s student,
SAPH 8420. Social and Behavioral Aspects of Pharmacy Practice. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; spring, every year)

Historical development of the profession, its growth and development, emphasizing factors of education, professionalization, attitude modification, and changes occurring as a product of legal and organizational forces in society.

SAPH 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

SAPH 8500. Pharmacy and Its Environment. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; spring, every year)

Cultural foundations of pharmacy. Development of present state of pharmacy practice. Role of pharmacist as health practitioner in relation to other health practitioners. Identification of factors (health policy, regulation, economics, research and development, promotion) that affect individual responses to drug therapy.

SAPH 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

Doctoral pre-thesis credits.

SAPH 8700. Hospital Pharmacy Administration. (3.0 cr.; A-F or Audit; prereq Grad SAPh major or #; )

History, classification, organization, and functions of hospital departments in relation to the pharmacy service.

SAPH 8702. Hospital Pharmacy Survey. (1.0 cr. [max 3.0 cr.]; prereq Grad SAPh major or #;)

Readings for self-directed students to explore contemporary issues in hospital pharmacy practices.

SAPH 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Master's student; [adviser, DGS] consent; fall, spring, summer, every year)

(No description)

SAPH 8810. Social Psychology of Health Care. (3.0 cr.; prereq Grad SAPh major or #; spring, offered periodically)

Behavioral and social aspects of recovery responses to drugs and other therapies, patients' compliance with prescribed therapies, relationships between healthcare professional and patient.

SAPH 8840. Social Measurement. (3.0 cr.; A-F or Audit; prereq Intro stat course, understanding of simple correlations or #; fall, spring, offered periodically)

How social factors such as innovativeness, compliance, religiosity, and stress are measured and tested for reliability and validity. Relationships between theory, concepts, variables, data.

SAPH 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)

(No description)

Social, Administrative, and Clinical Pharmacy (SACP)

College of Pharmacy

SACP 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, [adviser, DGS] consent; fall, spring, summer, every year)

tbd

SACP 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, [adviser, DGS] consent; fall, spring, summer, every year)

tbd

SACP 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

tbd

SAP 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Plan A, fall, spring, summer, every year)

tbd

SAP 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; fall, spring, summer, every year)

tbd

Sociology (SOC)

College of Liberal Arts

SOC 5090. Topics in Sociology. (1.0-3.0 cr. [max 9.0 cr.]; prereq Undergrad soc majors/ minors must register A-F; spring, offered periodically)

Topics specified in Class Schedule.

SOC 5455. Sociology of Education. (3.0 cr.; [OLPD 5041]; prereq 1001 or equiv or #; soc majors/minors must register A-F; spring, offered periodically)

Structures/processes within educational institutions. Links between educational organizations and their social contexts, particularly as they relate to educational change.

SOC 5511. World Population Problems. (3.0 cr.; [PA 5301]; prereq Soc majors/minors must register A-F; credit will not be granted if credit has been received for PA 5301; fall, every year)

Population growth, natural resources, fertility/mortality in less developed nations, population dynamics/forecasts, policies to reduce fertility.

SOC 5811. Intermediate Social Statistics. (4.0 cr.; [SOC 3811]; prereq Primarily for 1st-yr soc grad students; undergraduates with strong math background who have completed 3801 are encouraged to register for 5811 in lieu of 3811 or #; soc majors/minors must register A-F; fall, every year)

Measurement, theory of probability, bivariate statistics. Multiple regression analyses of sociological data.

SOC 8001. Sociology as a Profession. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Grad soc major, fall, spring, every year)

Sample topics: role of sociology in society, professional organizations, employment opportunities, professional ethics, and writing for publication or grant proposals.

SOC 8011. Teaching Sociology: Theory & Practice. (3.0 cr.; prereq Soc grad student or #; spring, every year)

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.

SOC 8090. Topics in Sociology. (1.5-3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, summer, every year)

Topics specified in [Class Schedule].

SOC 8091. Independent Study. (1.0-5.0 cr. [max 20.0 cr.]; )

Independent study of an established 8xxx course.

SOC 8093. Directed Study. (1.0-4.0 cr. [max 20.0 cr.]; prereq Grad soc major or #; fall, spring, summer, every year)

Directed study in sociology.

SOC 8094. Directed Research. (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)

May be used to fulfill sociology graduate requirement for advanced methodological training.

SOC 8101. Sociology of Law. (3.0 cr.; fall, spring, offered periodically)

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. (3.0 cr.; fall, spring, offered periodically)

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. (3.0 cr.; A-F or Audit; prereq [Grad student, 4148] or #; fall, spring, offered periodically)
Intensive survey of psychopathology. Reference to criminal behavior, criminal justice system.

SOC 8190. Topics in Law, Crime, and Deviance. (3.0 cr. [max 9.0 cr.]; prereq Grad student in sociology or #; fall, every year) Advanced topics in law, crime, and deviance. Social underpinnings of legal/illegal behavior and of legal systems.

SOC 8201. Social Stratification and Mobility. (3.0 cr.; prereq 3811 or equiv or #; fall, spring, offered periodically) Form and content of hierarchical arrangements. Relationship of hierarchy to social order and individual behavior. Structures of social stratification. Status attainment. Mobility. Inequality and economic development, social development, and technological change. Economic status in relation to social status, including race, gender.

SOC 8211. Race Relations Theory. (3.0 cr.; fall, spring, offered periodically) 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. (3.0 cr. =WOST 8202); fall, offered periodically) 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 Social Stratification. (3.0 cr. [max 12.0 cr.]; fall, offered periodically) 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. (3.0 cr.; fall, every year) 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. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SOC 8390. Topics in Political Sociology. (3.0 cr. [max 12.0 cr.]; prereq Soc grad student or #; fall, spring, offered periodically) Topics with common focus on social underpinnings of political behavior/change. 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. Topics specified in Class Schedule.


SOC 8421. Work and Occupations. (3.0 cr.; fall, every year) Sociological analysis of work, occupations, and labor markets, including contemporary theory and research. Course emphasis varies with instructor.

SOC 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SOC 8490. Advanced Topics in Social Organization. (3.0 cr. [max 12.0 cr.]; prereq #; fall, spring, every year) 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].

SOC 8501. Sociology of the Family. (3.0 cr.; fall, every year) 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. (3.0 cr. [max 12.0 cr.]; fall, every year) Families and mental health; families, work, and the labor market; historical/comparative research on the family. Topics specified in [Class Schedule].

SOC 8551. Social Structure and the Life Course. (3.0 cr.; prereq Soc grad major or #; fall, every year) Central concepts/prespectives of life course analysis as applied to intersocietal (comparative); intrasocietal (socioeconomic status, race, gender); and historical variability. Institutional patterning of life course (family, education, work, politics); deviance and criminal careers, changes in the self, methodological strategies.

SOC 8559. Topics in Life Course Sociology. (3.0 cr. [max 12.0 cr.]; fall, offered periodically) 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. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

SOC 8701. Sociological Theory. (4.0 cr.; A-F or Audit; prereq Grad soc major or #; fall, every year) Traditions of social theory basic to sociological knowledge, their reflection and expansion in contemporary theory, their applications in selected areas of empirical research. Sample topics: social inequality, social organization and politics, family organization and social reproduction, social order and change, sociology of knowledge and religion.

SOC 8721. Theories of Social Psychology. (3.0 cr.; fall, spring, offered periodically) Prominent contemporary theories of sociological social psychology, including structural (social structure and personality) perspectives, social relationships and small group processes (exchange, equity, expectation states theories), and symbolic interactionism. Classical writings, theoretical statements, and empirical studies.

SOC 8731. Sociology of Knowledge. (3.0 cr.; prereq Soc grad student or #; fall, offered periodically) Knowledge and related terms (ideology, stereotype, prejudice, belief, truth). Variation of knowledge across social groups/categories (e.g., gender, race, class, generation, nationality); institutions (e.g., politics, law, science); and societies across time and space. Power, rituals, institution, networks, and knowledge. Genealogy of theories.


SOC 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SOC 8790. Advanced Topics in Sociological Theory. (3.0 cr. [max 12.0 cr.]; spring, offered periodically) Sample topics: theories of conflict, theories of purposive action, Marxist theory, and structure-agency debate.

SOC 8801. Sociological Research Methods. (4.0 cr.; A-F or Audit; prereq Grad soc major or #; fall, spring, offered periodically) Multiple objectives of social research and how they inform research design. Conceptualization and measurement of complex concepts. Broad issues in research design and quantitative and qualitative approaches to data collection and management.
SOC 8811. Advanced Social Statistics. (4.0 cr.; A-F or Audit; prereq 5811 or equiv, grad soc major or #; fall, spring, every year) Statistical methods for analyzing social data. Sample topics: advanced multiple regression, logistic regression, limited dependent variable analysis, analysis of variance and covariance, log-linear models, structural equations, and event history analysis. Applications to datasets using computers.

SOC 8888. Thesis Credits: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq [Completion of four semesters and all required credits completed]; 24 cr required; fall, spring, every year) (No description)

SOC 8890. Advanced Topics in Research Methods. (2.0-3.0 cr. [max 6.0 cr.]; prereq Soc Grad Student whose completed 8801 and 8811 or #. Cr will not be granted if cr has been received for the same topics title; fall, spring, every year) Advanced Research Methods (e.g., multilevel models), historical/comparative, field, survey research. Topics specified in Class Schedule.

Software Engineering (SENG)

Institute of Technology

SENG 5115. Graphical User Interface Design, Evaluation, and Implementation. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, spring, every year) 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.

SENG 5116. Graphical User Interface Toolkits. (2.0-3.0 cr.; A-F or Audit; prereq Grad SEng major; ) 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.

SENG 5131. Distributed Application Design and Development. (3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) Java programming, concurrent programming, workflow, distributed database, security, collaborative computing, object-oriented architecture/design, network publishing, messaging architecture, distributed object computing, and intranet.

SENG 5199. Topics in Software Engineering. (2.0-3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq SEng grad student; spring, every year) Topics specified in Class Schedule.


SENG 5551. Introduction to Intelligent Robotic Systems. (3.0 cr.; A-F or Audit; prereq Grad SEng major; ) 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.

SENG 5707. The Principles of Database Systems. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, every year) Fundamental concepts; representing instances; prototypic model shapes; model evolution; interviewing user skills, reverse engineering; mapping to DBMS schema; database querying.

SENG 5708. Data Analytics. (2.0-3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) 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.

SENG 5801. Software Engineering I: Overview, Requirements, and Modeling. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, every year) 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.

SENG 5802. Software Engineering II: Software Design. (3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) 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.

SENG 5811. Software Testing and Verification. (2.0 cr.; A-F or Audit; prereq 5801, grad SEng major; spring, every year) 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.


SENG 5841. Model-based Development. (3.0 cr.; A-F or Audit; prereq Grad SEng major; spring, every year) Formal specification of software artifacts. Applicability of formal specifications. Methods such as Z, SCR, andSelecharts. Formal analysis. Theorem proving. Reachability analysis. Model checking. Tools such as PVS, Statemate, SPIN, and SMV.

SENG 5851. Software Project Management. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, spring, every year) 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.

SENG 5852. Quality Assurance and Process Improvement. (3.0 cr.; A-F or Audit; prereq Grad SEng major; fall, spring, every year) 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.

SENG 5861. Introduction to Software Architecture. (3.0 cr.; A-F or Audit; prereq 2nd year, MSSE grad student; ) Software/systems architecture. Representation/design, how they fit into software engineering process. Description of architectures, including representation and quality attributes.

SENG 5899. Software Engineering Seminar. (1.0 cr. [max 2.0 cr.]; prereq Grad SEng major, #; fall, every year) Software engineering trends. Talks by invited speakers, selected readings.

SENG 5900. Directed Study. (1.0-3.0 cr.; fall, spring, every year) Directed study/research in software engineering. Topics/scope decided in collaboration with instructor.

SENG 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SENG 8494. Capstone Project (Plan B Project). (3.0 cr.; S-N or Audit; prereq SEng major; spring, every year) Students work in teams on software project 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.

SENG 8891. Independent Project. (2.0-6.0 cr. [max 12.0 cr.]; fall, spring, every year) Independent project arranged with faculty.

Soil, Water, and Climate (SOIL)
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.

SOIL 8110. Colloquium in Soil Science. (1.0-3.0 cr.; [max 6.0 cr.]; S-N or Audit; fall, spring, summer, every year) Research or intellectual areas in soil science or climatology not covered in regular courses. Topics vary; contact department for current offerings.


SOIL 8510. Advanced Topics in Pedology. (2.0-4.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5515; fall, odd years) Sample topics: soil-landscape relations, soil genesis, landscape evolution, land use and management, precision agriculture, digital terrain modeling, forest soils.

SOIL 8541. Aquatic and Soil Chemistry. (3.0 cr.; A-F or Audit; prereq = CE 8541; 5311 or CE 4541; spring, odd years) 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.

SPAN 5110. Discursive Formations at the Threshold of 20th-Century Spain. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Theory and representative examples of the realist/naturalist novel (Galdas, Pardo Bazan) in the context of its antecedents ("costumbrismo"), opposites (the idealist/sentimental novel), and turn-of-the-century innovations of modernism and the "generation of 1898."


SPAN 5580. Latin American Cultural Integration in the Neocolonial Order. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Modernismo, historical vanguard, impact of populist politics in patterns of culture/literature. 1900-50.


SPAN 5701. History of Ibero-Romance. (3.0 cr.; prereq Grad student or #; spring, offered periodically) Origins and developments of Ibero-Romance languages; evolution of Spanish, Portuguese, and Catalan.

SPAN 5711. The Structure of Modern Spanish: Phonology. (3.0 cr.; prereq Grad student or #; fall, spring, every year) Formulating and evaluating a phonological description of Spanish. Approaches to problems in Spanish phonology within metrical, autosegmental, and lexical phonological theories.

SPAN 5714. Theoretical Foundations of Spanish Syntax. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Linguistic processes that appear across languages. Grammatical relations, word order, transitivity, subordination, information structure, grammaticalization. How these are present in syntax of Spanish.

SPAN 5715. The Structure of Modern Spanish: Semantics. (3.0 cr.; prereq Grad student or #; fall, offered periodically) 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.


SPAN 5717. Spanish Sociolinguistics. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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.

SPAN 5718. Spanish Language Contact. (3.0 cr.; prereq Grad student or #; fall, spring, offered periodically) Analysis of different types/results of Spanish language contact globally, taking into account varying social conditions under which contact occurs.

SPAN 5721. Spanish Laboratory Phonology. (3.0 cr.; A-F or Audit; prereq Grad student or #; fall, spring, offered periodically) 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.

SPAN 5910. Topics in Spanish Peninsular Studies. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; fall, spring, every year) Crucial moment or characters, works, or events marking beginning of new phase in literary/cultural landscape.

SPAN 5920. Topics in Spanish-American Studies. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; fall, spring, summer, offered periodically) 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.

SPAN 5930. Topics in Ibero-Romance Linguistics. (3.0 cr.; max 9.0 cr.; prereq Grad student or #; spring, summer, offered periodically) Problems in Hispanic linguistics; a variety of approaches and methods.

SPAN 5970. Directed Readings. (1.0-4.0 cr.; max 9.0 cr.; fall, spring, every year) 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. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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.

SPAN 5990. Directed Research. (1.0-4.0 cr.; max 9.0 cr.; fall, spring, every year) Directed research. Prereq Grad student or instr consent.

SPAN 5991. The Acquisition of Spanish as a First and Second Language. (3.0 cr.; prereq Grad student or #; spring, offered periodically) 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.

SPAN 8100. Research in Sociohistorical Approaches to Spanish Literature. (3.0 cr.; max 9.0 cr.; prereq 5xxx courses in Span literature and culture; ) Sociohistorical functions of Spanish literary works and major theories concerning literary production of texts. Testing modern theories in terms of representative fictional discourses from specific historical periods.

SPAN 8200. Spanish Literary Texts: Theories of Formal Structures. (3.0 cr.; max 9.0 cr.; prereq 5xxx courses in Span literature and culture; ) 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.

SPAN 8212. Spanish Theater of the 16th Century: Drama up to Lope. (3.0 cr.; prereq 5xxx courses in Span literature and culture; ) 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.


SPAN 8300. The Construction of Spanish Literary History. (3.0 cr.; max 9.0 cr.; prereq 5xxx courses in Span literature and culture; ) 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.

SPAN 8312. Two Spanish Masterpieces: [Libro de Buen Amor] and [La Celestina]. (3.0 cr.; prereq 5106, 5107 or 5xxx course in Span literature and culture; ) 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.
SPAN 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SPAN 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SPAN 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

SPAN 8710. Seminar in Hispanic Linguistics. (3.0 cr. [max 9.0 cr.]; prereq 5711, [Ling 5302 or #]; fall, even years) Critical examination of readings/research on specific topic.

SPAN 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (No description)

SPAN 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year) (No description)

SPAN 8900. Spanish Seminar. (3.0 cr. [max 9.0 cr.]; prereq Span 5xxx series required for MA or #; fall, spring, summer, every year) 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.

SPAN 8940. Advanced Research in Spanish-American Literary Historiography. (3.0 cr. [max 9.0 cr.]; ) 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. (3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Reading knowledge of Spanish and Portuguese; fall, spring, summer, every year) Individualized support and advice in framing, theorizing, problematizing, and interpreting areas of cultural research. Taught in Spanish, Portuguese, and English.

SPAN 8990. Advanced Comparative Research of Caribbean Genres. (3.0 cr. [max 9.0 cr.]; prereq 5525 or #; ) 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.

Spanish and Portuguese (SPPT) College of Liberal Arts

SPPT 5930. Selected Topics in Hispanic and Lusophone Cultural Discourse. (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; prereq Reading knowledge of Spanish and Port; fall, summer, every year) 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.

SPPT 5995. Directed Teaching. (1.0 cr.; S-N only; prereq Grad student with concurrent enrollment in 5999; fall, every year) 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.

SPPT 5999. The Teaching of College-Level Spanish: Theory and Practice. (3.0 cr.; prereq Grad or #; fall, every year) 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.

SPPT 8400. Topics in Modern Hispanic and Lusophone Culture. (3.0 cr. [max 9.0 cr.]; prereq Three 5xxx SPAN or PORT courses; fall, spring, offered periodically) Advanced research in methods of analysis of cultural products, including but not limited to substrates, assessment and diagnosis, and dementia. Consideration of neurologic and cognitive disabilities. Consideration of special populations in Speech-Language Pathology. Non-English IPA sounds needed for special populations.


SLHS 5401. Counseling and Professional Issues. (3.0 cr.; prereq [& 8720 or & 8820], grad student) recommended; fall, every year) Basic counseling principles and current professional issues in communication disorders. Application of counseling theory to clinical practice. Analysis of regulation, practice, and future direction of communication disorders.


SLHS 5503. Fluency and Motor Speech Disorders. (3.0 cr.; prereq graduate SLHS student or department permission, [3305, 4301] or #; fall, every year) Nature/management of motor speech disorders in adults/children.

SLHS 5504. Dysphagia. (2.0 cr.; prereq current SLHS graduate major; fall, every year) Normal/disordered aspects of swallowing. Nature, etiologies, evaluation, management of swallowing disorders.

SLHS 5602. Phonological Disorders. (3.0 cr.; prereq [3303, 3304, 4601] or #; fall, every year) Theory/research related to nature, assessment, treatment of phonological disorders in children.

SLHS 5603. Language and Cognitive Disorders in Children. (3.0 cr.; prereq 3303 or CDis 3303 or equiv or grad student or #; fall, spring, offered periodically) Language assessment, teaching procedures used with children/adolescents. Procedures apply to children who face language disabilities such as developmental delays, autism, learning disabilities.

SLHS 5605. Language and Cognitive Disorders in Adults. (3.0 cr.; prereq [3302, 4301] or [CDis 3302, CDis 4301] or #; fall, spring, offered periodically) Neurogenic communicative and cognitive disorders in adults, including aphasia, right-hemisphere syndrome, traumatic brain injury, and dementia. Consideration of neurologic substrates, assessment and diagnosis, and clinical intervention.

SLHS 5606. Introduction to Augmentative and Alternative Communication. (3.0 cr.; prereq SLHS grad or #; fall, spring, every year) Description of the range of augmentative and alternative communication applications for persons with developmental and acquired disabilities.
SLHS 5608. Clinical Issues in Bilingualism and Cultural Diversity. (3.0 cr.; A-F only; prereq 3303 or equiv or #; spring, every year) 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.

SLHS 5801. Audiologic Assessment I. (3.0 cr.; prereq 4801 or CDIs 4801 or#; fall, every year) Basic audiometric battery, including pure tones, speech, masking, and immittance in adults. Industrial audiology, ototoxic emissions.

SLHS 5802. Hearing Aids I. (3.0 cr.; prereq [3305, 4801] or [CDIS 3305, CDIS 4801], SLHS grad] or #; fall, every year) Survey of modern hearing aids including history of development, electroacoustic functions, clinic and laboratory measurement techniques, sound field acoustics, techniques for selection.

SLHS 5803. Hearing Loss in Children: Diagnosis. (3.0 cr.; prereq [4801 or CDIS 4801], SLHS grad] or #; fall, every year) Behavioral, physiological approaches to assessment and identification, development of the auditory mechanism, etiologies of hearing losses in infants, children, selection of sensory aids, principles of case management with children and families.

SLHS 5804. Cochlear Implants. (3.0 cr.; A-F or Audit; prereq [4802, 5801, 5802] or [CDIS 4802, CDIS 5801, CDIS 5802], SLHS grad] or #; spring, offered periodically) 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.


SLHS 5806. Auditory Processing Disorders. (3.0 cr.; A-F or Audit; prereq [4802 or CDIS 4802, SLHS grad] or #; spring, odd years) Normal/disordered auditory processing abilities. Anatomy/physiology of central auditory pathway, assessments to evaluate auditory processing skills, techniques to address auditory processing weaknesses. Current/historical theories/controversies surrounding auditory processing assessment.


SLHS 5808. Hearing Disorders. (3.0 cr.; A-F or Audit; prereq [8801, 8802] or [CDIS 8801, CDIS 8802], SLHS grad] or #; summer, every year) Disorders of auditory system, including anatomical, physiological, perceptual, and audiological manifestations of pathologies affecting hearing.

SLHS 5810. Laboratory Module in Audiology. (1.0-2.0 cr.; max 5.0 cr.; prereq [4801 or CDIS 4801, SLHS grad] or #; fall, spring, every year) Intensive study of clinical methods in audiology. Supplements didactic courses in audiology curriculum. Laboratory study, individually or in small groups.

SLHS 5820. Clinical Research and Practice: Grand Rounds. (1.0-6.0 cr.; S-N or Audit; prereq [4801 or CDIS 4801 or equiv], SLHS grad] or #; fall, spring, every year) 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.

SLHS 5830. Clinical Foundations in Audiology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; prereq Grad SLHS major; fall, spring, summer, every year) Clinical foundations in audiology for first year AuD graduate students.

SLHS 5900. Topic in Speech-Language-Hearing Sciences. (1.0-4.0 cr. [max 8.0 cr.]; prereq SLHS grad student or #; fall, spring, offered periodically) Topics listed in Speech-Language-Hearing Sciences office.

SLHS 5993. Directed Study. (1.0-12.0 cr. [max 18.0 cr.]; prereq SLHS grad or #; fall, spring, summer, every year) Directed readings and preparation of reports on selected topics.

SLHS 8333. FTE: Masters. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SLHS 8410. Seminar: Research. (3.0 cr.; fall, spring, offered periodically) Advanced study exploring application of experimental and quasi-experimental research designs used in single-subject and group research.

SLHS 8420. Seminar: Teaching. (3.0 cr. [max 9.0 cr.]; prereq Grad com dis major; fall, spring, offered periodically) Advanced study to prepare doctoral students for careers in undergraduate and graduate teaching.

SLHS 8430. Proseminar in Speech-Language-Hearing Sciences. (1.0 cr. [max 10.0 cr.]; S-N only; prereq SLHS grad student; fall, spring, every year) Presentations/discussions led by faculty and PhD students in the department, based on research or issues in the discipline.

SLHS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SLHS 8501. Interdisciplinary Management in Cleft Palate and Craniofacial Disorders. (3.0 cr.; prereq 3305 or CDIs 3305 or #; fall, every year) 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.

SLHS 8530. Seminar: Speech. (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Advanced study and analysis of research in speech science and speech pathology.


SLHS 8630. Seminar: Language. (3.0 cr.; max 12.0 cr.; fall, spring, offered periodically) Research in language acquisition, language science, and language disorders.

SLHS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) (1.0 cr. [max 12.0 cr.]; fall, spring, summer, every year) (No description)

SLHS 8720. Clinical Education in Speech-Language Pathology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; fall, spring, summer, every year) Clinical experience. Prereq Grad CDIs major, adviser, DGS consent.

SLHS 8777. Thesis Credits: Master's. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year) (1.0 cr. [max 18.0 cr.]; fall, spring, summer, every year) (No description)

SLHS 8801. Audiologic Assessment II. (3.0 cr.; prereq 5801 or CDIs 5801 or #; spring, every year) Auditory brainstem response and balance function in adults. Case studies and development of clinical protocols allowing for integration of topics from both courses in this sequence.
SLHS 8802. Hearing Aids II. (3.0 cr.; prereq 5802 or Cdis 5802 or #; spring, every year) Instrumentation and methods for fitting and evaluating personal hearing aids; ear impression techniques and materials; repair and modification of hearing aids.

SLHS 8803. Signals and Systems in Audiology. (3.0 cr.; prereq [3305, 3306, 4801] or [Cdis 3305, Cdis 3306, 4801] or #; fall, every year) Introduction to electronics, digital signal processing, and calibration of instruments used to assess hearing. Lab sessions on such topics as sound-field calibration, earphone calibration, filters, spectra of transient signals, and use of an artificial mastoid.


SLHS 8806. Audiology Capstone. (1.0-6.0 cr.; S-N or Audit; prereq 8802, 8807; fall, offered periodically) 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.

SLHS 8807. Audiologic Assessment III: Balance. (3.0 cr.; prereq 5801, 8801; spring, even years) Anatomy/physiology of vestibular mechanism, assessment techniques to evaluate balance function. Treatment options available for persons with balance disorders.

SLHS 8820. Clinical Education in Audiology. (1.0-8.0 cr. [max 24.0 cr.]; S-N or Audit; prereq Grad CDis majors; fall, spring, summer, every year) Clinical experience.

SLHS 8830. Seminar: Hearing. (3.0 cr. [max 12.0 cr.]; fall, spring, summer, offered periodically) Advanced study/analysis of research in hearing science and audiology.

SLHS 8840. Audiology Externship. (1.0-7.0 cr.; S-N or Audit; prereq [8802, 8807] or [CDis 8802, CDis 8807]; fall, spring, offered periodically) Students intern at external clinical setting under supervision of certified audiologist. Entry-level knowledge/skills required for professional practice as clinical audiologist. External internship settings may include hospitals, schools, private otolaryngology practices, hearing aid dispensing practices, industrial settings, and community clinics.

SLHS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required.; fall, spring, summer, every year) (No description)

STAT 5021. Statistical Analysis. (4.0 cr.; =STAT 3011, ANSC 3011, ESPM 3012; prereq = 3011; College algebra or #; fall, spring, every year) Intensive introduction to statistical methods for graduate students needing statistics as a research technique.

STAT 5031. Statistical Methods for Quality Improvement. (4.0 cr.; prereq [3021 or 3022 or 4102 or 5021 or 5012 or 8102], Math 1272; spring, offered periodically) Random variability/sampling. Controlling statistical process. Shewhart/accumulative charting. Analyzing plant data, trend surface, and variance/design of experiments.


STAT 5101. Theory of Statistics I. (4.0 cr.; =STAT 4101; prereq MATH 2263 or MATH 2374; fall, every year) 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.

STAT 5102. Theory of Statistics II. (4.0 cr.; =STAT 4102; prereq 5101 or Math 5651; spring, every year) Sampling, sufficiency, estimation, test of hypotheses, size/power. Categorical data. Contingency tables. Linear models. Decision theory.

STAT 5201. Sampling Methodology in Finite Populations. (3.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; spring, every year) Simple random, systematic, stratified, unequal probability sampling. Ratio, model based estimation. Single stage, multistage, adaptive cluster sampling. Spatial sampling.

STAT 5302. Applied Regression Analysis. (4.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; fall, spring, summer, every year) 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.

STAT 5303. Designing Experiments. (4.0 cr.; prereq 3022 or 4102 or 5021 or 5102 or #; fall, spring, summer, every year) Analysis of variance. Multiple comparisons. Variance-stabilizing transformations. Contrasts.
Audit; prereq Statistics grad or #; fall, every year
Linear/generalized linear models, modern regression methods including nonparametric regression, generalized additive models, splines/basis function methods, regularization, bootstrap/other resampling-based inference.

STAT 8052. Applied Statistical Methods 2: Design of Experiments and Mixed-Effects Modeling. (3.0 cr.; A-F or Audit; prereq 8051 or #; spring, every year)

STAT 8053. Applied Statistical Methods 3: Multivariate Analysis and Advanced Regression. (3.0 cr.; A-F or Audit; prereq 8052, 8102; fall, every year)

STAT 8054. Statistical Methods 4: Advanced Statistical Computing. (3.0 cr.; A-F or Audit; prereq 8053 or #; spring, every year)
Optimization, numerical integration, Markov chain Monte Carlo, related topics.

STAT 8055. Applied Project. (2.0 cr.; S-N only; prereq 8054, 8801 or #; fall, every year)
Collaborative applied statistical practice with a member of University community, including consulting, problem solving, presentation/documentation of results.

STAT 8101. Theory of Statistics 1. (3.0 cr.; prereq Statistics grad major or #; fall, every year)

STAT 8102. Theory of Statistics 2. (3.0 cr.; prereq 8101, Statistics graduate major or #; spring, every year)

STAT 8111. Mathematical Statistics I. (3.0 cr.; prereq 5102 or 8102 or #; [[Math 5615, Math 5616] or real analysis], matrix algebra; fall, every year)
Probability theory, basic inequalities, characteristic functions, and exchangeability. Multivariate normal distribution. Exponential family. Decision theory, admissibility, and Bayes rules.

STAT 8112. Mathematical Statistics II. (3.0 cr.; prereq 8111; spring, every year)

STAT 8141. Probability Assessment. (3.0 cr.; prereq 5102; spring, offered periodically)
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.

STAT 8171. Sequential Analysis. (3.0 cr.; prereq 8112; )
Wald's sequential probability ratio test and modifications. Sequential decision theory. Martingales. Sequential estimation, design, and hypothesis testing. Recent developments.

STAT 8201. Topics in Sampling. (3.0 cr.; S-N or Audit; prereq 8102 or #)
Sampling theory, stratified sampling, ratio estimators, cluster sampling, double sampling, superpopulation theory, Bayesian methods, multiple imputation, nonresponse.

STAT 8311. Linear Models. (4.0 cr.; prereq Linear algebra, 5102 or 8102 or #; fall, every year)
General linear model theory from a coordinate-free geometric approach. Distribution theory, ANOVA tables, testing, confidence statements, mixed models, covariance structures, variance components estimation.

STAT 8312. Linear and Nonlinear Regression. (3.0 cr.; prereq 8311; )
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.

STAT 8313. Topics in Experimental Design. (3.0 cr.; prereq 8311; )
Optimal, Bayes, and nonlinear designs; algorithms for computing designs; sample size; recent developments.

STAT 8321. Regression Graphics. (3.0 cr.; prereq 8311; )

STAT 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

STAT 8401. Topics in Multivariate Methods. (3.0 cr.; prereq 8311; fall, every year)

STAT 8411. Multivariate Analysis. (3.0 cr.; prereq 8152; fall, spring, offered periodically)
Multivariate normal distribution. Inference on the mean, covariance, and correlation and regression coefficients; related sampling distributions such as Hotelling's T-squared and Wishart distributions. Multivariate analysis of variance. Principal components and canonical correlation. Discriminant analysis.

STAT 8421. Theory of Categorical Data Analysis. (3.0 cr.; prereq 8062 or #)

STAT 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, every year)
(No description)

STAT 8501. Introduction to Stochastic Processes with Applications. (3.0 cr.; prereq 5101 or 8101; )
Markov chains in discrete and continuous time, renewal processes, Poisson process, Brownian motion, and other stochastic models encountered in applications.

STAT 8511. Time Series Analysis. (3.0 cr.; prereq 5102 or 8111 or #)

STAT 8666. Doct Pre-Thesis Cr. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prerequisite: Doctoral student who has not passed preliminary oral; no required consent for 1st/2nd registrations, up to 12 combined cr.; % 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.; fall, spring, summer, every year)
TBD

STAT 8701. Computational Statistical Methods. (3.0 cr.; prereq 8311, programming exper; spring, every year)
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.

STAT 8711. Statistical Computing. (3.0 cr.; prereq 8701; #)

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
Basic numerical analysis for statisticians. Numerical methods for linear algebra, eigen-analysis, integration, and optimization and their statistical applications.

**STAT 8721. Programming Paradigms and Dynamic Graphics in Statistics.** (3.0 cr.; prereq 8062, 8102.) Alternative programming paradigms to traditional procedural programming, including object-oriented programming and functional programming. Applications to development of dynamic statistical graphs and representation and use of functional data, such as mean function in nonlinear regression log likelihoods and prior densities in Bayesian analysis.

**STAT 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

**STAT 8801. Statistical Consulting.** (3.0 cr.; S-N or Audit; prereq Grad stat major or #; spring, every year) Principles of effective consulting/problem-solving, meeting skills, reporting. Aspects of professional practice/behavior, ethics, continuing education.

**STAT 8811. Statistical Consulting Practicum.** (3.0 cr. [max 12.0 cr.]; S-N or Audit; prereq Statistics grad student or #; fall, spring, every year) Providing (under faculty supervision) statistical support to clients, primarily University researchers. Exercises in problem solving, ethics, listening/communication skills.

**STAT 8821. Curricular Practical Training.** (1.0 cr.; S-N only; prereq Statistics grad student, %; fall, spring, summer, every year) Industrial work assignment using advanced statistical techniques. Grade based on final report and presentation covering work assignment.

**STAT 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr required; fall, spring, every year) (No description)

**STAT 8900. Student Seminar.** (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq Statistics graduate student; fall, spring, every year) Preparation or presentation of seminar on statistical topics.

**STAT 8913. Literature Seminar.** (1.0 cr. [max 4.0 cr.]; S-N only; prereq Statistics grad major or #; fall, spring, every year) Students will read, present, discuss, and critique current literature/research.

**STAT 8931. Advanced Topics in Statistics.** (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary according to student needs/available staff.

**STAT 8932. Advanced Topics in Statistics.** (3.0 cr. [max 12.0 cr.]; fall, spring, offered periodically) Topics vary according to student needs/available staff.

**STAT 8933. Advanced Topics in Statistics.** (3.0 cr. [max 12.0 cr.]; fall, spring, every year) Topics vary according to student needs and available staff.

**STAT 8992. Directed Readings and Research.** (1.0-6.0 cr. [max 12.0 cr.; prereq #; fall, spring, summer, every year] Directed study in areas not covered by regular offerings.

**SCB 5051. Stem Cell Biology Practical Training Module.** (1.0 cr.; A-F only; prereq Acceptance into stem cell biology master's program; fall, every year) 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.

**SCB 5054. Stem Cell Institute Research Seminar and Journal Club.** (2.0 cr. [max 6.0 cr.; A-F only; prereq Acceptance into stem cell biology master's prog or PhD minor prog or #; fall, spring, every year) Students attend weekly Stem Cell Institute research seminars and journal clubs, write brief summaries, participate in journal club, and present original research paper.

**SCB 5900. Master’s Plan B Research Paper and Presentation.** (2.0 cr.; A-F only; prereq Admission to stem cell biology master's plan B program; fall, spring, summer, every year) Students write research paper based on primary literature on stem cell biology topic of interest, mentored by faculty member.

**SCB 8181. Stem Cell Biology.** (3.0 cr.; [GCD 4171]; prereq [[GCD 4034], [GCD 4161]] or equiv or #; fall, every year) Stem cell research and its applications. Critical analysis, written summaries/critiques, oral presentations.

**SCB 8333. FTE: Master’s.** (1.0 cr.; No Grade Associated; prereq Master’s student, adviser consent, DGS consent; fall, spring, summer, every year) FTE: master’s

**SCB 8777. Thesis Credits: Master’s.** (1.0-18.0 cr. [max 50.0 cr.; No Grade Associated; fall, spring, summer, every year] Thesis credits: master’s

**SCMC 5001. Critical Debates in the Study of Cinema and Media Culture.** (4.0 cr.; fall, spring, every year) 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.** (4.0 cr.; A-F only; prereq [1201 or ARTH 1921W or SCSL 1201 or SCSL 1921 or equiv coursework]; SCMC major; fall, every year) 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.** (1.0-3.0 cr. [max 6.0 cr.; fall, spring, every year] Guided individual reading or study.

**SST 8000. Colloquium.** (1.5 cr. [max 3.0 cr.; S-N or Audit; prereq Grad SST minor; fall, spring, every year) Series of weekly lectures by nationally and internationally known scholars with diverse disciplinary and methodological backgrounds speaking on a variety of issues.

**SST 8100. Seminar: Models, Theories, and Reality.** (3.0 cr.; prereq HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #; fall, spring, every year) Students participate in ongoing research on the role of models and theories in science, and prepare and present research papers.

**SST 8200. Seminar: Philosophy of the Physical Sciences.** (3.0 cr. [max 6.0 cr.; prereq #; fall, offered periodically) Students participate in ongoing research in history, philosophy, and social study of physical sciences and prepare and present research papers.

**SST 8300. Seminar: The Biological and Biomedical Sciences.** (3.0 cr.; prereq HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #; fall, spring, every year) Students participate in ongoing research in history, philosophy, and social study of biological and biomedical sciences, and prepare and present research papers.

**SST 8400. Seminar: Science, Technology, and Society.** (3.0 cr.; prereq HSci 8111 or [Phil 8601 or Phil 8602 or Phil 8605] or #; fall, spring, offered periodically) Students participate in ongoing research on interactions involving science, technology, and society from perspectives of history, philosophy, and social study of science, and prepare and present research papers.

**SST 8420. Seminar: Social and Cultural Studies of Science.** (3.0 cr. [max 6.0 cr.; =PHIL 8660]; fall, spring, offered periodically) Recent work; theoretical and methodological differences among practitioners; selected responses from historians and philosophers of science.

**Supply Chain and Operations (SCO)**

Curtis L. Carlson School of Management
SCC 8651. Experimental Design. (3.0 cr.; A-F or Audit; prereq MBA 6120 or equiv or business ad submission Ph.D. student or #; offered alt yrs; spring, odd years) 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.

SCC 8652. Regression Analysis. (3.0 cr.; A-F or Audit; prereq MBA 6120 or equiv, business admin Ph.D student or #; offered alt yrs; spring, offered periodically) Regression and correlation models, inferences in simple and multiple regression, multicolinearity, indicator variables, variable selection techniques, treatment of assumption violations, applications to management problems, basic concepts of experimental design.

SCC 8711. Research in Operations Strategy. (3.0 cr.; A-F or Audit; prereq Business admin Ph.D student or #; offered alt yrs; fall, offered periodically) Operations performance, competitive advantage, focused factory, product, and process innovation; and operations strategy implementation. Research results and methods.

SCC 8721. Management of Technological Operations. (3.0 cr.; A-F or Audit, prereq Business admin Ph.D student or #; offered alt yrs; spring, offered periodically) 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.

SCC 8735. Supply Chain Management. (3.0 cr.; A-F or Audit; prereq Business admin Ph.D student or #; spring, offered periodically) 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.

SCC 8745. Research on Quality Management. (3.0 cr.; A-F or Audit; prereq Business admin Ph.D student or #; offered alt yrs; fall, spring, offered periodically) Research literature, methods, and results. Research on quality strategy, economics of quality, statistical process control, vendor management, off-line quality, and quality practice.

SCC 8755. Behavioral Operations. (3.0 cr.; A-F only; prereq Business admin Ph.D. student or #; fall, spring, offered periodically) 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.

SCC 8800. Research Topics in Operations and Management Science. (2.0-4.0 cr.; [max 16.0 cr.; A-F or Audit; prereq Business admin Ph.D. student or #; fall, offered periodically) Topics selected from new areas of research. Research methods, issues in operations management science.

SCC 8892. Readings in Operations and Management Science. (1.0-8.0 cr.; [max 16.0 cr.; prereq Business admin Ph.D student or #; fall, spring, summer, every year) Readings useful to student's individual program and objectives that are not available in regular courses.

SCC 8894. Graduate Research in Operations and Management Science. (1.0-8.0 cr.; [max 16.0 cr.; prereq Business admin Ph.D student or #; fall, spring, summer, every year) Individual research on an approved topic appropriate to student's program and objectives.

SURG 8200. Clinical Surgical Problems in Management. (3.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Diagnostic and management instruction in all phases of clinical surgery, inpatient and outpatient.

SURG 8201. Surgery Roentgenological Pathology Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Weekly review of surgical patients presenting interesting roentgen and pathological findings. Staff from the Departments of Surgery, Radiology, and Laboratory Medicine and Pathology. Basic science and management principles of the surgical patient.

SURG 8202. Surgical Research. (3.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Graduate students undertake original investigation of problems in either experimental or clinical surgery.

SURG 8203. Surgery Complications and Research Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Evaluation of surgical patients, including postoperative course. Discussion and critical evaluation of current research problems.

SURG 8207. Transplantation Conference. (1.0 cr.; A-F or Audit; prereq Grad surg major; fall, spring, summer, every year) Interdepartmental discussion and evaluation of current clinical and research problems.

SURG 8293. Applied Statistics. (1.0 cr.; S-N or Audit; prereq Grad student in [surgery or experimental surgery or health sciences] or; fall, spring, every year) 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.

SURG 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SURG 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year) (No description)

SURG 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year) TBD

SURG 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year) (No description)

SURG 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year) (No description)

Sustainable Agricultural Systems (SAGR) College of Food, Agricultural and Natural Resource Sciences

SAGR 8100. Colloquium in Sustainable Agriculture. (2.0 cr.; A-F or Audit; prereq Coursework in biological or social sciences that provides intro to ag practices or issues; fall, every year) Forum for University faculty and students, and representatives of the farming community, including farmers, grassroots organizations, agricultural businesses, and representatives of state agencies, to engage in discussions on topics related to sustainability of food production.

SAGR 8202. Field Experience in Sustainable Agriculture. (1.0-4.0 cr.; S-N or Audit; prereq Coursework in biological or social sciences that provides intro to ag practices or issues; fall, spring, summer, every year) 3- to 14-week internship with growers or organizations working with sustainable agriculture issues. Students analyze issues in final written project, oral seminar.

Swahili (SWAH) College of Liberal Arts
SWAH 5226. Advanced Swahili II. (3.0 cr.; prereq 5225 or equiv; spring, every year) Continuation of skill development from 5225.

TMD & Orofacial Pain (TMDP)
School of Dentistry

TMDP 8440. Advanced Theory and Principles of TMD and Orofacial Pain. (0.0-3.0 cr.; A-F or Audit; fall, spring, every year) Nature and pathophysiology of disorders causing chronic pain in TMJ and craniofacial regions; advanced principles and theory on assessment, diagnosis, and interdisciplinary management.

TMDP 8441. Seminar in Temporomandibular Disorders & Orofacial Pain. (1.0 cr.; A-F or Audit; fall, spring, summer, every year) 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. (1.0-4.0 cr.; A-F or Audit; prereq Participation in TMJ and orofacial pain advanced education program; fall, spring, summer, every year) 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.

Theatre Arts (TH)
College of Liberal Arts

TH 5100. Theatre Practicum. (1.0-4.0 cr.; [max 20.0 cr.; prereq %; 4 cr of 3100 for undergrads: fall, spring, every year]) Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright. (See 5500 for design practicums.)

TH 5117. Performance and Social Change. (3.0 cr.; A-F or Audit; prereq Jr or sr or grad student; ) 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.

TH 5178. History and Theory of Performance Conventions. (3.0 cr.; A-F or Audit; prereq [1322, [3171 or 3172]] or grad student) Draws on visual materials, practical exercises, and theories of spatial representation in context of political/social function. Historical/cross-cultural overview of performance conventions and theatrical space from City of Dionysia to site-specific happenings of 20th century.

TH 5179W. Text and Performance. (3.0 cr.; A-F or Audit; prereq [1322, [3171 or 3172]] or grad student; fall, every year) How to read texts toward performance in various dramatic/non-dramatic material. Method of unlocking metaphorical energy of texts. Vocabulary/techniques of analysis that transform text from page to stage.

TH 5181W. Blacks in American Theatre. (3.0 cr.; = [AFRO 5181W]; spring, offered periodically) Historical survey of significant events in the development of American black theatre traditions. Essays, plays, playwrights, and theatres from early colonial references to the Black Arts Movement.

TH 5182. Contemporary Black Theatre: 1960-Present. (3.0 cr.; = [AFRO 5182]; fall, every year) Essays, plays, playwrights, and theatres that have contributed to contemporary Black theatre. From the beginning of the Black Arts Movement to the present.

TH 5182W. Contemporary Black Theatre: 1960-Present. (3.0 cr.; spring, odd years) 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. (3.0 cr.; prereq Jr or sr or grad student; summer, every year) 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.

TH 5330. Comedy: Advanced Physical Performance Studio. (3.0 cr.; A-F only; prereq 3331; #; spring, every year) 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.

TH 5340. Tragedy/Poetry: Advanced Physical Performance Studio. (3.0 cr. [max 6.0 cr.]; A-F only; prereq 3322, 3331, grad student) or #; fall, every year) 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/poetic work.

TH 5355. Puppetry: Techniques and Practice in Contemporary Theatre. (3.0 cr.; prereq [[3513 or 3515, #; #; grad student; fall, spring, every year]) 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.

TH 5370. Hand, Mind, and Gesture: An Independent Study in the Creation of Image Driven Performance. (3.0 cr.; prereq 5355, #; spring, every year) 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.

TH 5500. Theatre Design Practicum. (1.0-3.0 cr. [max 20.0 cr.; prereq 3515, #; %; fall, spring, summer, every year]) Individual projects in production of approved plays as a designer of scenery/properties, costumes, lighting, or sound. (See 5100 for other creative practicums.)

TH 5510. Drawing, Rendering, and Painting for the Theatre Designer I. (3.0 cr.; prereq 3515 or grad or #; fall, spring, offered periodically) Development of skills necessary for presentation of theatre scene/costume designs. Materials, layout, and techniques in scene painting. Basic drawing/graphic skills.

TH 5520. Scene Design. (3.0 cr. [max 9.0 cr.; prereq 3515 or grad or #; fall, every year) Conceiving/communicating design ideas in both two-dimensional sketches and three-dimensional models for theatre and allied venues. Drafting.

TH 5530. Costume Design. (3.0 cr. [max 9.0 cr.; prereq 3515 or grad or #; fall, every year) 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.

TH 5545. Stage Lighting Technology. (3.0 cr. [max 6.0 cr.; prereq 4560; #; spring, every year) 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.

TH 5550. Video Project. (3.0 cr. [max 6.0 cr.; prereq 4550 or 4560 [preferred], #; fall, offered periodically) Students participate in a video-shoot project serving in various positions, including camera operator, gaffer, grip, audio engineer, cast, and possibly director and director of photography.

TH 5554. Multimedia Production for Live Performance. (3.0 cr.; prereq 5553 or #; ) Use of multimedia production technologies in actual production. Students apply knowledge/skill in conjunction with an artistic team on a production and are an integral part of the development/realization of that production.

TH 5556. Audio Engineering. (3.0 cr.; prereq 4555, #; spring, offered periodically) Miking/recording techniques specific to music/dramatic dialogue. Recording different styles of music. Hands-on recording of bands, doing final mixes to demo CD. Field trips
to professional studios and club/concert recordings.

**TH 5559. Sound Design for Performance.** (3.0 cr.; prereq 4555 or #; fall, spring, offered periodically)
Audio technology/psychology, their impact on audience in a performance. Communication, design process, psychoacoustics, script analysis.

**TH 5560. Drawing, Rendering, and Painting for the Theatre Designer II.** (3.0 cr.; prereq 5510; spring, offered periodically)
Development of skills necessary for presentation of material, layout, and techniques in scene painting. Rendering and scene painting skills.

**TH 5570. Properties/Scenery Technology.** (1.0-3.0 cr. [max 15.0 cr.]; prereq 3515 or grad or #; fall, spring, every year)
Management, structures, upholstery, mask-making, furniture construction, stage mechanics, soft properties, faux finishes. Topics specified in Class Schedule.

**TH 5580. Costume Technology.** (3.0 cr. [max 15.0 cr.]; prereq 3515 or grad or #; fall, spring, every year)
Fabric enhancement techniques, masks, wig-making, millinery, makeup prosthetics, pattern drafting, and draping. Topics specified in Class Schedule.

**TH 5590. Theatre Technology Practicum.** (1.0-3.0 cr. [max 15.0 cr.]; prereq 3515, #, %; 4 cr max for undergrads; fall, spring, summer, every year)
Individual creative project in technology/craft area of theatre. Practical work in costume, lighting, makeup, props, scenery, sound, or theatre management.

**TH 5711. Advanced Stage Direction.** (3.0 cr.; prereq [4711, #] or grad student; fall, spring, offered periodically)

**TH 5716. Stage Management for the Theatre.** (4.0 cr.; prereq [1101, 1321, soph] or grad; fall, every year)
Theory, practicalities, and techniques for rehearsal/performance. Organizing/managing various types of performance venues.

**TH 5718. Principles of Arts Management.** (3.0 cr.; prereq #, fall, offered periodically)
Nonprofit arts organization structure: concept, mission, organization. Financial, marketing, fund-raising, and grant-writing strategies. Discussion/guest professionals from Twin Cities arts/funding communities.

**TH 5760. Advanced Stage Management.** (2.0-3.0 cr.; prereq 5716 or & 5716, #; [4 cr max for undergrads]; fall, spring, every year)
Practical experience in stage management for specific productions of the University Theatre with emphasis on rehearsal and performance.

**TH 5780. Advanced Topics in Arts Management.** (2.0-4.0 cr. [max 8.0 cr.]; prereq 5718; fall, offered periodically)
Students apply non-profit arts management theories/techniques learned in 5718. Marketing/audience development, fundraising and grant writing strategies, and financial management of a nonprofit arts organization.

**TH 5950. Topics in Theatre.** (1.0-4.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)
Topics specified in Class Schedule.

**TH 5993. Directed Study.** (1.0-5.0 cr. [max 20.0 cr.]; fall, spring, summer, every year)
Guided individual reading or study. Prereq 6 Th cr, instr consent, dept consent, college consent.

**TH 8100. Theatre Practicum.** (1.0-4.0 cr. [max 20.0 cr.]; prereq #, %; fall, spring, summer, every year)
Individual creative projects in production of approved plays as an actor, director, dramaturg, or playwright (see 8500 for design practicums).

**TH 8102. Theatre Historiography.** (3.0 cr.; fall, offered periodically)
Current trends in historiography; research strategies and methods.

**TH 8111. History and Theory of Western Theatre: Ancient World and Early Medieval.** (3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8112. History and Theory of Western Theatre: Medieval Through Renaissance.** (3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8113. History and Theory of Western Theatre: National Theatres to the French Revolution.** (3.0 cr.; fall, spring, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8114. Theatre: Performance and Political Modernity.** (3.0 cr.; fall, spring, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8115. History and Theory of Western Theatre: 20th Century Through World War II.** (3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8116. History and Theory of Western Theatre: 20th Century From 1945 to the Present.** (3.0 cr.; fall, offered periodically)
History, theories, arts, and crafts of western theatre from the ancient world to the present.

**TH 8120. Seminar.** (3.0 cr. [max 12.0 cr.]; fall, spring, every year)
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.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**TH 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**TH 8500. Theatre Design Practicum.** (1.0-3.0 cr. [max 20.0 cr.]; prereq #; fall, spring, summer, every year)
Individual creative projects in production of approved plays as a designer for scenery/properties, costumes, lighting, or sound (see 8100 for other creative practicums).

**TH 8510. Professional Design Workshop.** (2.0 cr. [max 4.0 cr.]; A-F only; prereq MFA candidate; fall, spring, every year)
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.

**TH 8590. Theatre Technology Practicum.** (1.0-3.0 cr. [max 20.0 cr.]; prereq #, %; fall, spring, every year)
Individual creative projects in the technology or craft of costume, lighting, makeup, props, scenery, sound, or theatre management.

**TH 8666. Doctoral Pre-Thesis Credits.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

**TH 8711. Theory and Practice of the Modern Stage Director.** (3.0 cr.; fall, offered periodically)
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.** (2.0-3.0 cr. [max 10.0 cr.]; A-F or Audit; prereq MFA directing specialization; fall, spring, every year)
Rehearsed and performed production of published or original one-act (2 cr) or full-length play (3 cr) with budgeted design and technical support.

**TH 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, every year)
(No description)

**TH 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)
TH 8950. Topics in Theatre. (1.0-4.0 cr. [max 8.0 cr.]; spring, every year)

Topics specified in Class Schedule.

TH 8980. Internship. (1.0-5.0 cr. [max 10.0 cr.; prereq #; %; fall, spring, every year])
tbd

TH 8990. MFA Creative Thesis. (3.0-4.0 cr.; prereq #; %; fall, spring, every year)
tbd

TH 8994. Directed Research. (1.0-5.0 cr.; prereq #; %; fall, spring, every year)
tbd

Therapeutic Radiology (TRAD)

Medical School

TRAD 8149. Advanced Topics in Radiation Therapy Physics. (2.0 cr.; A-F only; prereq [7170, 7173] or [BPHY 5170, BPHY 5173]; fall, every year)

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.

TRAD 8204. Tumor Clinic Conference. (0.0 cr.; fall, every year)

TRAD 8240. Radiation Therapy Conference. (0.0 cr.; fall, every year)

TRAD 8310. Fundamentals of Radiation Therapy. (1.0 cr.; fall, every year)

TRAD 8315. Radiation Therapy Pathology. (1.0 cr.; fall, every year)

TRAD 8320. Radiation Therapy Treatment Planning Problems. (1.0 cr.; fall, every year)

TRAD 8325. Radiation Therapy Pediatrics Oncology. (1.0 cr.; fall, every year)

TRAD 8350. Research: Radiation Therapy. (1.0-15.0 cr.; fall, every year)

TRAD 8450. Research: Radiation Biology. (1.0-15.0 cr.; fall, every year)

TRAD 8550. Research: Radiological Physics. (1.0-15.0 cr.; fall, every year)

Toxicology (TXCL)

College of Veterinary Medicine

TXCL 5000. Directed Research in Toxicology. (1.0-5.0 cr. [max 80.0 cr.; A-F or Audit; prereq #; %; fall, spring, every year])

Special project that addresses specific issue in toxicology. Under guidance of faculty member.

TXCL 5011. Principles of Toxicology. (2.0 cr.; A-F or Audit; prereq Grad txcl major or #; Introduction to fundamentals of poisoning in individuals and the environment, assessment of potential health hazards, and application of toxicology in various professional careers.

TXCL 5012. Principles of Toxicology. (3.0 cr.; A-F or Audit; prereq At least one semester [biochemistry, calculus, cell biology]; at least one semester of [human or animal] physiology recommended; spring, every year)


TXCL 5013. Chemical Toxicology. (3.0 cr.; A-F or Audit; prereq 5012; #; fall, every year)

Signs, symptoms, and mechanism of toxicity of different classes of chemicals spanning several organ systems, including chemical carcinogenesis.

TXCL 5101. Molecular and Cellular Basis of Nanoparticle Toxicology. (3.0 cr.; [max 6.0 cr.; A-F or Audit; [MED 5011]; prereq Introductory toxicology course; fall, odd years)

Introduction to science of nanotoxicology. Nanotechnology in scientific research. Assessment of impact on biological systems.

TXCL 5195. Veterinary Toxicology. (3.0 cr.; A-F or Audit; = [CVM 6195]; prereq Grad student or #; fall, every year)

Toxicology of minerals, pesticides, venoms, and various toxins. Identification of poisonous plants. Recognition, diagnosis, and treatment of animal poisons.

TXCL 5545. Introduction to Regulatory Medicine. (2.0 cr.; A-F or Audit; = [CVM 6545]; prereq Grad student or #; spring, offered periodically)

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.

TXCL 8012. Advanced Toxicology I. (3.0 cr.; A-F or Audit; prereq 5011 or BioC 4331, PUBH 5104 or #; spring, every year)

Absorption, distribution, metabolism, and excretion of xenobiotics; toxicokinetics; mechanisms of toxicity or specific classes of chemical agents.

TXCL 8013. Advanced Toxicology II. (3.0 cr.; A-F or Audit; prereq 8012, BioC 4332, Phsi 5062 or Phsi 6101 or #; fall, every year)

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.

TXCL 8100. Investigative Toxicology. (1.0 cr. [max 2.0 cr.; A-F or Audit; prereq 8013 or #; fall, spring, every year)

Evaluating toxicity research issues and literature.

TXCL 8333. FTE: Master’s. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; spring, summer, every year)

(No description)

TXCL 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)

(No description)

TXCL 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
tbd

TXCL 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; spring, summer, every year)

(No description)

TXCL 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, every year)

(No description)

Translation and Interpreting (TRIN)

College of Continuing Education

TRIN 5900. Topics in Translation and Interpreting. (1.0-4.0 cr. [max 16.0 cr.; fall, spring, summer, every year])

Topics specified in Class Schedule.

TRIN 5993. Directed Study. (1.0-3.0 cr. [max 6.0 cr.]; fall, spring, summer, every year)

Directed study in translation/interpretation.

University College (UC)

College of Continuing Education

UC 5075. Directed Study. (1.0-8.0 cr.; fall, spring, every year)

Directed study.

UC 5950. Special Topics. (1.0-8.0 cr. [max 16.0 cr.; fall, spring, summer, every year)

Special topics.

Urban Studies (URBS)

College of Liberal Arts

URBS 5101. The City and the Metropolis: An Exploration. (3.0 cr.; A-F only; prereq Grad student or [adv UrbS undergrad, #]; spring, even years)

The City and the Metropolis as places that result from important acts of human creativity. Interdisciplinary/exploratory perspectives. Building/developing (North American) cities, Construction of “urban culture.”

URBS 5861. Financing Cities. (3.0 cr.; A-F only; fall, odd years)

Services/projects cities provide/finance. Ways in which developers/consumers participate in urban development through policies and financial tools. Challenges cities face in determining budgets.

Urologic Surgery (UROL)

Medical School

UROL 8254. Urological Seminar. (2.0 cr.; spring, every year)
tbd

UROL 8255. Urological Radiological Conference. (2.0 cr.;

UROL 8256. Urological Pathological Conference. (2.0 cr.;

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
VMED 5080. Problems in Veterinary Epidemiology and Public Health. (1.0-3.0 cr.; A-F or Audit; fall, spring, every year) Individual study on problem of interest to epidemiology or public health student.

VMED 5082. Diagnostic Epidemiology of Infectious Diseases. (2.0 cr.; A-F only; prereq Statistics course or #; spring, every year) Theoretical principles, practical applications of diagnostic testing in populations. Examples related to infectious diseases in veterinary/human health. Basis of test performance, limitations, interpretations.

VMED 5090. Seminar: Veterinary Epidemiology. (1.0 cr. [max 3.0 cr.]; S-N or Audit; prereq Veterinary Medicine grad student; fall, spring, every year) 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.

VMED 5101. Molecular and Cellular Basis of Nanoparticle Toxicity. (3.0 cr. [max 6.0 cr.]; A-F or Audit; #XCL 5101); fall, every year) Use of nanotechnology in scientific research. Impact of nanomaterials on biological systems.

VMED 5165. Surveillance of Foodborne Diseases and Food Safety Hazards. (2.0 cr.; #PUBH 6181; prereq #PUBH 5330, [professional school or grad student]) or #; spring, every year) Principles/methods for surveillance of foodborne diseases. Investigation of outbreaks. Assessment of food safety hazards. Focuses on integration of epidemiologic/lab methods.

VMED 5180. Ecology of Infectious Disease. (3.0 cr.; #CMB 5180, PUBH 6330); fall, every year) 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. (4.0 cr.; Student Option No Audit; #CMB 5181; prereq Intro to epidemiology, statistics, #; spring, every year) Spatial distribution of disease events. Exposures/outcomes. Factors that determine where diseases occur. Analyzing spatial disease data in public health, geography, epidemiology. Focuses on human/animal health related examples.

VMED 5190. Seminar and Presentation Development. (2.0 cr.; S-N only; prereq Grad student; fall, every year) 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.

VMED 5193. Dairy Decision Making in a Financial Context for Veterinarians. (3.0 cr.; A-F only; fall, every year) 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. Prereq Earned DVM, instr consent.

VMED 5196. Dairy Production Medicine. (4.0 cr.; A-F only; prereq DVM degree, #; fall, every year) Intense eight week course designed to develop advanced knowledge/skills in dairy production medicine. Mixture of lectures, wetlabs, farm investigations, presentations. Held at Dairy Education Center at New Sweden Dairy.

VMED 5210. Advanced Large Animal Physiology I. (1.0-3.0 cr. [max 6.0 cr.]; fall, every year) 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. (1.0-3.0 cr.; A-F or Audit; prereq #; 5210 recommended; spring, every year) 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.

VMED 5232. Comparative Clinical Veterinary Dermatologic Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM degree or foreign equiv; fall, spring, every year) Microscopic pathology of basic dermatologic reactions and of variable disease states.

VMED 5240. Advanced Small Animal Pathobiology I. (1.0 cr.; A-F only; fall, every years) Biology, pathology, physiopathology, and medicine of disciplines relevant to companion animals. Pathogenesis/treatment of diseases. Developing hypotheses that can be translated into clinical research. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5241. Advanced Small Animal Pathobiology II. (1.0-2.0 cr.; A-F only; spring, odd years) Overview of biology, physiology, pathophysiologic, and medicine of disciplines. 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 5242. Advanced Small Animal Pathobiology III. (1.0 cr.; A-F only; fall, odd years) Overview of biology, physiology, pathophysiologic, 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 5420. Molecular Epidemiology of Infectious Disease. (3.0 cr.; A-F only; prereq Basic course in microbiology; spring, every year) Impact, application, and interpretation of molecular techniques in understanding etiology, transmission, and control of infectious diseases important to animal and public health. Theoretical/practical aspects of molecular biology methods in context of epidemiological studies of infectious diseases, including bacterial/viral infections of veterinary/zoonotic significance. Population and evolutionary genetics of pathogenic microorganisms. Data analysis/interpretation. Design of descriptive/hypothesis-driven epidemiological studies involving molecular techniques.

VMED 5430. HIV/AIDS: Pathogenesis, Treatment, and Prevention. (1.0 cr.; prereq Grad student; fall, every year) Exposure to pathogenesis, treatment, and prevention of HIV/AIDS from clinical faculty who are dealing with AIDS patients. Developing new questions and design experiments that have greatest change of translating to clinical setting.

VMED 5440. Microbial Risk Assessment of Foods. (3.0 cr.; Student Option No Audit; prereq Quantitative course in microbiology, [basics algebra, calculus, probability theory, probability distributions] or #; spring, every year) Risk analysis process as part of science-based decision-making. Conduct microbial risk assessment by different steps of hazard identification, hazard characterization, exposure assessment/risk characterization. Qualitative/quantitative tools.

VMED 5496. Training in Swine Production and Management. (4.0 cr.; S-N only; prereq VMED grad student or #; fall, spring, every year) Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5594. Research in Veterinary Medicine. (0.5-4.0 cr. [max 8.0 cr.]; prereq Jr, #; fall, spring, summer, every year) Independent study as determined by instructor. Usually activity includes conducting research in instructor's lab, though research in field may also be included.

VMED 5596. Swine Diseases and Diagnostics. (2.0-3.0 cr. [max 2.0 cr.]; fall, spring, every year) Review of recent advances in swine diseases; farm visits for on-farm disease diagnostics and control programs.

VMED 5621. Principles of Veterinary Anesthesiology. (2.0 cr.; A-F only; prereq VMED grad student, [DVM degree or foreign equiv], instr consent; spring, every year) In-depth training in principles of veterinary anesthesiology. Lectures, anesthesia labs, presentations by students.

VMED 5670. Bovine Surgery Practicum. (2.0 cr.; S-N only; prereq [VMED grad student, DVM or equiv foreign degree] or #; fall, spring, every year) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components.

VMED 5910. Grant Writing: What Makes a Winning Proposal?. (2.0 cr.; #CMB 5910); spring, every year) Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

VMED 5920. Food Defense: Prepare, Respond, Recover. (3.0 cr.; A-F only; prereq Grad or professional student or #; fall, every year) Basic principles of preparedness/emergency response. Instructor may substitute topics if timelier topic arises.

VMED 5921. Seminar in Food Protection and Defense. (1.0 cr.; fall, spring, every year) Complexities of our food systems. Natural/intentional threats to food security within various industry sectors. Which agencies are responsible for regulating food chains, monitoring food safety, responding to contamination events.

VMED 5991. Animal Health and Food System Policy and U.S. State government. (1.0 cr. [max 2.0 cr.]; S-N only; fall, spring, every year) Policy making process. Animal health, public health, food systems at state/provincial levels. Science, politics, belief in developing/implementing policy.

VMED 5992. Animal Health and Food System Policy and U.S. National Government. (0.0-1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) 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 at national level, as well as role of scientific evidence.

VMED 5993. Animal Health and Food System Policy and Intergovernmental Organizations. (1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) 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.

VMED 5994. Advanced Clinical Epidemiology. (1.0 cr.; A-F only; fall, every year) An in-depth focus on infectious disease epidemiology, with opportunities to apply epidemiologic principles to control infectious diseases in animal populations.

VMED 5995. Engaging Intergovernmental Organizations. (1.0 cr.; S-N only; fall, spring, every year) Relevant policy issue/roles of intergovernmental organizations. Discussions/debate about current issue, interact with key officials, perform group task assignments, develop/deliver presentation to relevant leaders.

VMED 5996. Professional Communications: Current Veterinary, Public Health and Food System Issues. (1.0 cr. [max 2.0 cr.]; S-N only; 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 #; spring, every year) Critical review of scientific/lay literature. Principles of risk communication. Presentation of scientific information. Prepare/critique executive summaries of current topics for CAHFS Daily News. Support media interactions of CAHFS faculty. Generate fact sheets for use on CAHFS website.

VMED 5997. Farm to Table Study Program. (1.0 cr.; prereq #; fall, every year) Explore food system within 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.

VMED 5998. Leadership to Address Global Grand Challenges. (1.5 cr.; Student Option No Audit; prereq Grad or professional student; spring, every year) Leadership strategies useful in addressing global grand challenges. Practices that foster collective action across diverse groups of people. Mapping polarities/balancing paradox. Inclusive decision-making processes.

VMED 5999. Professional Communications: Agendas, Minutes, Briefing Memos, Decision Memos. (1.0 cr.; S-N only; prereq 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 #; fall, every year) Improve professional communications to increase effectiveness of meetings, conference calls. Enhance influence of emails, minutes, issue briefs/decision memos. Compose/critique meeting agendas, minutes, notes, summaries, e-mails, trip reports. Produce issue briefs/decision memos.

VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans. (3.0 cr.; A-F or Audit; prereq Epidemiology and infectious disease course or #; fall, spring, every year)
Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

VMED 8134. Ethical Conduct of Animal Research. (3.0 cr.; A-F or Audit; [ANSC 8134, CMB 8134]; prerequisite Grad or professional school student or; fall, every year)
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 proper conduct. Societal impact on scientific investigations utilizing animal subjects.

VMED 8220. Advanced Nephrology/Urology Clinics. (1.0-3.0 cr.; prerequisite; fall, spring, every year)
Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center.

VMED 8230. Medical Conference. (1.0 cr; [max 2.0 cr.]; prerequisite; fall, spring, every year)
Participation in weekly conference about internal medical disorders.

VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism. (2.0-4.0 cr.; A-F or Audit; prerequisite; fall, spring, every year)
Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

VMED 8292. Journal Club: Large Animal Internal Medicine. (1.0 cr; [max 3.0 cr.]; A-F or Audit; prerequisite; fall, spring, offered periodically)
Students/faculty keep abreast of current literature in large animal internal medicine. Students critically evaluate the literature.

VMED 8293. Advanced Studies in Nephrology and Urology. (1.0-3.0 cr.; A-F or Audit; prerequisite; fall, spring, every year)
Studies of urinary tract disease with goal of generating new knowledge.

VMED 8333. FTE: Master’s. (1.0 cr; [max 2.0 cr.]; No Grade Associated; prerequisite Master’s student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

VMED 8360. Evidence-based Medicine. (2.0 cr.; A-F or Audit; prerequisite; fall, spring, every year)
Use of medicine literature in clinical problem solving.

VMED 8394. Research in Veterinary Medicine. (1.0-3.0 cr.; prerequisite; fall, spring, every year)
Research problems relating to any aspect of internal medicine or to the various systems in animals.

VMED 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prerequisite Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

VMED 8492. Seminar: Infectious Diseases and Swine Medicine. (1.0 cr; [max 2.0 cr.]; fall, spring, every year)
Students, faculty, and guest speakers present seminars on current research in diagnosis, control, and treatment of infectious diseases.

VMED 8520. Advanced Immunology. (2.0 cr.; spring, every year)
Lectures and case presentations.

VMED 8550. Veterinary Medicine Seminar. (1.0 cr; [max 2.0 cr.]; S-N only; prerequisite Grad student; fall, spring, every year)
Seminar. Exposure to research activities of CMB and VMED students and faculty. Students prepare/present a 20 minute seminar on their original research.

VMED 8592. Infectious Disease Journals: Critical Thinking. (1.0 cr.; fall, spring, summer, every year)
Reading and critical discussion of journal articles.

VMED 8593. Advanced Veterinary Virology and Serology. (1.0-3.0 cr.; fall, spring, every year)
Discussion and laboratory practice.

VMED 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr; [max 12.0 cr.]; No Grade Associated; prerequisite Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

VMED 8682. Advanced Large Animal Surgery. (2.0 cr; [max 6.0 cr.]; A-F or Audit; prerequisite DVM or equiv degree; #; fall, spring, every year)
Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

VMED 8684. Surgical Physiology. (1.0-3.0 cr.; fall, spring, offered periodically)
Discussions on pathophysiology of surgical diseases in dogs and cats.

VMED 8685. Neurosurgery. (2.0-3.0 cr.; A-F or Audit; fall, spring, every year)
Advanced neurosurgical diseases of small animals amenable to surgical treatment.

VMED 8686. Thoracic and Cardiovascular Surgery. (2.0-4.0 cr.; A-F or Audit; fall, spring, every year)
Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

VMED 8696. Research in Critical Care/Emergency Medicine. (1.0-3.0 cr.; prerequisite DVM or equiv degree; fall, spring, every year)
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.

VMED 8777. Thesis Credits: Master’s. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

VMED 8780. Advanced Avian Critical Care: Principles and Procedures. (2.0 cr.; A-F or Audit; prerequisite Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care; spring, every year)
Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma.

VMED 8781. Seminar: Advanced Veterinary Anesthesiology. (1.0-3.0 cr.; A-F or Audit; prerequisite [CVM 6321, CVM 6322] or equiv); grad student; fall, every year)
Active interaction around topics of advanced anesthesiology in veterinary species.

VMED 8788. Seminar: Veterinary Critical Care/Emergency Medicine. (1.0 cr.; A-F or Audit; prerequisite DVM or equiv degree; fall, spring, every year)
Current topics.

VMED 8793. Seminar: Veterinary Anesthesiology. (1.0-2.0 cr.; [max 4.0 cr.]; A-F or Audit; prerequisite [CVM 6321 or equiv]; DVM degree; fall, spring, every year)
Discussion and presentations; for veterinary anesthesiology and surgery residents and graduate students.

VMED 8796. Avian Anesthesia and Orthopedic Surgery. (1.0-3.0 cr.; A-F or Audit; prerequisite courses in vet anesthesia, vet small animal orthopedics; fall, spring, every year)
Current methods for anesthetizing raptors, psittacine birds, and waterfowl. Lecture and lab on current methods for avian fracture bone fixation.

VMED 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prerequisite Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

Vienna Executive MBA (VMBA)

Curtis L. Carlson School of Management

VMBA 5700. Managerial Accounting. (4.0 cr.; A-F or Audit; spring, every year)

VMBA 5701. Data Analysis and Decision Making. (4.0 cr.; A-F or Audit; spring, summer, every year)
Exploratory data analysis, basic inferential procedures, statistical process control, regression analysis, decision models.

**VMBA 5702. Financial Management. (4.0 cr.; A-F or Audit; spring, summer, every year)**
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. (4.0 cr.; A-F or Audit; spring, summer, every year)**
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. (4.0 cr.; A-F or Audit; spring, every year)**
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. (4.0 cr.; A-F or Audit; fall, every year)**
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. (4.0 cr.; A-F or Audit; fall, every year)**
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. (6.0 cr.; A-F or Audit; fall; every year)**
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. (6.0 cr. [max 24.0 cr.]; A-F or Audit; spring, every year)**
Various information technologies, their applications. Competitive advantages associated with information technology, organizational/managerial implications.

**VMBA 5710. Advanced Financial Management for Global Markets. (4.0 cr.; A-F or Audit; spring, every year)**
Advanced financial concepts for corporate financial decisions at executive level. Investment, firm financing, global markets.

**VMBA 5711. Managing Globalization (Guangzhou). (4.0-6.0 cr.; A-F or Audit; spring, summer, every year)**


**VMBA 5712. Strategies for a Global Company: an Integrative Perspective. (6.0 cr. [max 36.0 cr.]; A-F or Audit; spring, every year)**
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. (4.0 cr.; A-F only; spring, every year)**
Typical challenges faced when negotiating. Strategies for managing challenges and improving skills as a negotiator and conflict manager.

**VMBA 5714. Financial Accounting. (4.0 cr.; A-F or Audit; spring, every year)**

**Warsaw Executive MBA (WMBA)**

**WMBA 5650. Management Challenges and Organizational Behavior. (3.0 cr.; A-F or Audit; fall, spring, every year)**
Ideas, theories, and concepts for organizations. Managerial responsibility. Linkages between business logistic, operations, and other managerial disciplines, such as marketing and finance.

**WMBA 5651. Human Resources Management. (3.0 cr.; A-F or Audit; fall, spring, every year)**
Human resources issues from managerial perspective. External environment in which firm operates, characteristics of its workforce. The firm's developed culture. Strategy of the organization, technology of production, organization of work. Framework for managing human resources strategically.

**WMBA 5652. Managerial Economics.**

**WMBA 5653. Managerial Economics.**

**WMBA 5654. Business Law.**

**WMBA 5655. Data Analysis and Reasoning.**

**WMBA 5656. Financial Accounting.**

**WMBA 5657. Managerial Accounting.**

**WMBA 5658. Financial Management.**

**WMBA 5659. Strategic Marketing Management.**

**WMBA 5660. Operations and Logistics Management.**

**WMBA 5661. Managing in an International Environment.**

**WMBA 5662. Macroeconomic Business Environment.**

**WMBA 5663. Business Ethics.**

Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu
logical relationship between ethical behavior and profitability? Ethical dilemmas in various business settings.

WMBA 5664. Strategic Management. (4.5 cr.; A-F or Audit; fall, spring, every year)
Integrated top-executive point of view on successful managing of diverse businesses in a challenging game with competitors. Analytical skills, creative synthesis of diverse factors, individual/team work, information search, problems formulation. Decision making under conditions of time pressure, uncertainty, ambiguity, and risk.

WMBA 5665. Management Information Systems. (3.0 cr.; A-F or Audit; fall, spring, every year)
Information technology/systems. Data flow diagrams, data modeling, electronic commerce, HTML, Web design, ERP systems, database management systems, business process re-engineering.

WMBA 5666. Effective Decisions. (1.5 cr.; A-F or Audit; fall, spring, every year)
Identifying barriers to effective decision making in business. Different forms of decision making. Methods of overcoming barriers and managing practical difficulties.

WMBA 5670. Field Project. (12.0 cr.; A-F or Audit; )
Students define problem; gather, analyze, and evaluate data; develop managerial recommendations; and prepare/present a report.

WMBA 5673. Strategic Brand Management. (1.5 cr.; A-F only; spring, every year)
Warsaw Executive MBA: Strategic Brand Management

WMBA 5696. Developing a New High-Growth Business. (1.5 cr. [max 3.0 cr.]; A-F only; fall, spring, summer, every year)
Entrepreneurship as a business phenomenon, whether as a corporate or independent venture or as an alliance. How to apply knowledge to new-business development process.

WMBA 5700. Developing Management Skills. (1.5 cr.; A-F only; spring, every year)

Water Resources Science (WRS)
College of Food, Agricultural and Natural Resource Sciences

WRS 5050. Special Topics in Water Resources Science. (1.0-3.0 cr.; A-F or Audit; fall, spring, offered periodically)
Special topics in Water Resources Science.

WRS 5101. Water Policy. (3.0 cr.; =PA 5723; prereq Grad student or #; spring, every year)
Socio-cultural, legal, and economic forces that affect use of water resources by individuals/institutions. Historical trends in water policy, resulting water laws in the United States. Institutional structures whereby water resources are managed at federal, state, and local levels.

WRS 5241. Ecological Risk Assessment. (3.0 cr.; prereq #; spring, every year)
Evaluating current/potential impact of physical, chemical, and biological agents on ecosystems. Identifying ecological stressors, assessing level of exposure, measuring ecological responses, communicating/managing risks. Class participation, two reaction papers, final exam, small-group project.

WRS 8050. Special Topics in Water Resources Science. (1.0-3.0 cr.; [max 6.0 cr.]; A-F or Audit; fall, spring, every year)
Special topics in water resources science.

WRS 8060. Directed Studies in Water Resources Science. (1.0-3.0 cr.; [max 6.0 cr.]; A-F or Audit; prereq #; fall, spring, every year)
Directed studies in water resources science.

WRS 8095. Plan B Project. (3.0 cr.; S-N or Audit; fall, spring, every year)
Satisfies Plan B project requirement. May appear on master's program, but does not count toward credit minimum in major. Project topic arranged between student and adviser. Written report required.

WRS 8100. Interdisciplinary Seminar in Water Resources. (0.5-3.0 cr.; fall, spring, every year)
Interdisciplinary Seminar in Water Resources.

WRS 8333. FTE: Master's. (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

WRS 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

WRS 8581. Research and Professional Ethics in Water Resources and Environmental Science. (0.5 cr.; S-N or Audit; =CE 8581; prereq [Environmental engineering or water resources science] grad student or #; spring, every year)
Ethics of water resources science and environmental engineering research/practice. Societal responsibility, plagiarism, recording-keeping, authorship, confidentiality, conflicts of interest, professional relationships, fraud, reporting misconduct. Meets during first eight weeks of spring semester.

WRS 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr.; [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)
TBD

WRS 8777. Thesis Credits: Master's. (1.0-18.0 cr.; [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

WRS 8888. Thesis Credit: Doctoral. (1.0-24.0 cr.; [max 100.0 cr.]; No Grade Associated; prereq [Max 18 cr per semester or summer]; 24 cr required; fall, spring, summer, every year)
Thesis credit: doctoral

Writing Studies (WRIT)
College of Liberal Arts

WRIT 5001. Introduction to Graduate Studies in Scientific and Technical Communication. (3.0 cr.; A-F only; prereq Grad student or #; fall, every year)
History of technical communication. Different audiences, purposes, genres, and emerging trends. International/intercultural issues. Students participate within a community of technical communication professionals.

WRIT 5051. Graduate Research Writing Practice for Non-native Speakers of English. (3.0 cr.; prereq Grad student; fall, spring, summer, every year)
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.

WRIT 5052. Graduate Research Presentations and Conference Writing for Non-Native Speakers of English. (3.0 cr.; prereq [Grad student, non-native speaker of English] or #; fall, spring, every year)
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.

WRIT 5112. Information Design: Theory and Practice. (3.0 cr.; A-F or Audit; prereq Grad student or #; spring, offered periodically)
Political, economic, social, and technical aspects of media selection and message design. Media analyses, scripts, budgets, treatments, project-design plans, interactive screens. Online design project.

WRIT 5196. Internship in Scientific and Technical Communication. (3.0-6.0 cr.; S-N or Audit; prereq STC grad or #; fall, spring, summer, every year)
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. (3.0 cr.; [max 9.0 cr.]; prereq Grad student or #; fall, spring, offered periodically)
Topics specified in Class Schedule.

WRIT 5291. Independent Study, Reading, and Research. (1.0-3.0 cr.; prereq #, %; fall, spring, summer, every year)
Supervised reading/research on advanced projects not covered in regularly scheduled offerings.

**WRIT 5511. Research in Scientific and Technical Communication.** (3.0 cr.; A-F or Audit; fall, every year)
Experimental/survey research techniques for quantitative/qualitative methodologies in scientific/technical communication. Face-to-face, phone, focus group interviewing. Questionnaire development, contextual inquiry. Using rating, ranking, q-sort methods. Ethics, experimental bias, inferential statistical analysis.

**WRIT 5531. Introduction to Writing Theory and Pedagogy.** (3.0 cr.; A-F or Audit; prereq Grad student; fall, every year)
Pedagogical philosophy/methodology in composition, primarily first-year writing. Theories underlying teaching/tutoring with technology.

**WRIT 5532. Writing Pedagogy Practicum.** (1.0 cr. [max 3.0 cr.]; S-N only; prereq Grad student; spring, every year)
Discussion/activities that support development of sound pedagogical practices. Practical details of classroom. Professionalization, pedagogy.

**WRIT 5534. Designing Technical Writing for Intercultural Audiences.** (3.0 cr.; A-F or Audit; fall, spring, offered periodically)
Select and research a training topic, write learning objectives and outcomes, set the conditions for learning, complete a comprehensive course outline, and one training module.

**WRIT 5561. Editing and Style for Technical Communicators.** (3.0 cr.; A-F only; prereq [Grad student, knowledge of grammar/punctuation rules] or #; spring, summer, every year)
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.

**WRIT 5570. Minnesota Writing Project Directed Studies.** (1.0-3.0 cr. [max 9.0 cr.]; A-F or Audit; summer, every year)
Guided individual research into current theories/practices of writing and writing pedagogy.

**WRIT 5671. Visual Rhetoric.** (3.0 cr.; A-F only; prereq Jr or Sr or grad student; spring, every year)
Range/development of visuals, especially those in science/technology. Vocabulary for commenting on, criticizing, and creating visuals.

**WRIT 5775. The Rhetorical Tradition: Classical Period.** (3.0 cr.; A-F only; fall, every year)
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.** (3.0 cr.; A-F or Audit; spring, offered periodically)
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.** (3.0 cr.; A-F or Audit; prereq STC/RSTC grad student or #; fall, offered periodically)
Survey of quantitative/qualitative research methods. Theoretical perspectives that demonstrate/test analytical approaches to scientific/technological rhetoric.

**WRIT 8012. Applied Research Methods in Writing Studies and Technical Communication.** (3.0 cr. [max 6.0 cr.]; A-F or Audit; prereq [8011, grad student] or #; fall, spring, every year)
Introduction to one or two quantitative or qualitative research methods in scientific/technical communication or rhetoric (e.g., ethnography, case studies, discourse analysis).

**WRIT 8333. FTE: Master's.** (1.0 cr.; No Grade Associated; prereq Master's student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**WRIT 8444. FTE: Doctoral.** (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

**WRIT 8505. Professional Practice.** (3.0 cr.; S-N only; prereq Grad student; fall, spring, summer, every year)
Extended problem-solving situation in business, government, or industry. Student acts as consultant to explore problem, identify possible solutions, introduce solution, apply it.

**WRIT 8510. Seminar in Rhetoric.** (3.0 cr. [max 12.0 cr.]; A-F or Audit; prereq 5775 or equiv; fall, spring, offered periodically)
Topics may include theories, history, criticism, major figures, movements, visual or material rhetoric. Topics vary. See the Class Schedule.

**WRIT 8520. Seminar in Scientific and Technical Communication.** (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically)
Topics may include theories, landmark studies, history, gender, ethics. Topics vary. See the Class Schedule.

**WRIT 8540. Seminar in Technical Communication and Composition**

**Pedagogies.** (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically)
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.** (3.0 cr. [max 12.0 cr.]; A-F or Audit; fall, spring, offered periodically)
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.** (3.0 cr. [max 12.0 cr.]; A-F only; prereq Grad student; fall, spring, every year)
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.** (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr%; 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; fall, spring, summer, every year)
Doctoral Pre-Thesis Credits

**WRIT 8777. Thesis Credits: Master's.** (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

**WRIT 8792. Independent Study, Reading, and Research.** (1.0-4.0 cr. [max 12.0 cr.]; S-N only; prereq #; fall, spring, summer, every year)
Supervised study, reading, or research on projects not covered in regularly scheduled offerings.

**WRIT 8794. Directed Research.** (1.0-4.0 cr. [max 12.0 cr.]; S-N only; prereq #; fall, spring, summer, every year)
Supervised research project.

**WRIT 8888. Thesis Credit: Doctoral.** (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)

**YOST 5031. International Youthwork.** (3.0 cr.; [YOST 3031]; prereq 2xxx or #; fall, every year)
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
Craft of youthwork as a framework to understand life-worlds of young people and a practice to enhance healthy development. How young people often make artificially/harmfully divide their lives into "school" and "not school."

YOST 5316. Media & Youth: Learning, Teaching, and Doing. (2.0 cr.; [=YOST 4316]; prereq 1001 or 2101 or #; spring, every year) 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.

YOST 5319. Understanding Youth Subcultures. (3.0 cr.; [=YOST 4319]; prereq 2001 or one course each in [Anth, Soc] or #; summer, every year) 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 changes.

YOST 5321. Work With Youth: Individual. (2.0 cr.; [=YOST 4321]; prereq 1001 or 2002W or #; fall, spring, summer, every year) Basic assumptions underlying individual work with youth. Special issues/concerns of adolescents and of persons who work with them, especially those who work with youth in one-to-one interactions.

YOST 5322. Work With Youth: Families. (2.0 cr.; [=YOST 4322]; prereq 1001 or 2002W or #; fall, spring, summer, every year) Theories/techniques of working with youth and their families. Practical methods of structural change. Developing effective communication. Decision-making/problem-solving systems. Winning the family's cooperation. Role of professional in influencing healthy family development.

YOST 5323. Work with Youth--Groups. (2.0 cr.; [=YOST 4323]; prereq 1001 or 2002W or #; fall, summer, every year) Theories/techniques of working with youth and their groups. Emphasizes social group work. Adolescent group needs/associations. Group process. Working with diverse groups of youth in community, in group living situations, and in group therapy.

YOST 5401. Young People’s Spirituality and Youthwork: an Introduction. (4.0 cr.; A-F or Audit; [=YOST 4401W]; prereq [2001, one course each in [Anth, Soc, CPsy]] or #; spring, every year) Adolescent spirituality, its relation to working with young people. Faith/spirituality as actual.necessary aspects of healthy youth development. Research, active community-based programs. Knowledge, attitudes, and skills to meet adolescent needs/wants.

YOST 5402. Youth Policy: Enhancing Healthy Development in Everyday Life. (4.0 cr.; [=YOST 4402]; prereq [2001, one course each in [FSos, PolSci, Soc]] or #; spring, every year) Youth policy as formulated in response to youth issues, problems, and community/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.
College of Pharmacy

PHAR 1. CoF - Phillips Neighborhood Clinic. (0.0 cr.; No Grade Associated; prereq Current Student Pharmacist in the College of Pharmacy; fall, spring, summer, every year) Teaching laboratories to community/community-based interdisciplinary patient care model at Phillips Neighborhood Clinic.

PHAR 1001. Orientation to Pharmacy. (2.0 cr.; fall, spring, summer, every year) Overview of profession of pharmacy.

PHAR 1002. Medical Terminology. (2.0 cr.; fall, spring, summer, every year) Students analyze/build terminology by using/combing forms, suffixes, prefixes.

PHAR 1003. Non-Prescription Medications and Self-Care: Treating Minor Conditions. (2.0 cr.; fall, spring, summer, every year) Non-prescription medications and self-care available to treat many different medical conditions. Becoming an informed consumer of over-the-counter medications and testing devices.

PHAR 1004. Common Prescription Drugs and Diseases. (2.0 cr.; fall, spring, summer, every year) Frequently prescribed medications, how they work and are chosen, what conditions they are intended to treat, and why some medications cannot be used by certain people.

PHAR 1006. Orientation to Health Literacy and Communication. (2.0 cr.; A-F only; fall, spring, summer, every year) Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

PHAR 3206. Issues in Health Literacy and Communication. (3.0 cr.; A-F only; =PHAR 5206; fall, spring, summer, every year) Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

PHAR 3207. Leadership in Health Care. (3.0 cr.; A-F only; =PHAR 5207; fall, spring, summer, every year) Leadership skills/theories to create positive change in health care settings.


PHAR 3601. Basic Human Physiology for the Health Professions. (3.0 cr.; A-F only; prereq Medical terminology and anatomy; fall, spring, summer, every year) Normal functions/physiology of major human organ systems/diseases/pathophysiology in those systems.

PHAR 3700. Fundamentals of Pharmacotherapy. (3.0 cr.; A-F only; =PHAR 5700; prereq Medical terminology; fall, spring, every year) Drug therapy/pharmacology. Recognition of brand/generic drug names. Therapeutic classes, common uses. How to review medication lists and other forms of health communication/documentation.

PHAR 3800. Pharmacotherapy for the Health Professions. (3.0 cr.; A-F or Audit; =PHAR 5800; prereq Anatomy/physiology, nursing or respiratory care; fall, spring, every year) Drug therapy. Implications in patient care.

PHAR 4200W. Drugs and the U.S. Health Care System. (3.0 cr.; A-F only; =PHAR 5200, PHAR 4200; fall, spring, every year) How to be informed/responsible participant in debates related to medication use within US health care system.


PHAR 4293. Directed Research I for Undergraduates. (1.0-5.0 cr.; prereq undergrad; #; fall, spring, summer, every year) Work with College of Pharmacy faculty.

PHAR 4294. Directed Study I for Undergraduates. (1.0-5.0 cr. [max 10.0 cr.]; prereq Undergraduate; #; fall, spring, summer, every year) Individualized study. Students work with faculty on special projects.

PHAR 5200. Drugs and the U.S. Health Care System. (3.0 cr.; A-F only; =PHAR 5200, PHAR 4200, PHAR 4200W; prereq grad or professional student; fall, spring, every year) How to be informed/responsible participant in debates related to medication use.

PHAR 5201. Applied Health Sciences Terminology. (2.0 cr.; prereq Basic knowledge of human anatomy/physiology; fall, spring, summer, every year) Identify/describe various medical conditions/processes. Medical abbreviations, surgical procedures, medical terminology. Analyzing words at roots.

PHAR 5205. Obesity: Issues, Interventions, Innovations. (2.0 cr.; A-F only; fall, spring, summer, every year) Information necessary for prevention, treatment, management of obesity, from individual adipose cell to entire public health community.

PHAR 5206. Applied Health Literacy and Communication. (3.0 cr.; A-F only; =PHAR 3206; fall, spring, summer, every year) Issues associated with health literacy. Dimensions associated with misunderstandings that occur in health-related communication.

PHAR 5207. Applied Leadership in Health Care. (3.0 cr.; A-F only; =PHAR 3207; prereq advanced undergraduates or professional health care students or grad students; fall, spring, summer, every year) Leadership skills/theories to create positive change in health care settings.

PHAR 5210. Diminishing Health Disparities Through Cultural Competence: Community Engagement. (2.0 cr.; A-F only; fall, every year) Various dynamics of health disparities, cultural competencies. Uses sociological framework.

PHAR 5212. Survey of Pediatric Metabolic, Genetic, and Oncologic Disease. (2.0 cr.; A-F only; prereq Second year or higher in College of Pharmacy or #; fall, summer, every year) Appraisal of major genetic/metabolic disorders and oncologic diseases of childhood. Disease state epidemiology, pharmacotherapy, monitoring, practical applications.

PHAR 5230. Principles of Clinical Pharmacology Research. (2.0 cr.; A-F only; prereq 3rd Year Pharmacy Student or #; fall, every year) 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.


PHAR 5700. Applied Fundamentals of Pharmacotherapy. (3.0 cr.; A-F only; =PHAR 3700; prereq Medical terminology and admission to grad program or #; fall, spring, every year) Drug therapy/pharmacology. Recognition of brand/generic drug names. Therapeutic classes, common uses. Review medication lists/other forms of health communication/documentation.

PHAR 5800. Pharmacotherapy for the Health Professions. (3.0 cr.; A-F only; =PHAR 3800; prereq Nursing grad program; fall, every year) Drug therapy, its implications in patient care.

PHAR 6122. Pharmacotherapy II: Patient-Centered Pathophysiological Approach. (5.0 cr.; A-F only; prereq 6121, 6131, 6154, 6163, 6173, PHCL 5101, PHCL 5102, spring, every year) Pathophysiology/pharmacotherapy of common cardiovascular, endocrine, gastrointestinal disorders.

PHAR 6123. Pharmacotherapy III: Patient-Centered Pathophysiological Approach. (5.0 cr.; A-F only; prereq 6122, 6163, &6175, PHCL 5101, PHCL 5102; fall, every year)
Pathophysiology/pharmacotherapy of common neurologic, psychiatric, pulmonary, geriatric disorders.

PHAR 6124. Pharmacotherapy IV: Patient-centered Pathophysiologic Approach. (5.0 cr.; A-F only; prereq 6121, 6122, 6123, 6155, 6163; spring, every year)
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.

PHAR 6133. Pharmacy Practice Management. (3.0 cr.; A-F only; prereq 3rd yr pharmacy student; spring, every year)
Principles of pharmacy management, including inventory control, purchasing, pricing, financial analysis, personnel management.

PHAR 6135. Pharmacy Outcomes. (2.0 cr.; A-F only; prereq 6123, 6175; spring, every year)
How to integrate knowledge of basic sciences, pharmacotherapy, pharmacy practice management, pharmaceutical care, written communication, literature evaluation, drug information retrieval, law/ethics, and pharmacoeconomics to manage patients with multiple medical conditions.

PHAR 6136. Pharmacy Law. (1.0 cr.; A-F only; prereq 3rd yr pharmacy student; spring, every year)
Federal regulation of medications, regulation of controlled substances, federal/state regulation of pharmacy practice. Minnesota Pharmacy Practice Act, relevant federal regulations pertaining to pharmacy.

PHAR 6137. Ethics in Pharmacy Practice. (1.0 cr.; A-F only; prereq 3rd yr pharmacy student; spring, every year)

PHAR 6150. CoP Honors: Medicinal Chemistry Seminar. (1.0 cr. [max 2.0 cr.]; A-F only; prereq #: fall, spring, every year)
Current topics in medicinal chemistry.

PHAR 6151. Biochemistry of Medicinals I. (3.0 cr.; A-F only; prereq 1st yr PHAR, 6171; fall, every year)
Biochemistry topics required for understanding pharmacodynamic action/therapeutic use of medicinal agents.

PHAR 6153. Pharmaceutical Immunology. (2.0 cr.; A-F only; prereq 6151; spring, every year)
Basic biological mechanisms of immune system. Emphasizes drug allergies, immunosuppressives, monoclonal antibodies, and preparation/use of immunologic derived agents in diagnosing/treating disease.

PHAR 6155. Medicinal Agents II. (2.0 cr.; A-F only; prereq 6154, & 6174 and Phcl 5102; spring, every year)
Chemical/biological properties and therapeutic uses of drugs affecting central nervous, endocrine, and intermediary metabolism systems.

PHAR 6156. Medicinal Agents III. (4.0 cr.; A-F only; prereq 6151, 6141; fall, every year)
Therapeutic properties/uses of antiviral, anti-infective, antineoplastic agents.

PHAR 6157. Human Nutrition and Drug Therapy. (3.0 cr.; A-F only; prereq 6152; spring, every year)
Basic concepts of human nutrition and clinical application.

PHAR 6158. Recombinant DNA-Derived Drugs. (1.0 cr.; A-F only; prereq 6151; spring, every year)
Biotechnology as it relates to basic/clinical pharmaceutical sciences. Emphasizes recombinant DNA techniques and preparation/use of biotechnology-derived agents in diagnosing/treating disease.

PHAR 6160. CoP Honors: Experimental and Clinical Pharmacology Seminar. (1.0 cr. [A-F only; prereq #: fall, spring, every year])
Selected topics in experimental/clinical pharmacology.

PHAR 6164. Biopharmaceutics. (3.0 cr.; A-F only; prereq 6161, 6162, 6163; fall, every year)
Applied theory of dosage form design for optimal drug activity/bioavailability for all routes of drug administration.

PHAR 6174. Pharmaceutical Care Skills IV. (2.0 cr.; A-F only; prereq 6122; spring, every year)
Basic/clinical science curriculum in lab setting. Longitudinal care in lab setting.

PHAR 6175. Pharmaceutical Care Skills V. (2.0 cr.; A-F only; prereq [6171, 6172, 6173, 6174, 6111, 6112] or #: fall, every year)
Integrates basic/clinical science curriculum lab setting.

PHAR 6181. Pharm.D. Paper & Seminar. (1.0 cr.; A-F only; prereq 3rd yr Pharmacy student; fall, spring, every year)
Research paper/research project plan. Professional behavior, patient confidentiality, universal precautions.

PHAR 6182. Pharm.D. IV Seminar. (1.0 cr.; S-N only; prereq 4th yr pharmacy student, 6181; fall, every year)
Students present thesis topics to peers and faculty evaluators.

PHAR 6183. Pharm.D. IV Paper. (2.0 cr.; S-N only; prereq 6181, 4th yr Pharmacy student; fall, spring, summer, every year)
Final paper describing hypothesis-driven research project, patient-care oriented project, management project, drug-usage evaluation, or extensive literature review.

PHAR 6200. Drugs and the U.S. Health Care System. (2.0 cr.; A-F only; prereq Pharmacy student; fall, spring, every year)
How to be informed/responsible participant in debates related to medication use within US health care system.

PHAR 6204. College of Pharmacy Community Outreach. (1.0-3.0 cr.; A-F or Audit; prereq Current student pharmacist in College of Pharmacy; fall, spring, summer, every year)
Apply knowledge gained in classroom and teaching laboratories to community-based patient care activities.

PHAR 6205. Interprofessional Teamwork for the Health Professions. (1.0 cr.; A-F only; prereq Major in [public health or nursing or medicine or dentistry or social work or pharmacy]; fall, every year)
Interprofessional education that provides an introductory experience to interprofessional teamwork skills with a focus on patient-centered care, especially end of life care.

PHAR 6206. Directed Study: Introduction to Pharmacy Research. (1.0 cr.; S-N only; prereq PharmD student; spring, every year)
Overview of principles to research in particular research topic areas. Forum for scientists involved in research in particular topic areas to discuss research, environment, careers with students.

PHAR 6208. Community-based Immunization Delivery. (1.0 cr.; S-N only; fall, every year)
Students will learn about, plan, and implement influenza immunization clinics.

PHAR 6210. Immunization Tour. (1.0 cr.; A-F or Audit; [=NURS 4430]; prereq 6175, Completion of CPR; fall, every year)

PHAR 6211. Non-Prescription Drug Therapy: Focus on Patient Self-Care. (2.0 cr.; A-F or Audit; prereq 6112; spring, every year)
Over-the-counter medications. Diagnostic/ durable medical equipment available in community pharmacies. Use of alternative medications.

PHAR 6212. Dermatology. (1.0 cr.; A-F only; prereq 3rd yr Pharmacy student; fall, every year)
Pathophysiology/pharmacotherapy of dermatologic disorders.

PHAR 6215. Applied Pharmacokinetics. (2.0 cr.; A-F or Audit; prereq 6163; spring, every year)
Applying clinical pharmacokinetics and assay methodologies to patient care. Assessing drug therapy outcomes.

PHAR 6217. Advanced Pharmaceutical Care Clinic. (1.0-2.0 cr.; prereq [6230] or 3rd yr pharmacy student; spring, every year)
Expanded, direct patient care opportunities. Students conduct comprehensive pharmaceutical care assessments in presence of practitioners. Weekly student case presentations/discussions.
PHAR 6219. Building a Pharmaceutical Care Practice. (2.0 cr.; A-F only; prereq 2nd or 3rd year pharmacy student; spring, every year) Initiating pharmaceutical care practice. Building personal practice plan.

PHAR 6220. Pediatric Drug Therapy. (2.0 cr.; A-F or Audit; prereq 3rd or 4th yr pharmacy student; spring, every year) Pathophysiology/therapeutics of disease states. Common issues encountered in providing pharmaceutical care to pediatric patients.

PHAR 6221. Geriatric Pharmacotherapy. (2.0 cr.; A-F for Audit; prereq 3rd or 4th yr pharmacy student; spring, every year) Pharmacokinetic/pharmacodynamic changes and their implications in elders. Effects of drug-drug/disease interactions. Drug adherence barriers to provide optimum pharmacotherapy to elderly persons.

PHAR 6222. Advanced Pharmaceutical Compounding. (2.0 cr.; A-F only; prereq 2nd or 3rd year pharmacy student; fall, spring, every year) Expands skills gained in pharmaceutical care lab.

PHAR 6223. Pharmacokinetics Research Seminar. (1.0 cr. [max 2.0 cr.]; A-F or Audit; =PHM 8150); prereq 6163 with grade of "B" or better; fall, spring, every year) Evaluate literature in pharmacokinetics/pharmacodynamics/drug metabolism.

PHAR 6224. Pharmacogenomics: Genetic Basis for Variability in Drug Response. (2.0 cr.; A-F only; prereq At least 2nd year or later in healthcare or related program or equivalent experience or #; spring, every year) Theory/practice of pharmacogenomics. Principles of human genetics/genomics. Applications to scientific education, problems in drug therapy optimization, patient care.

PHAR 6226. Interprofessional Diabetes Experience. (2.0 cr.; A-F only; prereq 2nd year or later pharmacy student; spring, every year) Diabetes mellitus through active, hands-on learning in interprofessional environment. Participate in week-long experience of living with diabetes. Online learning activities.

PHAR 6227. Leading Adaptive Change. (2.0 cr.; S-N only; prereq 6237, 6238, must have submitted declaration to complete Leadership Emphasis Area; fall, every year) 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 6228. Leading Change Portfolio. (2.0 cr.; S-N only; prereq 6237 or 6238; spring, every year) Supports completion of Leadership Emphasis Designation. Documentation/self-reflection of leadership learning experiences pursued inside/outside of classroom.

PHAR 6230. Ambulatory Pharmaceutical Care Clinic. (2.0 cr.; prereq Enrolled pharmacy student; spring, every year) How to conduct pharmaceutical care assessments, for patients with actual drug-related needs, in a controlled clinic setting.

PHAR 6231. Community Pharmacy Management. (2.0 cr.; A-F only; spring, every year) Management techniques needed in community pharmacy practice. Emphasizes marketing/service.

PHAR 6232. Health System Pharmacy Management. (2.0 cr.; A-F only; prereq 2nd or 3rd yr pharmacy student; spring, every year) Management techniques needed in various institutional pharmacy settings. Integrating distributive/clinical components of institutional practice.

PHAR 6233. Drug Use Review and Management. (2.0 cr.; A-F or Audit; prereq 3rd yr PHAR; fall, every year) Principles of drug use review in various health care settings. Optimizing quality, minimizing cost.

PHAR 6234. Pharmaceutical Economics and Public Policy. (2.0 cr.; A-F only; spring, every year) 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. (2.0 cr.; A-F or Audit; =PHAR 6235); spring, every year) 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. (2.0 cr.; A-F only; fall, spring, every year) U.S. Food and Drug (FDA) law, civil liability of malpractice, duty of pharmacy professionals, implications of intellectual property rights of others. Business law topics ranging from contracts to non-compete agreements.

PHAR 6237. Leading Change in Pharmacy I. (2.0 cr.; S-N only; fall, every year) Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6238. Leading Change in Pharmacy II. (2.0 cr.; S-N only; spring, every year) Mini-curriculum. Leadership development, its relation to advancing the profession of pharmacy.

PHAR 6248. Drugs of Abuse. (2.0 cr.; S-N only; prereq Organic chemistry I/II or [organic chemistry I, biochemistry I]; spring, odd years) Basic medicinal chemistry of substances of abuse, associated paraphernalia.

PHAR 6249. Addiction Medicine, Substance Abuse, and Chemical Dependency. (2.0 cr.; A-F or Audit; prereq 2nd or 3rd yr Pharmacy student; spring, every year) Addiction, chemical abuse, chemical dependency. How pharmacists can impact those affected.

PHAR 6250. CoP Honors: Social and Administrative Pharmacy Seminar. (1.0 cr. [max 2.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Current topics in hospital pharmacy.

PHAR 6257. Leadership Best Sellers for Pharmacists. (2.0 cr.; A-F only; fall, spring, every year) Part of the leadership track in pharmacy.

PHAR 6260. CoP Honors: Pharmaceutics Seminar. (1.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Contemporary topics in pharmaceutics research.

PHAR 6270. CoP Honors: Critical Care Seminar. (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Research/topics of importance to experimental/clinical pharmacology.

PHAR 6293. Directed Research I. (1.0-5.0 cr.; max 10.0 cr.; prereq #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6294. Directed Study I. (1.0-5.0 cr.; #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, experimental or clinical pharmacology.

PHAR 6301. Veterinary Pharmacotherapy. (2.0 cr.; A-F only; prereq 3rd year pharmacy student; spring, every year) Pharmacotherapy of common medical conditions of small animals.

PHAR 6393. Directed Research II. (1.0-5.0 cr.; max 10.0 cr.; prereq #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6394. Directed Study II. (1.0-5.0 cr.; A-F or Audit; #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental or clinical pharmacology.

PHAR 6493. Directed Research III. (1.0-5.0 cr.; #; fall, spring, summer, every year) Directed research in pharmacy practice, pharmaceutics, medicinal chemistry, or experimental and clinical pharmacology.

PHAR 6494. Directed Study III. (1.0-5.0 cr.; max 10.0 cr.; A-F or Audit; #; fall, spring, summer, every year) Directed studies in pharmacy practice, pharmaceutics, medicinal chemistry, and experimental or clinical pharmacology.

PHAR 6501. Ethics in Pharmacy Practice. (2.0 cr.; A-F only; prereq 3rd yr Pharmacy student; #; fall, every year)
PHAR 6610. Spiders, Scorpions, and Snakes: Clinical Toxicology. (2.0 cr.; A-F only; prereq 2nd yr student in health care or related program or equivalent experience or #; spring, every year)
Module focused on Drug Delivery I. Dosage forms, mostly solid/dispersed. Chemical kinetics, chemical stability, buffer systems, polymers/proteins, rheology. Physiochemical principles relevant to design, preparation, storage, use, efficacy, evaluation of pharmaceutical dosage forms.

PHAR 6700. Becoming a Pharmacist. (2.0 cr.; S-N only; fall, every year)
Introduction to knowledge, skills, attitudes necessary for success in professional pharmacy curriculum/practice of pharmacy.

PHAR 6702. Integrated Biochemical Sciences. (4.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year)
Foundation in structure/function of medicinals. Familiarize students with structural/physical properties of proteins, nucleic acids, lipids, carbohydrates, ligands/drugs. Basic concepts central to structure-function relationships of therapeutics.

PHAR 6704. Foundations of Social and Administrative Pharmacy. (2.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year)
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).

PHAR 6706. Foundations of Pharmaceutical Care. (1.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year)
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.

PHAR 6708. Drug Delivery I. (2.5 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year)
Fundamental physicochemical principles applicable to dosage forms. Foundational scientific principles (continued in DDII) illuminated with examples of solution drug dosage forms. Concepts relevant to current/future dosage forms.

PHAR 6710. Pharmaceutical Care Skills I. (2.0 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year)
Introduction to profession/building skills necessary to become competent, caring pharmaceutical care practitioner. Course consists of laboratory section and lecture.

PHAR 6715. Professional Development and Assessment Sequence I. (1.0 cr.; S-N only; prereq Successful completion of Becoming a Pharmacist; spring, every year)
Knowledge acquisition. Career/professional development.

PHAR 6716. Applied Pharmaceutical Care. (3.2 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist; spring, every year)
Common medical conditions/medications are likely to encounter during their introductory pharmacy practice experiences (IPPEs).

PHAR 6718. Drug Delivery II. (2.4 cr.; A-F only; prereq Successful completion of Drug Delivery I; spring, every year)
Builds on Drug Delivery I. Dosage forms, mostly solid/dispersed. Chemical kinetics, chemical stability, buffer systems, polymers/proteins, rheology. Physiochemical principles relevant to design, preparation, storage, use, efficacy, evaluation of pharmaceutical dosage forms.

PHAR 6720. Pharmaceutical Care Skills Lab II. (2.0 cr.; A-F only; prereq Successful completion of Pharmaceutical Care Skills Lab I; spring, every year)
Part of pharmaceutical care learning center curriculum spanning six semesters. Introduction to profession. Begin building skills necessary to become competent/caring pharmaceutical care practitioner.

PHAR 6722. Principles of Medicinal Chemistry. (2.1 cr.; A-F only; prereq Successful completion of Integrated Biochemical Sciences; spring, every year)
Discipline of medicinal chemistry. Principles of drug design/drug metabolism.

PHAR 6724. Immune System and Infectious Disease. (3.1 cr.; A-F only; prereq Successful completion of Integrated Biochemical Sciences; spring, every year)

PHAR 6726. Principles of Pharmacology. (2.3 cr.; A-F only; prereq Successful completion of Foundations of SAPh; spring, every year)
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.

PHAR 6728. Pharmaceutical Calculations. (0.7 cr. [max 3.1 cr.]; A-F only; prereq Successful Completion of Drug Delivery I; spring, every year)
Accurately perform pharmaceutical calculations. How to prevent patient harm/possible fatality.

PHAR 6730. Professional Development and Assessment II. (0.54 cr.; S-N only; prereq PD&A I; fall, every year)
Emphasis on reinforcing, supporting, developing, assessing competencies/skills exercised in multiple courses. Includes work in career/professional development.

PHAR 6732. Medicinal Chemistry and Pharmacology of Cardiovascular Agents. (2.3 cr.; A-F only; prereq Principles of Pharmacology, Principles of Medicinal Chemistry; fall, every year)
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.

PHAR 6734. Cellular Metabolism and Nutrition. (2.8 cr.; A-F only; prereq Integrated Biochemical Sciences; fall, every year)
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.

PHAR 6736. Cardiovascular Pharmacotherapy. (1.9 cr.; A-F only; prereq All PharmD year one coursework, Physiology Competency Exam; fall, every year)
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 arrythmias (atrial fibrillation), chronic heart failure.

PHAR 6738. Pharmacokinetics. (3.7 cr.; A-F only; prereq Drug Delivery I & II; fall, every year)
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/III. Follows path of drug molecule from incorporation into dosage form to release/disposition in biological system.

PHAR 6740. Pharmaceutical Care Skills Lab III. (2.0 cr.; A-F only; prereq Pharmaceutical Care Skills Lab I & II; Applied Pharmaceutical Care; fall, every year)
Designed for second year pharmacy students to continue to build skills necessary to become pharmaceutical care practitioner. Laboratory section/discussion.

PHAR 6742. Colloquium I: Scholarly Presentation Skills. (0.8 cr.; A-F only; prereq Becoming a Pharmacist, Foundations of Social and Administrative Pharmacy, Foundations of Pharmaceutical Care; fall, every year)
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.

PHAR 6800. Rehabilitation Pharmacotherapy. (2.0 cr.; A-F or Audit; prereq Enrolled physical therapy student; summer, every year)
Impact of medications on rehabilitation, how rehabilitation affects medication use.
PHAR 6937. Directed Study: Leading Change in Pharmacy I. (2.0 cr.; S-N only; prereq PDII or PDIII Pharmacy student; fall, spring, every year) Leadership development/its relation to advancing profession of pharmacy.

PHAR 7001. Early Pharmacy Practice Experience I. (1.0 cr.; A-F only; prereq Criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, every year) First in series of four courses. Focuses on patient perspective in managing/living with chronic conditions/ chronic medication use. Community-based instruction, mentor program.

PHAR 7002. Early Pharmacy Practice Experience II. (1.0 cr.; A-F only; prereq 7001 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; spring, every year) Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentor program.

PHAR 7003. Early Pharmacy Practice Experience III. (0.5 cr.; A-F only; prereq 7002 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; fall, every year) Third in series of four courses. Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentoring. Upcoming patient care opportunities.

PHAR 7004. Early Pharmacy Practice Experience IV. (0.5 cr.; A-F only; prereq 7003 or #, criminal background check, BLS CPR certification, negative Mantoux test (or explanation of positive test), chicken pox immunity; spring, every year) Patient perspective in managing/living with chronic conditions/chronic medication use. Community-based instruction, mentoring.

PHAR 7005. Introductory Community-Practice Pharmacy Experience. (2.5 cr.; S-N only; prereq 6111, 6171, 7001, 1st year pharmacy student; spring, every year) Experience in patient care at community practice setting. Three weeks, 40 hrs/week.

PHAR 7006. Introductory Institutional-Pharmacy Practice Experience. (2.5 cr.; S-N only; prereq College of Pharmacy student completed 6121, 6122, 6131, 6132, 6173, 6174, 7003 and 7004 with passing grade, registered with Minnesota Board of Pharmacy as intern; spring, every year) Experience in patient care in hospital setting. Three-week, 40 hours/week.

PHAR 7010. APPE Continuing Professional Development Portfolio. (1.5 cr.; S-N only; prereq 3rd yr pharmacy student; spring, every year) 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.

PHAR 7120. Community Practice Experience. (4.0 cr.; A-F only; 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; fall, spring, every year) Students assigned to participating community pharmacies. Community practice activities full-time for 5 weeks.

PHAR 7122. Acute Patient Care Practice Experience I. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks.

PHAR 7123. Ambulatory Patient Care Practice Experience. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in an ambulatory setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

PHAR 7126. Patient Care Practice Experience. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Patient care experience in any setting. Students responsible for drug-related needs of individual patients. Full-time for five weeks.

PHAR 7128. Acute Patient Care Practice Experience II. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks.

PHAR 7121. Elective Practice Experience I. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in outpatient or patient pharmacy practices where direct patient contact/ care occurs for 5 weeks, or experience in non-patient care setting. Site varies from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7123. Elective Practice Experience II. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in outpatient or patient pharmacy practices where direct patient contact/ care occurs for 5 weeks, or experience in non-patient care setting. Site varies from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7124. Elective Practice Experience IV. (4.0 cr.; A-F only; 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; fall, spring, summer, every year) Experience in an inpatient setting. Students responsible for all drug-related needs of individual patients. Full-time for five weeks.

PHAR 7127. Elective Practice Experience V. (4.0 cr.; A-F or Audit; 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; fall, spring, every year) Experience in outpatient or patient pharmacy practices where direct patient contact/ care occurs for 5 weeks, or experience in non-patient care setting. Site varies from governmental agencies to pharmacy associations to specialized practices for 5 weeks.

PHAR 7310. Introduction to Community Health, Community Engagement and Leadership I. (1.0 cr.; A-F only; prereq Successful completion of Becoming a Pharmacist (BaP); fall, every year) Gain understanding of community/population health, professionalism, teamwork, leadership.

PHAR 7320. Early Pharmacy Practice Experience II: Planning and Implementing a Community Health Project. (1.0 cr.; A-F only; prereq Successful completion of EPPE I; spring, every year) Series of interconnected active learning activities spanning first two years of professional program. Builds on learning from previous semester/semi-semester learning experiences. Continue into EPPE III (in following semester).
CVM 6000. Gopher Orientation and Leadership Experience. (2.0 cr. [max 4.0 cr.]; S-N only; prereq Admission to veterinary program; fall, spring, every year) Introduces first-year students to the veterinary college, program, and profession. Two-day and one-half 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.

CVM 6001. Opportunities in International and Cultural Immersion. (0.5 cr. [max 1.0 cr.]; S-N only; fall, spring, every year) Finding and applying for opportunities. Securing funding. Travel safety. Topics in cultural competence. Presentations from students who have participated in international projects.

CVM 6003. Clinical Correlations . (2.0 cr. [max 6.0 cr.]; S-N only; spring, every year) Principles of research in learning. Prepares students for clinical work senior year/career.


CVM 6006. Global One Health: Thailand. (3.0 cr.; S-N only; spring, offered periodically) 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 6025. Large Animal Hospital Practicum: Year 2. (1.0 cr.; S-N only; fall, spring, every year) Animal handling, evaluation, treatment protocols. Presentation/considerations related to veterinary diseases. Case care. Team skills. Hospital procedures for clinical rotations. Students provide primary case care and service support. Prereq-2nd yr DVM or instr consent.

CVM 6026. Small Animal ICU Practicum: Year 4. (1.0 cr. [max 3.0 cr.]; S-N or Audit; fall, spring, summer, every year) Management of dogs/cats requiring urgent medical care, intensive medical management. Providing primary care 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. (1.0 cr.; S-N only; fall, spring, every year) Experience in procedures/policies involved in after-hours care of hospitalized/emergency cases in the large-animal hospital. Prereq-3rd DVM or [instr consent, college consent]

CVM 6028. Large Animal Hospital Practicum: Year 4. (4.0 cr. [max 12.0 cr.]; S-N or Audit; prerequisite All 4th year students in Food Animal, Equine, Mixed tracks, as well as affiliate students; fall, spring, summer, every year) Team leadership in procedures/policies involved in after hours care of hospitalized/emergency cases in large-animal hospital.

CVM 6029. Small Animal Hospital Practicum: Year 3. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM 3rd yr or #; fall, spring, summer, every year) Management of dogs/cats requiring urgent medical care, intensive medical management. Providing primary care service and support through patient evaluation, problem solving, health care delivery, equipment operation. Practicum in Small Animal Intensive Care Unit.

CVM 6030. Veterinary and Community Public Health. (2.0 cr.; A-F or Audit; prereq 6201, 6202, 6220; spring, every year) Epidemiological approach to veterinary public health. Major zoonoses, animal sentinels, meat/milk inspection, preharvest food safety, environment, occupational health/safety, euthanasia, carcass disposal methods, cruelty investigations, welfare issues. Problem-solving examples.

CVM 6031. International Animal Diseases. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq DVM, [CVM grad student or #]; spring, every year) Epidemiology, clinical signs, differential diagnoses, pathology, economic effect of diseases not currently or intermittently present in the United States. International role of veterinarians in controlling disease, increasing food production, facilitating trade.

CVM 6042. Practice Management/Law and Ethics. (2.0 cr.; S-N or Audit; prereq DVM or #; spring, every year) Economic, marketing, personnel management, accounting issues in veterinary practice management. Legal/ethical parameters for veterinary practice. Attendance required.

CVM 6103. Veterinary Imaging II. (2.0 cr.; A-F or Audit; prereq [6100, 6101, 6102, 6103, DVM 3rd yr] or #; fall, every year) Musculoskeletal, general abdomen, and alimentary tract systems. Interpretation of radiographs (film or digital) germane to common animal diseases. Clinical applications. Lectures, lab exercises using body systems approach to imaging (primarily radiographic) of large/small animals.

CVM 6105. Small Animal Ultrasonography. (1.0 cr. [max 2.0 cr.]; S-N or Audit; prereq 6100, 6101, 6102, 6103, 3rd yr DVM student) or #; spring, every year) Body systems approach to imaging (primarily abdominal) of small animals. Ultrasonographic physics/technique, normal anatomy. Portal vein-associated organs, general abdomen (masses, effusions, tissue echogenicity, bowel). Upper/lower urinary tracts, genital tract, echocardiography. Head-neck ultrasound (eye, thyroid, etc.). Background of image generation/interpretation of sonograms germane to common animal diseases.

CVM 6136. Small Animal Nutrition: Advanced Block. (2.5 cr.; prereq 3rd yr DVM or #; spring, every year) Clinical application in nutrition competencies expected of a practicing small or mixed animal veterinarian. Feeding of healthy pets. Nutritional assessment. Formulating a nutritional management plan for patients.

CVM 6137. Small Animal Clinical Nutrition. (2.0 cr. [max 6.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; fall, spring, summer, every year) 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.

CVM 6222. Advanced Clinical Epidemiology. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year) 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 6305. Clinical Skills IV. (1.0 cr.; S-N only; prereq DVM 3rd yr or #; fall, every year) Domestic animal behavior. Basic animal handling/managing skills. Small-animal clerk duty. Using an IV/syringe pump, setting up ICU order sheets, using glucometer/centrifuge to perform "big 4" daily ICU/C tests.

CVM 6306. Small Animal Clinical Skills: Advanced Block. (1.0 cr.; S-N or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year) Advanced clinical skills used by small animal practitioners in private practice.

CVM 6312. Veterinary Dental Rotation (SDen). (2.0 cr. [max 6.0 cr.]; A-F only; prereq DVM 3rd yr or student #; fall, spring, summer, every year) 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.

CVM 6404. Small Animal Dermatology: Advanced Block. (1.0 cr.; A-F or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year) Case-base discussion of common dermatologic conditions that affect dogs/cats. Students work on clinical cases outside classroom. Cases are discussed in classroom.

CVM 6410. Large Animal Digestive Disorders. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd yr or #; fall, every year) Digestive disorders of domestic large animal species, beginning with oral cavity.
Pathogenesis, clinical signs, diagnosis, treatment, prevention. Case examples, lab exercises.

CVM 6411. Small Animal Gastroenterology. (3.0 cr.; A-F only; prereq DVM 3rd yr or #; fall, every year)

CVM 6420. Musculoskeletal System Diseases. (3.0 cr.; A-F only; prereq DVM 3rd yr or #; fall, every year)
Presentation, pathophysiology, diagnostic, and therapeutic/management approaches for common disorders of locomotion.

CVM 6424. Small Animal Orthopedic: Advanced Block. (1.0 cr.; A-F or Audit; prereq [3rd or 4th] yr DVM or #; non-track students may audit lectures, but labs must be taken for grade; spring, every year)
Dog/cat pediatric, adult orthopedic problems frequently seen in clinical practice. For comparative information, selected human orthopedic problems are presented by guest lecturers. Attendance/participation required for grade.

CVM 6434. Critical Care: Advanced Block. (1.0 cr.; S-N or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year)

CVM 6436. Small Animal Cardiology: Advanced Block. (0.5 cr.; S-N or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year)
Diagnostic/therapeutic considerations related to small animal cardiovascular disorders beyond core in preparation for clinical rotations.

CVM 6442. Animal Behavior Elective: Advanced Block. (1.0 cr.; S-N or Audit; prereq [3rd or 4th] yr DVM or #; spring, every year)
Introduction to abnormal/undesired animal behavior, diagnostic procedures, and behavioral/pharmacological modifications.

CVM 6444. Ophthalmology. (2.0 cr.; A-F or Audit; prereq 2nd yr DVM student; spring, every year)
Common procedures for evaluation, diagnosis, treatment of eye disorders in domestic species.

CVM 6448. Veterinary Oncology. (2.0 cr.; A-F only; spring, every year)
Cancer biology/metastasis. Surgical oncology, chemotherapy, and radiation therapy. Pathophysiology, clinical presentation, diagnostic testing and therapeutic options (curative, palliative-intent) for neoplastic/paraneoplastic diseases in domestic animal species.

CVM 6451. Metabolic Disorders. (2.0 cr.; A-F only; prereq DVM 3rd yr or #; fall, every year)
Metabolic diseases of both companion and large animal species. Endocrinology, unique metabolic disorders of large animals. Introductions to pediatrics and geriatric medicine.

CVM 6452. Metabolic Disorders II. (3.0 cr.; A-F or Audit; prereq DVM 3rd yr or #; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocols for metabolic and endocrine based disorders of domestic species.

CVM 6461. A Clinician's Analysis of Urinalysis. (1.0 cr.; S-N only; prereq 3rd yr DVM or #; spring, every year)
Informal, case-based, interactive, in-depth approach to evaluation of urinalyses of clinical cases recently admitted to Veterinary Teaching Hospitals. Improving observational interpretation skills. Recognizing invito factors that may alter results of urinalyses.

CVM 6464. Small Animal Urinary System Diseases: Case Based Discussion. (1.0 cr.; S-N only; prereq [DVM 3rd or 4th yr] or #; spring, every year)
Expands on disorders of small animal urinary system. Core/additional disorders.

CVM 6471. Problems in Small Animal Medicine. (2.0 cr.; A-F only; spring, every year)
Problem-based approach to clinical problems in dogs/cats. Logical, structured approach to problems. Interpretation of laboratory results. Discussion, weekly self-assessment quiz, in-class work on next case.

CVM 6472. Small Animal Infectious Diseases. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of multisystemic infectious diseases of dogs and cats.

CVM 6473. Large Animal Infectious Diseases. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of multisystemic infectious diseases of ruminants and horses.

CVM 6474. Hematologic and Immunologic Disorders. (1.0 cr. [max 2.0 cr.]; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, and management protocol of disorders of immunologic/hematologic systems.

CVM 6481. Obstetrics Lab. (1.0 cr.; S-N only; spring, every year)
Techniques for pregnancy diagnosis, obstetric manipulation in large animal species.

CVM 6482. Small Animal Theriogenology. (1.0 cr. [max 2.0 cr.]; A-F only; prereq 3rd yr DVM or #; fall, every year)

CVM 6483. Theriogenology Diagnostic Techniques. (1.0 cr.; S-N only; prereq 3rd yr DVM or #; fall, every year)
Obstetric manipulation in domestic species.

CVM 6491. Avian Core. (2.0 cr.; A-F only; spring, every year)
Avian nutrition, physiology, anatomy, and disease. Prereq-DVM or instr consent.

CVM 6494. Small Animal Anesthesia Advanced Block Core. (1.0 cr.; A-F only; prereq 3rd yr DVM or #; spring, every year)
Sedative techniques, combination injectable anesthesia, pediatric/geriatric small animal anesthesia, pain control, regional techniques, anesthesia in trauma cases, complications in anesthesia, ventilator use.

CVM 6497. Avian Medicine and Surgery. Advanced Block. (1.0 cr.; Student Option No Audit; prereq [3rd or 4th yr] DVM or #; spring, every year)

CVM 6500. Veterinary Public Health and Regulatory Medicine. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM 3rd yr or 4th yr or grad student or #; fall, spring, summer, every year)
Interacting with public health, regulatory, and community activities. Roles in food industry. Public/occupational health, environmental problems. Zoonotic disease problems, food/occupational safety, euthanasia, carcass disposal, epidemiologic investigations, animal transportation/control, emergency preparedness, USDA accreditation. Students select clinical case, prepare oral response to hypothetical questions, conduct occupational safety/hazard review, present findings.

CVM 6501. Advanced Veterinary Public Health: Current Topics. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM or MPH or grad student or #; fall, spring, summer, every year)
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.

CVM 6502. Necropsy. (2.0 cr. [max 4.0 cr.]; S-N only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year)
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.
CVM 6503. Exotic Animal Necropsy Rotation. (2.0 cr.; A-F only; fall, spring, summer, every year) Zoo/wildlife pathology service similar to required necropsy rotation (CVM 6502). Perform necropsies of incoming cases of "nontraditional" animals. Write report and after discussion with faculty member chose appropriate additional tests. Perform histologic evaluation of selected organs. Small projects pertaining to exotic animal pathology (and medicine). Present during lab's Thursday seminar series.

CVM 6505. Topics. (0.25-8.0 cr.; max 160.0 cr.;) fall, spring, summer, every year) Elective topics.

CVM 6506. Directed Studies in Large Animal Medicine (DistL). (1.0-2.0 cr.; max 40.0 cr.;) S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year) Students, under guidance of a faculty member, conduct 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 CVM's curriculum committee.

CVM 6507. Directed Studies in Small Animal Medicine (DistS). (1.0-2.0 cr.; max 40.0 cr.;) S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year) Students, under guidance of a faculty member, conduct 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.

CVM 6508. Directed Studies: Pathobiology (DistPB). (1.0-2.0 cr.; max 40.0 cr.;) S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year) Students, under guidance of a faculty member, conduct 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.

CVM 6509. Directed Studies: Diagnostic Medicine (DistD). (1.0-2.0 cr.; max 40.0 cr.;) S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year) Students, under guidance of a faculty member, conduct 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.

CVM 6510. MPH Project: PHP. (1.0-3.0 cr.; max 9.0 cr.;) S-N only; prereq DVM student or #; fall, spring, summer, every year) Directed field research. Original or secondary analysis of data sets related to public health practice.

CVM 6511. Exotic Animal Medicine Rotation. (2.0 cr.; A-F only; fall, spring, summer, every year) Develop knowledge/technical skills to manage common exotic pets through case-based examples, lectures, and labs. Two days a week in a field setting of choice from the following (DNR, Raptor Center, Wildlife Rehabilitation Center, Como Zoo, MN Zoo, private practices with an exotic case load).

CVM 6512. Zoo and Wildlife Rounds. (0.5 cr.; max 3.0 cr.;) S-N only; fall, spring, every year) Zoo, wildlife, and exotic pet conservation. Seminars involving topics of exotic animal conservation, medicine, and pathology encountered at the 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 will be presented and discussed by zoo keepers, case veterinarian, and/or case pathologist, and students. Apply principles of basic and clinical science to address the cause of disease for individual animals as well as populations of animals.

CVM 6513. Topics on Climate Change and Agriculture. (1.0 cr.; A-F only; spring, every year) Science of climate change, role of agriculture and steps that are being taken to mitigate effects. Readings/discussions on a series of topics including, evidence for climate change, policy actions, carbon credits, soil sequestration, role of livestock, anaerobic digesters, and carbon footprint.

CVM 6514. Directed Studies in Food Animal Medicine (DistFA). (1.0-2.0 cr.; S-N only; fall, spring, summer, every year) Conduct special project addressing issue in food animal medicine under guidance of faculty member. Project proposals include hypothesis, objectives, plan of study, product for evaluation by adviser/approval by CVM's curriculum committee.

CVM 6515. Externship (Extern). (1.0-2.0 cr.; max 24.0 cr.;) S-N or Audit; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Students spend two weeks/rotation in a practice or other professional setting.

CVM 6516. Field Experience in Public Health Practice. (0.5-8.0 cr.; max 24.0 cr.;) S-N only; [PUBH 7296]; prereq DVM student or #; fall, spring, summer, every year) Directed field experience or clinical rotation/practicum in selected community or public health agencies/institutions. Integration of knowledge/skills in population science for public health.

CVM 6519. Wildlife Rehabilitation Center Summer Internship. (0.1 cr.; S-N only; prereq DVM student; summer, every year) Six-week summer internship (15 hr/wk) at Wildlife Rehabilitation Center. Hands-on learning in clinical medicine; avian, waterfowl, and mammal nurseries; wildlife handling and management; and wildlife rehabilitation. Final project.

CVM 6525. Rotation at Other Institution (RAOI). (1.0-2.0 cr.; max 40.0 cr.;) S-N or Audit; prereq DVM 4th yr or #; fall, spring, summer, every year) Students to spend one-six weeks in an organized program at another degree-granting institution, in an area either not offered at the University or in one that complements experience in a clinical rotation at the University.

CVM 6526. Dermatology Rotation at Other Institution. (2.0 cr.; max 4.0 cr.; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year) Rotation through which students may take a required dermatology course at another accredited veterinary college.

CVM 6527. Anesthesiology Rotation at Other Institution. (2.0 cr.; max 4.0 cr.; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year) Rotation offered allowing students to fulfill their anesthesiology rotation requirement at another accredited veterinary college.

CVM 6528. Radiology Rotation at Other Institution. (2.0 cr.; max 4.0 cr.; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year) Radiology core rotation taken at another accredited veterinary college and used to meet core requirements.

CVM 6529. Equine Medicine Rotation at Other Institution. (2.0 cr.; max 4.0 cr.; prereq DVM 3rd or 4th year or #; fall, spring, summer, every year) Equine Medicine Rotation at another accredited veterinary college and used to meet a core medicine requirement.

CVM 6530. Orientation to Clinical Rotations. (1.0 cr.; max 2.0 cr.;) S-N only; prereq 3rd yr DVM; spring, every year) Topics, issues, and procedures encountered during clinical rotations. Transition into clinics. Flow during rotations. Didactic lectures, group exercises, discussions. CVM/MC policies/ procedures, patient flow, SOAPs, discharges, admissions, ICU/wards, patient care, UVIS, client communications, infection control, safety, pharmacy, licensure, rotation expectations.

CVM 6531. Biosecurity and Biocontainment for Food Animals. (2.0 cr.; A-F only; spring, summer, every year) Rotation. Biocontainment and biosecurity measures and strategies that are being used in the food animal industry (swine, poultry and dairy) to prevent the spread of disease. Hands on experience for students interested in developing biosecurity plans for farms. Pathogen transmission within and between populations, the routes of pathogen dissemination and measures and strategies used to prevent disease dissemination. Hands on biosecurity audits/develop recommendations for system improvement.

CVM 6532. Clinical Laboratory Medicine (Labs). (2.0 cr.; max 4.0 cr.; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) One-semester intensive rotation in veterinary clinical lab medicine. Hematology, cytology, clinical chemistry, endocrinology, microbiology. Sample submission. Lab test methodology. Didactic teaching, small group discussion, case-based/guided self-instruction, microscopy.
CVM 6540. Advanced Veterinary Toxicology. (2.0-8.0 cr. [max 40.0 cr.]; S-N or Audit; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6560. Public Health Issues and Veterinary Medicine Opportunities. (1.0 cr. [max 2.0 cr.]; A-F only; fall, spring, every year) 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). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6602. Small Animal Internal Medicine: (SAM B). (2.0 cr. [max 52.0 cr.]; prereq [6601, DVM 3rd or 4th yr] or #; fall, spring, summer, every year) 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.

CVM 6605. Banfield Elective Clinical Rotation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) Managing general/clinical 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). (2.0 cr. [max 4.0 cr.]; A-F only; prereq Sr; fall, spring, summer, every year) Emergency/critical-care cases in small animal practice or emergency practice. History taking, physical exams. Creating problem lists, proposing diagnostic/therapeutic plans.

CVM 6610. Small Animal Dentistry and Oral Surgery Elective. (2.0 cr.; A-F or Audit; spring, every year) Small animal dentistry and oral surgery (primarily canine and feline, but includes exotic animal dentistry) Clinical recognition, diagnosis, assessment, and treatment of dental, oral, and maxillofacial pathology common to small animal clinical practice. Didactic lectures, laboratory teaching, small group learning exercises, and critical overview of published literature (that will be utilized in the group case presentations). Feline oral surgery; noninvasive maxillofacial fracture repair techniques. Critical grading on surgical procedures.

CVM 6611. Equine Dentistry Elective. (0.0-1.0 cr.; A-F only; prereq First-yr spring DVM courses; spring, every year) Equine dental disorders for the equine or mixed animal practitioner. Oral health maintenance in horses and diagnosis of dental disorders.

CVM 6630. Behavior (Beha). (2.0 cr. [max 8.0 cr.]; prereq DVM [3rd or 4th yr] or grad student or #; fall, spring, every year) 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.

CVM 6632. Dermatology (Derm). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6634. Comparative Ophthalmology (Ophth). (2.0 cr. [max 40.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Entry-level ophthalmology. Diagnosis, treatment. Outside readings, review papers, final essay exam.

CVM 6636. Cardiology (Card). (2.0 cr. [max 40.0 cr.]; prereq DVM 4th yr or CVM grad or #; fall, spring, summer, every year) Clinical problem solving. Cases of cardiopulmonary disease, including canine/feline congenital heart disease, acquired valvular/myocardial disease, dicrofilariasis, arrhythmias, pulmonary disorders. Hands-on experience in conducting physical exams, recording electrocardiograms/echocardiograms, and reading thoracic radiographs. Group discussions, rounds.

CVM 6644. General Practice (GenP). (2.0 cr. [max 40.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Students manage their own cases including developing diagnostic, treatment, and preventive health maintenance plans for each patient, performing routine medical/surgical procedures, and conducting client communication/education. Wide variety of cases.

CVM 6648. Advanced Clinical Oncology Rotation. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or grad student or #; fall, spring, summer, every year) 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.

CVM 6651. Small Animal Ultrasound (SAUS). (2.0 cr. [max 8.0 cr.]; A-F only; prereq [3rd or 4th] yr DVM or #; fall, spring, summer, every year) 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.

CVM 6661. Neurology (Neur). (2.0 cr. [max 4.0 cr.]; prereq 3rd or 4th yr DVM or #; fall, spring, summer, every year) 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.

CVM 6662. Comparative Anesthesiology (Anes). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr; fall, spring, summer, every year) 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, teamwork, and pain management.

CVM 6663. Small Animal Surgery (SAS). (2.0 cr. [max 8.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6664. Elective Small Animal Surgery (ESAS). (2.0 cr. [max 10.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Elective surgeries such as ovariohysterectomies, neuters, 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.

CVM 6665. Small Animal Physical Rehabilitation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) 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. (2.0 cr.; prereq DVM 3rd or 4th yr or grad or #; fall, spring, offered periodically) Contrast agents and procedures used to examine various body systems or anatomical areas.

CVM 6668. Small Animal Radiology (RAD). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6669. Radiology: Mixed Animal. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6681. Advanced Small Animal Theriogenology. (1.0 cr.; A-F only; spring, every year) Non-core small animal theriogenology topics. Online course.

CVM 6690. Integrative Medicine. (2.5 cr.; S-N or Audit; prereq 2nd yr DVM student or #; spring, every year) History/principles of acupuncture, chiropractic, and other commonly used complementary approaches to care of domestic animals. Training requirements for certification. Lectures, case examples, demonstrations.

CVM 6691. Veterinary Acupuncture (AcPunct). (2.0 cr. [max 6.0 cr.]; prereq [6690, yr 3 or 4 DVM]] or #; fall, spring, summer, every year) Basic veterinary acupuncture theory, point combination, treatment, diagnosis of diseases, hands-on veterinary acupuncture technique.

CVM 6702. Large Animal Palpation Labs. (2.0 cr.; S-N only; prereq DVM or #; fall, every year) Hands-on clinical experiences in equine, bovine, or large animal reproductive status/disorders. Students select species.

CVM 6704. Reproductive Diseases of Cattle. (2.0 cr. [max 8.0 cr.]; A-F or Audit; prereq 3rd yr DVM or #; fall, every year) Common diseases affecting reproductive function in cattle, swine, and small ruminants.

CVM 6711. Large Animal Medicine (LAM). (2.0 cr. [max 8.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Medical diseases of horses, cattle, small ruminants, South American camelids, and pot-bellied 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.

CVM 6712. Equine Ambulatory Rotation. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, summer, every year) 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. (2.0 cr. [max 10.0 cr.]; prereq 3rd or 4th yr DVM student or #; fall, spring, summer, every year) General surgery, lameness cases. Emphasizes horses. Some cattle, small ruminants/camelids. 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.

CVM 6720. Problem Solving in Equine Medicine. (2.0 cr.; A-F or Audit; prereq DVM 3rd yr or #; spring, every year) 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.

CVM 6721. Large Animal Neonatology. (1.0 cr. [max 2.0 cr.]; S-N or Audit; fall, every year) Instruction, emergency duty, practical application of principles in evaluating/treating sick equine neonates. Seasonal participation in clinically managing hospitalized foals/periodically reviewing past cases.

CVM 6726. Developing Profound Conversations. (1.0 cr.; S-N only; spring, every year) Enhance skills essential for effective clinician-client and interprofessional healthcare delivery, including non-verbal communication, empathy, emotional intelligence, deep listening, and mindfulness. Horses are used as a non-judgmental indicator of behavior.

CVM 6727. Equine Palpation. (1.0 cr.; S-N only; prereq DVM or #; fall, every year) Hands-on clinical experience in evaluation of equine reproductive status and reproductive disorders.

CVM 6728. Reproductive Diseases of the Horse. (1.0 cr.; A-F or Audit; prereq DVM 3rd yr or #; fall, every year) Reproduction patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses.

CVM 6732. Equine Dentistry and Preventative Medicine. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; intended for equine track or mixed track students; fall, spring, summer, every year) Two-week rotation on dental health care and general preventative health care for horses.

Field trips, presentations, labs, case studies, clinical cases.

CVM 6733. Equine Dentistry and Nutrition. (2.0 cr. [max 4.0 cr.]; A-F only; fall, spring, every year) 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. (2.0 cr. [max 4.0 cr.]; A-F only; prereq Intended for equine track or mixed track students; fall, spring, summer, every year) Rotation introduces diagnosis/treatment of equine lameness/hoof disorders. Clinical cases, presentations, case studies, labs.

CVM 6737. Equine Sports Medicine. (2.0 cr.; A-F only; prereq 6736; spring, every year) 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.

CVM 6747. Equine Theriogenology Introduction (ETHI). (2.0 cr. [max 16.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Techniques in equine reproduction. Handling of stallions/mares. Testing for estrus detection. Rectal palpation, ultrasound exam of reproductive tract. Breeding management, hormone treatments, vaginal examination, uterine culture, cytology/biopsy, semen collection/evaluation, intrauterine therapy, artificial insemination.

CVM 6748. Equine Theriogenology Advanced (ETHA). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, every year) Students are in charge of breeding management decisions: select mares from teaching herd, use palpation and ultrasound/ pharmacologic aids to ensure timely breeding to frozen semen, which was frozen/assessed by students. Students participate in equine theriogenology cases admitted to Veterinary Medical Center.

CVM 6750. Equine Sports and Rehabilitation Medicine. (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; intended for equine track or mixed track students; fall, spring, every year) 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.

CVM 6752. Advanced Equine Elective I. (1.0 cr.; A-F only; prereq Veterinary core curriculum for Advanced Equine Elective I; summer, every year) More depth on equine health topics than offered in core curriculum. Includes cadaver lab and two live horse exercises.
CVM 6753. Advanced Equine Elective II. (3.5 cr.; A-F or Audit; prereq 6752; fall, spring, every year) Lecture format. Topics in equine medicine. More depth than core veterinary courses.

CVM 6789. Fresh Dairy Doe and Newborn Goat Kid Management. (2.0 cr. [max 4.0 cr.]; A-F only; spring, every year) Rotation at Poplar Hill Goat Dairy during fresh doe/goat kid season. How to recognize, diagnose, and treat kid illnesses. Health strategies to control Johnne's, caprine arthritis encephalitis virus, coccidiosis, neonatal diarrhea, mastitis, parasitism, and nutritional deficiencies.

CVM 6790. Advanced Small Ruminant Practice. (1.5 cr. [max 3.0 cr.]; A-F or Audit; prereq DVM 3rd or 4th yr or #; spring, every year) Training beyond core in practice of small ruminants. Common diagnostic/therapeutic procedures.

CVM 6792. Small Ruminant Health and Production Rotation (SmRu). (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) 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.

CVM 6793. Small Ruminant Reproduction. (0.5 cr.; A-F or Audit; prereq 3rd yr DVM or #; fall, every year) Breeding soundness of males, embryo transfer, artificial insemination semen, cryopreservation. Reproductive management of goat/sheep herds. Sire/dam selection, genetic potential, nutritional affects. Reproductive tracts. Estrus detection, breeding patterns, reproductive phannacology. Vaginal examination, biopsy/ cytology, reproductive microbiology. Camellid progesterone case studies. Captive breeding programs for wild hoof stock.

CVM 6794. Camelid Medicine, Surgery, Reproduction, and Health Management. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; spring, every year) 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.


CVM 6797. Beef Production Systems Medicine: Cow-Calf (BSPCC). (2.0 cr. [max 4.0 cr.]; A-F only; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Beef production medicine and health management. How cow-calf medicine fits within the larger North American beef production system. Cow-calf beef production system and related preventative/therapeutic health management programs, purchasing/Introducing new stock, marketing systems, facility requirements/design, husbandry, field diagnostics, reproductive management, breeding soundness evaluations, vaccine protocols, record keeping and economics, calving management, body condition scoring, and calf scours management and treatment. Farm visits to evaluate production systems with field trips to high/low health calf-cow operations with focus on problem solving and discussions of on farm disease cases and important industry topics.

CVM 6800. Bovine Palpation. (1.0 cr.; S-N only; prereq DVM or #; fall, every year) Practice in diagnostic evaluation of bovine reproductive tract.

CVM 6803. Advanced Bovine Practice: Laboratory Block. (1.0 cr.; S-N or Audit; prereq [6802. [DVM 3rd or 4th yr]] or #; spring, every year) Cattle health, production medicine. Topics not included in core, more extensive discussion of conditions introduced in core.

CVM 6804. Bovine Surgery. (2.0 cr. [max 4.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Technical/theoretical skills in management of individual cow surgical diseases. Emphasizes abdominal/urogenital surgery of dairy cow. Discussion, labs. Students research topics and prepare for surgery.

CVM 6805. Food Animal and Exotic Animal Anesthesia. (0.5 cr.; S-N or Audit; prereq 5321 or equiv; spring, every year) Techniques/complications of sedation, local anesthesia, and general anesthesia in ruminants, pigs, and some large exotic species. Cases demonstrate anesthetic management of clinical problems common in veterinary practice.

CVM 6806. Food Animal Disease and Diagnostics. (2.0 cr. [max 4.0 cr.]; prereq 3rd or 4th yr DVM student or #; spring, every year) Two-week rotation. Food animal necropsies, diagnostic assays.

CVM 6810. Food Animal Basics. (2.0 cr.; S-N only; prereq Successful completion of first 2 years of DVM curriculum; spring, every year) Therapeutic principles and vaccinology; animal housing and welfare, diagnostic approaches for populations; genetic improvement and biosecurity. Holistic appreciation of major issues in animal health and production. Preparation for food animal rotations in senior year.

CVM 6811. Dairy Theriogenology Palpation (DThP). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year) Palpating the reproductive tract of the cow per rectum. On-farm reproductive record systems. Evaluating dairy herd reproductive performance through DHI reports. Dairy Comp 305 and DairyCHAMP reports. Farm visits, case discussions, laboratories, student presentations.

CVM 6813. Miracle of Birth. (2.0 cr. [max 4.0 cr.]; A-F only; prereq 3rd or 4th yr DVM or #; fall, summer, every year) 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/ interviews. Students work with large animal veterinarians, FFA students, and instructors in this rotation.

CVM 6821. Dairy on Farm Clinical (DOFC). (2.0 cr. [max 12.0 cr.]; A-F only; prereq 3rd or 4th yr DVM student or #; fall, spring, summer, every year) 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.


CVM 6827. Dairy Production Medicine 2. (2.0 cr. [max 4.0 cr.]; prereq 6818, 6826, [3rd or 4th yr DVM or #]; summer, every year) Rotation expand on topics listed under Dairy Production Medicine 1.

CVM 6828. Dairy Production Medicine 3. (2.0 cr. [max 4.0 cr.]; prereq 6818, 6826, 6827, [3rd or 4th yr DVM or #]; summer, every year) Rotation provides additional training following Dairy Production Medicine 2.

CVM 6829. Dairy Production Medicine 4. (2.0 cr. [max 4.0 cr.]; prereq [6818, 6826, 6827, 6828]...
Courses listed in this catalog are current as of December 12, 2014. For up-to-date information, visit www.catalogs.umn.edu

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.

**CVM 6865. Introduction to Swine Production Medicine.** (1.0 cr.; max 2.0 cr.; A-F only; prereq DVM student or #; spring, every year)
Contemporary approaches to swine practice. Swine production, disease diagnosis. Control, treatment, eradication.

**CVM 6862. Companion Birds (ComB).** (2.0 cr. [max 4.0 cr.; prereq DVM 3rd or 4th yr or #; fall, spring, every year)
Avian medicine/surgery relating to companion birds. Hands-on experience in local avianries and breeding facilities. Acquisition of basic avian clinical skills in the Raptor Center.

**CVM 6901. Physiology I.** (5.0 cr.; A-F only; fall, every year)

**CVM 6890. Microscopic Anatomy.** (4.0 cr.; A-F only; fall, )
Identification, description, understanding of basic structure/elements of cells/basic tissues. Identify/describe structure/organization of organ systems presented.

**CVM 6904. Clinical Skills II.** (5.0 cr.; A-F only; spring, every year)
Clinical problem solving based on case examples, first-hand field experiences. Students visit/assess enterprises representing all components of pork chain, from feed milling, to animal production, to slaughter/processing. Problem definition/investigation. Formal follow up, report writing, oral presentation of recommendations.

**CVM 6803. Swine Disease Diagnostics, Therapeutics, and Prevention (SDxT).** (2.0 cr. [max 4.0 cr.; prereq DVM 3rd or 4th yr or #; fall, spring, every year)
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.

**CVM 6842. Swine Disease Diagnostics.** (2.0 cr. [max 8.0 cr.; A-F only; fall, spring, summer, every year)
In-clinic diagnostic techniques. Students visit/assess enterprises representing all components of pork chain, from feed milling, to animal production, to slaughter/processing. Problem definition/investigation. Formal follow up, report writing, oral presentation of recommendations.

**CVM 6845. Swine Production Training (SPTTr).** (2.0 cr. [max 8.0 cr.; prereq 3rd or 4th yr DVM or #; fall, spring, summer, every year)
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.

**CVM 6854. Introduction to Swine Health and Production.** (2.0 cr. [max 12.0 cr.; summer, every year)
Practical applications and tools necessary for effective swine health and production. Demonstrate knowledge, skills, and attitudes related to swine production.

**CVM 6856. Advanced Swine Health and Production.** (2.0 cr. [max 12.0 cr.; summer, every year)
Capstone course. Complex field problems. Student teams take a field case, work it up, and propose steps for farm to resolve problem. Lectures, in-class exercises, field trips.

**CVM 6860. Integrating Laboratory Diagnostics With Field Investigations of Swine Disease.** (2.0 cr. [max 4.0 cr.; prereq DVM 3rd or 4th yr or #; spring, every year)
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.

**CVM 6905. Professional Development I.** (1.0 cr.; S-N only; )

**CVM 6906. Critical Scientific Reading.** (2.0 cr.; S-N only; spring, every year)
Skill development in reading of scientific literature. Papers critiqued for experimental design, statistical analysis, validity of results, contributions to literature, merit of study conclusions.

**CVM 6907. Professional Development II.** (1.5 cr.; S-N only; spring, every year)
Develop knowledge/proficiency 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.

**CVM 6908. Anatomy II.** (3.0 cr. [max 5.0 cr.; A-F only; spring, every year)
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.** (1.0 cr.; A-F only; spring, every year)
Domestic animal behavior. Basic small animal handling/management skills. Introduction to hospital. Small-animal clerk duty is required.

**CVM 6910. Physiology II.** (5.0 cr.; A-F only; spring, every year)
Anatomic strategies adapted 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.** (2.0 cr.; A-F only; spring, every year)
Immunology

**CVM 6912. Basic Pathology.** (2.0 cr.; A-F only; spring, every year)
Mechanisms in reactions of cells/tissues to injury. Retrogressive changes in cells, cell death, pigments, circulatory disturbances, inflammation, alterations of cell growth (including neoplasia). Applications to evaluation of gross/microscopic tissue alterations.

**CVM 6913. Agents of Disease I.** (4.0 cr.; A-F only; spring, every year)
Mechanics of agent-host interactions in important animal diseases. Become familiar using literature to understand/solve infectious disease problems, evaluate strategies for
controlling diseases. Basic structure of viruses, bacteria, parasites.

CVM 6914. Preventive Medicine. (4.0 cr.; A-F only; fall, spring, every year)
Concepts of preventive medicine. Information reinforced in other coursework. Short video lectures/notes on website for access throughout training.

CVM 6915. Clinical Pathology I. (2.0 cr.; A-F only; fall, every year)
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 6916. Clinical Pathology II. (2.0 cr.; A-F only; spring, every year)
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. (5.0 cr.; A-F only; fall, every year)
Extends foundational information obtained on viruses, bacteria, parasites in Agents of Disease I into understanding diseases caused by these agents in species of veterinary importance.

CVM 6918. Pharmacology I. (3.0 cr.; A-F only; fall, every year)
General knowledge of pharmacology important for later coursework in veterinary medicine/future successful veterinary practice.

CVM 6919. Systemic Pathology. (5.0 cr. [max 10.0 cr.]; A-F only; fall, every year)
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. (2.0 cr.; A-F only; fall, every year)
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. (2.0 cr.; S-N only; fall, every year)
Builds on 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 2.0 cr.]; A-F only; fall, every year)
Concepts, principles, applications of veterinary epidemiology.

CVM 6923. Public Health and Community Practice. (2.0 cr.; A-F only; fall, every year)
Mixture of didactic classroom lectures/in-class discussions/exercises 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. (2.0 cr.; A-F only; fall, every year)
Pathophysiology, clinical presentation, diagnostic approach, therapeutic options, management protocol of common/important hematologic, immunologic, infectious diseases of dogs/cats.

CVM 6925. Diagnostic Laboratory. (2.0 cr.; A-F only; fall, every year)
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.

CVM 6931. Diseases of Zoo Animals and Exotic Pets. (1.0 cr.; S-N or Audit; prereq DVM or grad or #)
Diseases of and management procedures for zoo animals and exotic pets. Restraint procedures, medication, diagnosis.

CVM 6932. Introduction to Non-Domestic Veterinary Medicine. (1.0 cr.; S-N only; prereq 1st yr DVM or #; fall, every year)
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.

CVM 6933. Zoological Medicine (MNZM). (2.0 cr. [max 20.0 cr.]; prereq DVM 3rd or 4th yr or #; fall, spring, summer, every year)
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.

CVM 6934. Selected Topics in Zoo Animal Medicine. (2.0 cr. [max 10.0 cr.]; A-F only; prereq DVM 1st or 2nd yr or #; fall, spring, offered periodically)
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.

CVM 6939. Non-Traditional Pet Core. (1.0 cr.; A-F or Audit; spring, every year)
General/reproductive biology, behavior, husbandry, nutrition, handling, restraint, anesthesia. Common diseases, their treatments. Research animal issues. Special considerations of species commonly encountered in small/mixed animal practices (mice, rats, hamsters, gerbils, guinea pigs, chinchillas, rabbits, ferrets, basic aquarium species).

CVM 6941. Clinical Skills IV. (2.0 cr.; S-N only; spring, every year)
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. (2.0 cr.; A-F only; spring, every year)
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.
Option No Audit; [CMB 5181]; prereq Intro to epidemiology, statistics, #; spring, every year)

VMED 5190. Seminar and Presentation Development. (2.0 cr.; S-N only; prereq Grad student; fall, every year)
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.

VMED 5193. Dairy Decision Making in a Financial Context for Veterinarians. (3.0 cr.; A-F only; fall, every year)
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. Prereq Earned DVM, instr. consent.

VMED 5196. Dairy Production Medicine. (4.0 cr.; A-F only; fall, every year)
Intense eight week course designed to develop advanced knowledge/skills in dairy production medicine. Mixture of lectures, wetlabs, farm investigations, presentations. Held at Dairy Education Center at New Sweden Dairy.

VMED 5210. Advanced Large Animal Physiology I. (1.0-3.0 cr.; max 6.0 cr.); fall, every year)
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. (1.0-3.0 cr.; A-F or Audit; prereq #; 5210 recommended; spring, every year)
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.

VMED 5232. Comparative Clinical Veterinary Dermatologic Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq DVM degree or foreign equiv; fall, spring, every year)
Microscopic pathology of basic dermatologic reactions and of variable disease states.

VMED 5240. Advanced Small Animal Pathobiology I. (1.0 cr.; A-F only; fall, every 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. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5241. Advanced Small Animal Pathobiology II. (1.0 cr.; A-F only; spring, odd years)
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. Prereq CVM grad student, [DVM or foreign equiv] degree.

VMED 5242. Advanced Small Animal Pathobiology III. (1.0 cr.; A-F only; fall, odd years)
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 5243. Advanced Small Animal Pathobiology IV. (1.0 cr.; A-F only; spring, even years)
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. (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq VMED grad student, possess DVM; fall, spring, every year)
Hospital cases using standardized format, audiovisual aids. Review literature pertaining to case. One or two cases presented by enrolled participants per month.

VMED 5310. Topics in Veterinary Clinical Pathology. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student in CVM; fall, spring, every year)
Modified rounds format. Cases from VMC used to explore cytolgy 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, ELV test), lab testing for infectious agents.

VMED 5319. Veterinary Gross Pathology. (1.0 cr. [max 3.0 cr.]; S-N only; fall, spring, every year)
Diagnosing gross lesions of tissues. Evaluating images from wide variety of animals submitted to lab. Mock exams. Students prepare two in-depth reviews on topics covered during course. Prereq Grad student in CVM or VMED, [DVM degree or foreign equivalent], college consent

VMED 5320. Advanced Veterinary Systemic Pathology I. (3.0 cr.; A-F only; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv] or #; fall, even years)
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.

VMED 5330. Veterinary Descriptive Histopathology. (1.0 cr. [max 2.0 cr.]; prereq Grad student in VMED or [CMB, [DVM degree or foreign equiv] or #; fall, spring, every year)
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.

VMED 5410. Scientific Writing and Speaking. (2.0 cr.; A-F only; prereq Grad student in health sciences; fall, odd years)

VMED 5420. Molecular Epidemiology of Infectious Disease. (3.0 cr.; A-F only; prereq Basic course in microbiology; spring, every year)

VMED 5430. HIV/AIDS: Pathogenesis, Treatment, and Prevention. (1.0 cr.; prereq Grad student in CVM or foreign equiv degree.
Exposure to pathogenesis, treatment, and prevention of HIV/AIDS from clinical faculty who are dealing with AIDS patients. Developing new questions and design experiments that have greatest chance of translating to clinical setting.

VMED 5440. Microbial Risk Assessment of Foods. (3.0 cr.; Student Option No Audit; prereq Intro course in microbiology, [basics algebra, calculus, probability theory], probability distributions] or #; spring, every year)
Risk analysis process as part of science-based decision-making. Conduct microbial risk assessment by different steps of hazard identification, hazard characterization, exposure assessment/risk characterization. Qualitative/quantitative tools.

VMED 5496. Training in Swine Production and Management. (4.0 cr.; S-N only; prereq VMED grad student or #; fall, spring, every year)
Production module introduces techniques/protocols for swine production system operation. Research module covers applied research trials for viral/bacterial pathogens in pigs.

VMED 5594. Research in Veterinary Medicine. (0.5-4.0 cr. [max 8.0 cr.]; prereq Jr, #; fall, spring, summer, every year)
Independent study as determined by instructor. Usual activity includes conducting research in instructor’s lab, though research in field may also be included.

**VMED 5596. Swine Diseases and Diagnostics.** (2.0-3.0 cr. [max 2.0 cr.]; fall, spring, every year) Review of recent advances in swine diseases; farm visits for on-farm disease diagnostics and control programs.

**VMED 5621. Principles of Veterinary Anesthesiology.** (2.0 cr.; A-F only; prereq VMed grad student, [DVM degree or foreign equiv], instr consent; spring, every year) In-depth training in principles of veterinary anesthesiology. Lectures, anesthesia labs, presentations by students.

**VMED 5670. Bovine Surgery Practicum.** (2.0 cr.; S-N only; prereq [VMed grad student, [DVM or equiv foreign degree] or #; fall, spring, every year) Intensive training in ruminant surgery. Evaluation of food animal surgery principles, hands-on laboratory components.

**VMED 5910. Grant Writing: What Makes a Winning Proposal?** (2.0 cr.; =[CMB 5910]; spring, every year) Components of a strong proposal. Grant submission process. What reviewers look for. How to locate grant announcements that match research interests.

**VMED 5920. Food Defense: Prepare, Respond, Recover.** (3.0 cr.; A-F only; prereq Grad or professional student or #; fall, every year) Basic principles of preparedness/emergency response. Instructor may substitute topics if timelier topic arises.

**VMED 5921. Seminar in Food Protection and Defense.** (1.0 cr.; fall, spring, every year) Complexities of our food systems. Natural/intentional threats to food security within various industry sectors. Which agencies are responsible for regulating food chains, monitoring food safety, responding to contamination events.

**VMED 5991. Animal Health and Food System Policy and U.S. State government.** (1.0 cr. [max 2.0 cr.]; S-N only; fall, spring, every year) Policy making process. Animal health, public health, food systems at state/provincial levels. Science, politics, belief in developing/implementing policy.

**VMED 5992. Animal Health and Food System Policy and U.S. National Government.** (0.0-1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) 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 at national level, as well as role of scientific evidence.

**VMED 5993. Animal Health and Food System Policy and Intergovernmental Organizations.** (1.0 cr.; S-N only; prereq DVM or equiv degree or current DVM student or #; spring, every year) 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.

**VMED 5994. Advanced Clinical Epidemiology.** (1.0 cr.; A-F only; fall, every year) An in-depth focus on infectious disease epidemiology, with opportunities to apply epidemiologic principles to control infectious diseases in animal populations.

**VMED 5995. Engaging Intergovernmental Organizations.** (1.0 cr.; S-N only; fall, spring, every year) Relevant policy issue/roles of intergovernmental organizations. Discussions/debate about current issue, interact with key officials, perform group task assignments, develop/deliver presentation to relevant leaders.

**VMED 5996. Professional Communications: Current Veterinary, Public Health and Food System Issues.** (1.0 cr. [max 2.0 cr.]; S-N only; 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 #; spring, every year) Critical review of scientific/lay literature. Principles of risk communication. Preparation of scientific information. Prepare/critique executive summaries of current topics for CAHFS Daily News. Support media interactions of CAHFS faculty. Generate fact sheets for use on CAHFS website.

**VMED 5997. Farm to Table Study Program.** (1.0 cr.; prereq #; fall, every year) Explore food system within 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.

**VMED 5998. Leadership to Address Global Grand Challenges.** (1.5 cr.; Student Option No Audit; prereq Grad or professional student; spring, every year) Leadership strategies useful in addressing global grand challenges. Practices that foster collective action across diverse groups of people. Mapping polarities/balancing paradox. Inclusive decision-making processes.

**VMED 5999. Professional Communications: Agendas, Minutes, Briefing Memos, Decision Memos.** (1.0 cr.; S-N only; prereq 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 #; fall, every year) Improve professional communications to increase effectiveness of meetings, conference calls. Enhance influence of emails, minutes, issue briefs/decision memos. Compose/critique meeting agendas, minutes, notes, summaries, e-mails, trip reports. Produce issue briefs/decision memos.

**VMED 8090. Epidemiology of Zoonoses and Diseases Common to Animals and Humans.** (3.0 cr.; A-F or Audit; prereq Epidemiology and infectious disease course or #; fall, spring, every year) Major human zoonotic diseases, methods of transmission, diagnosis, control, and prevention.

**VMED 8134. Ethical Conduct of Animal Research.** (3.0 cr.; A-F or Audit; #; spring, every year) 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 proper conduct. Societal impact on scientific investigations utilizing animal subjects.

**VMED 8220. Advanced Nephrology/Urology Clinics.** (1.0-3.0 cr.; #; fall, spring, every year) Clinical investigation of naturally occurring urinary diseases in patients admitted to Veterinary Medical Center.

**VMED 8230. Medical Conference.** (1.0 cr. [max 2.0 cr.]; prereq #; fall, spring, every year) Participation in weekly conference about internal medical disorders.

**VMED 8250. Problems in Acid-base, Electrolyte, and Fluid Metabolism.** (2.0-4.0 cr. [max 2.0 cr.]; A-F or Audit; prereq #; fall, spring, every year) Clinical problems and physiology of acid-base, electrolyte, and fluid disorders of dogs and cats.

**VMED 8292. Journal Club: Large Animal Internal Medicine.** (1.0 cr. [max 3.0 cr.]; A-F or Audit; prereq #; fall, spring, offered periodically) Students/faculty keep abreast of current literature in large animal internal medicine. Students critically evaluate the literature.

**VMED 8293. Advanced Studies in Nephrology and Urology.** (1.0-3.0 cr.; A-F or Audit; #; spring, every year) Studies of urinary tract disease with goal of generating new knowledge.

**VMED 8333, FTE: Master’s**. (1.0 cr. [max 2.0 cr.]; No Grade Associated; prereq Master’s student, adviser and DGS consent; fall, spring, summer, every year) Studies of urinary tract disease with goal of generating new knowledge.

**VMED 8360. Evidence-based Medicine.** (2.0 cr.; A-F or Audit; prereq #; fall, spring, every year) Use of medicine literature in clinical problem solving.
VMED 8394. Research in Veterinary Medicine. (1.0-3.0 cr.; prereq #: fall, spring, every year)
Research problems relating to any aspect of internal medicine or to the various systems in animals.

VMED 8444. FTE: Doctoral. (1.0 cr.; No Grade Associated; prereq Doctoral student, adviser and DGS consent; fall, spring, summer, every year)
(No description)

VMED 8492. Seminar: Infectious Diseases and Swine Medicine. (1.0 cr. [max 2.0 cr.]; fall, spring, every year)
Students, faculty, and guest speakers present seminars on current research in diagnosis, control, and treatment of infectious diseases.

VMED 8520. Advanced Immunology. (2.0 cr.; spring, every year)
Lectures and case presentations.

VMED 8550. Veterinary Medicine Seminar. (1.0 cr. [max 2.0 cr.]; S-N only; prereq Grad student; fall, spring, every year)
Seminar. Exposure to research activities of CMB and VMED students and faculty. Students prepare/present a 20 minute seminar on their original research.

VMED 8592. Infectious Disease Journals: Critical Thinking. (1.0 cr.; fall, spring, summer, every year)
Reading and critical discussion of journal articles.

VMED 8593. Advanced Veterinary Virology and Serology. (1.0-3.0 cr.; fall, spring, every year)
Discussion and laboratory practice.

VMED 8666. Doctoral Pre-Thesis Credits. (1.0-6.0 cr. [max 12.0 cr.]; No Grade Associated; prereq Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % 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; fall, spring, summer, every year)

VMED 8682. Advanced Large Animal Surgery. (2.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Surgery of various systems in large animals, with preoperative and postoperative evaluation and management.

VMED 8684. Surgical Physiology. (1.0-3.0 cr.; fall, spring, offered periodically)
Discussions on pathophysiology of surgical diseases in dogs and cats.

VMED 8685. Neurosurgery. (2.0-3.0 cr.; A-F or Audit; fall, spring, every year)
Advanced neurosurgical diseases of small animals amenable to surgical treatment.

VMED 8686. Thoracic and Cardiovascular Surgery. (2.0-4.0 cr.; A-F or Audit; fall, spring, every year)
Advanced thoracic and cardiovascular diseases of small animals amenable to surgical treatment.

VMED 8693. Seminar: Large Animal Surgery. (1.0 cr. [max 6.0 cr.]; A-F or Audit; prereq DVM or equiv degree; #; fall, spring, every year)
Discussion of current literature and surgery board preparation.

VMED 8696. Research in Critical Care/Emergency Medicine. (1.0-3.0 cr.; prereq DVM or equiv degree; fall, spring, every year)
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.

VMED 8777. Thesis Credits: Master’s. (1.0-18.0 cr. [max 50.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 10 cr total required [Plan A only]; fall, spring, summer, every year)
(No description)

VMED 8780. Advanced Avian Critical Care: Principles and Procedures. (2.0 cr.; A-F or Audit; prereq Course each in vet pathology, physiology, pharmacology, anatomy, small animal anesthesiology and critical care; spring, every year)
Procedures and protocols for managing avian medical emergencies such as starvation, toxicities, respiratory failure, and massive trauma.

VMED 8781. Seminar: Advanced Veterinary Anesthesiology. (1.0-3.0 cr.; A-F or Audit; prereq [CVM 6321, CVM 6322] or equiv], grad student; fall, every year)
Active interaction around topics of advanced anesthesiology in veterinary species.

VMED 8788. Seminar: Veterinary Critical Care/Emergency Medicine. (1.0 cr.; A-F or Audit; prereq DVM or equiv degree; fall, spring, every year)
Current topics.

VMED 8793. Seminar: Veterinary Anesthesiology. (1.0-2.0 cr. [max 4.0 cr.]; A-F or Audit; prereq [CVM 6321 or equiv], DVM degree; fall, spring, every year)
Discussion and presentations; for veterinary anesthesiology and surgery residents and graduate students.

VMED 8796. Avian Anesthesia and Orthopedic Surgery. (1.0-3.0 cr.; A-F or Audit; prereq courses in vet anesthesia, vet small animal orthopedics; fall, spring, every year)
Current methods for anesthetizing raptors, psittacine birds, and waterfowl. Lecture and lab on current methods for avian fracture bone fixation.

VMED 8888. Thesis Credit: Doctoral. (1.0-24.0 cr. [max 100.0 cr.]; No Grade Associated; prereq Max 18 cr per semester or summer; 24 cr required; fall, spring, summer, every year)
(No description)
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 2011
- 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.

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.

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.

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 2011
• Length of program in credits: 54
• 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.

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, 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 Graduate School regulations and all students will be required to pass the oral examination to continue in the Ph.D. program. Within one semester of passing the preliminary oral examination, each Ph.D. student must file a Thesis Proposal Form with the Graduate School.

Ph.D. Final Oral Defense: 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 Graduate School regulations. It will consist of a public seminar presented by the student.
Twin Cities Campus
Toxicology M.S.

Medical School - Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Toxicology Graduate Program, Medical School Duluth, 162 SMed, 1035 University Drive, Duluth, MN 55812 (218-726-6354; fax: 218-726-8014)
Email: toxgrad@d.umn.edu
Website: http://www.ahc.umn.edu/toxicology

- Program Type: Master's
- Requirements for this program are current for Fall 2011
- Length of program in credits: 36 to 38
- 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 University-wide program provides comprehensive training in the broad scope of toxicology. Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Although most chemical agents at sufficiently large doses may be toxic, not all present a significant risk to human health or to environmental organisms or ecosystems. Accordingly, the essence of the science of toxicology is defining the fine line that distinguishes a risk from a residue. To accomplish this requires scientific expertise in such areas as analytical and environmental chemistry, biology, and mathematics. Advanced courses and research are also available in such subdisciplines as human health risk assessment, epidemiology, environmental chemistry and engineering ecotoxicology, food additives and nutritional toxicology, biochemical and physiological mechanisms, histopathology, diagnostic and analytical toxicology, drug metabolism, chemical carcinogenesis, behavioral toxicology, and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

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's degree or its foreign equivalent from a recognized college or university with a full year each of biology, organic chemistry, and physics, as well as 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
  - 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

Plan A: Plan A requires 22 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 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 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 master of science degree is offered under Plan A and Plan B. Plan A requires 22 course credits and 10 thesis credits; Plan B requires 30 course credits. A core curriculum of 8 credits in toxicology (TXCL 8012, 8013, and 8100) is required for both plans. Additional courses are arranged on an individual basis.
Twin Cities Campus
Toxicology Minor
Medical School - Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Toxicology Graduate Program, Medical School Duluth, 162 SMed, 1035 University Drive, Duluth, MN 55812 (218-726-6354; fax: 218-726-8014)
Email: toxgrad@d.umn.edu
Website: http://www.ahc.umn.edu/toxicology

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2011
- Length of program in credits (Masters): 12
- Length of program in credits (Doctorate): 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.

This University-wide program provides comprehensive training in the broad scope of toxicology. Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Although most chemical agents at sufficiently large doses may be toxic, not all present a significant risk to human health or to environmental organisms or ecosystems. Accordingly, the essence of the science of toxicology is defining the fine line that distinguishes a risk from a residue. To accomplish this requires scientific expertise in such areas as analytical and environmental chemistry, biology, and mathematics. Advanced courses and research are also available in such subdisciplines as human health risk assessment, epidemiology, environmental chemistry and engineering, ecotoxicology, food additives and nutritional toxicology, biochemical and physiological mechanisms, histopathology, diagnostic and analytical toxicology, drug metabolism, chemical carcinogenesis, behavioral toxicology, and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A minor is available at the doctoral level and requires 12 credits: 8 credits of core courses and 4 credits of advanced toxicology courses.
Twin Cities Campus
Toxicology Ph.D.
Medical School - Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Toxicology Graduate Program, Medical School Duluth, 162 SMed, 1035 University Drive, Duluth, MN 55812 (218-726-6354; fax: 218-726-8014)
Email: toxgrad@d.umn.edu
Website: http://www.ahc.umn.edu/toxicology

- Program Type: Doctorate
- Requirements for this program are current for Fall 2011
- Length of program in credits: 54
- This program requires summer semesters for timely completion.
- The Toxicology 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 Toxicology 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.

This University-wide program provides comprehensive training in the broad scope of toxicology. Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Although most chemical agents at sufficiently large doses may be toxic, not all present a significant risk to human health or to environmental organisms or ecosystems. Accordingly, the essence of the science of toxicology is defining the fine line that distinguishes a risk from a residue. To accomplish this requires scientific expertise in such areas as analytical and environmental chemistry, biology, and mathematics. Advanced courses and research are also available in such subdisciplines as human health risk assessment, epidemiology, environmental chemistry and engineering, ecotoxicology, food additives and nutritional toxicology, biochemical and physiological mechanisms, histopathology, diagnostic and analytical toxicology, drug metabolism, chemical carcinogenesis, behavioral toxicology, and the toxicity of noxious agents to various organ systems (e.g., nervous, heart, liver, kidneys).

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's degree or its foreign equivalent from a recognized college/university. At least a full year each of biology, organic chemistry, and physics, as well as 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
  - 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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Information current as of December 12, 2014
Program Requirements
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 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 doctor of philosophy degree requires core courses in physiology (4 credits), biochemistry (6 credits), statistics (2 credits), and toxicology (10 credits). Students must also complete 12 credits in a minor or supporting program and 24 thesis credits. Because the program spans the Duluth and Twin Cities campuses, the required courses differ on each campus.

Additional advanced courses in toxicology or related fields may be specified by the adviser. Students must complete and defend an original research project.
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, 173 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: Master's
- Requirements for this program are current for Fall 2011
- Length of program in credits: 30
- 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 emphasis at the M.S. level: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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; Microbiology; Plant Biology; Soil, Water, and Climate; and the Humphrey Institute of Public Affairs. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Geography; Geological Sciences; Physics; and Political Science; 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 or biological science or engineering.

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 adviser are important criteria for admission to the program.
Special Application Requirements:
Applicants must submit three letters of recommendation via the Graduate School ApplyYourself website. These letters should be from professors qualified to estimate the 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 instruction can be found on the program website: wrs.umn.edu/prospectivestudents/apply/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

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 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 defined by the faculty adviser. 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 semester must be completed before filing a Degree Program Form.

Students may choose Plan A, which requires a thesis, or Plan B, which requires additional coursework and a major project. Both plans incorporate courses offered on the Twin Cities and Duluth campuses.

Students must complete courses in four core areas: 1) hydrology (surface and/or hydrogeology); 2) environmental/water chemistry; 3) limnology; and 4) water resources policy, economics, and management, and two electives in such areas of emphasis as aquatic biology, hydrologic science, watershed science and management, and water management technology. One elective must be from an approved list of technical courses dealing with water quality science/management. A minimum of two related field courses (at least 6 credits) outside of aquatic science are required. Registration for the WRS Seminar during the first semester in residence and training in responsible conduct of research and ethics are also required.

Approved core and area of emphasis courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/index.htm.

A minimum of 20 course credits (plus 10 thesis credits) are required for Plan A and a minimum of 30 credits are required for Plan B (up to 3 credits may be used for the Plan B project). Students who had classes equivalent to those in the WRS core as undergraduates may substitute other classes to meet minimum credit 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.

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. Such interdisciplinary fields in the modern research university require mechanisms to insure 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 may choose Plan A, which requires a thesis, or Plan B, which requires additional coursework and a major project. Specific curriculum for the limnology and oceanography track follows WRS course requirements. Both plans incorporate courses offered on the Twin Cities and Duluth campuses.

Students must complete courses in four limnology and oceanography track core areas: 1) hydrology (surface and/or hydrogeology); 2) environmental/water chemistry; 3) limnology; and 4) water resources policy, economics, and management; and one elective must be from an approved list of technical courses dealing with water quality science/management. An additional one or two electives in limnology and oceanography are also required. A minimum of two related field courses (at least 6 credits) outside of aquatic science are required. Registration for the WRS Seminar during the first semester in residence and training in responsible conduct of research and ethics are also required.

A minimum of 20 course credits (plus 10 thesis credits) are required for Plan A and a minimum of 30 credits are required for Plan B (up to 3 credits may be used for the Plan B project). Students who had classes equivalent to those in the WRS core as undergraduates may substitute other classes to meet minimum credit requirements.

The faculty adviser must be a member of the limnology and oceanography track faculty.

Approved limnology and oceanography track core and elective courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/landotrack/index.htm.
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, 173 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 2011
- 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 emphasis at the M.S. and Ph.D. levels: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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; Microbiology; Plant Biology; Soil, Water, and Climate; and the Humphrey Institute of Public Affairs. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering; Geography; Geological Sciences; Physics; and Political Science; 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)

Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

A master's minor requires 9 credits, including WRS 5101 (3 credits) and two of the other core courses described under M.S. degree requirements. Doctoral students must complete 12 credits, including WRS 5101 (3 credits), a core courses described under the M.S. degree requirements, and two electives from one of the areas of emphasis.
**Twin Cities Campus**

**Water Resources Science Ph.D.**

Water Resources Center

Graduate School

Link to a list of faculty for this program.

**Contact Information:**

Water Resources Science, 173 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](http://wrs.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2011
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- The Water Resources Science 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 Water Resources Science 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.

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 emphasis at the Ph.D. level: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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; Microbiology; Plant Biology; Soil, Water, and Climate; and the Humphrey Institute of Public Affairs. It also involves faculty from the following departments on the Duluth campus: Biology; Chemical Engineering; Chemistry; Civil Engineering Geography; Geological Sciences; Physics; Political Science; 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 or master's degree in physical or biological science or engineering.

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 adviser are important criteria for admission to the Ph.D. program.
Special Application Requirements:
Applicants must submit three letters of recommendation via the Graduate School 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/prospectivestudents/apply/index.htm.

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

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 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Coursework is tailored to student interests, and many areas of emphasis are possible. Core courses are offered on both the Twin Cities and Duluth campuses.

Students complete coursework equivalent to that of an M.S. in water resources science, with additional coursework in an area of emphasis. There are no specific credit requirements in the major, but Ph.D. programs normally include at least 40 course credits beyond the B.S. level, including relevant coursework taken for a master's degree and a required minimum of 12 credits in a supporting or minor program.

Approved core and area of emphasis courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/index.htm.

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. WRS limnology and oceanography faculty list: http://wrs.umn.edu/faculty/landotracklist/index.htm.

Specific curriculum for the limnology and oceanography track follows WRS course requirements. Core courses are offered on both the Twin Cities and Duluth campuses.

Students must complete coursework equivalent to that of an M.S. in the water resources science limnology and oceanography track, with additional coursework in an area of limnology and oceanography. There are no specific credit requirements in the major, but Ph.D. programs normally include at least 40 course credits beyond the B.S. level, including relevant coursework taken for a master's degree and a required minimum of 12 credits in a supporting or minor program.

Ph.D. students pursuing this track must have at least two members of the limnology and oceanography track faculty on their committee including the adviser.

Approved limnology and oceanography track core and elective courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/landotrack/index.htm.
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: bicbgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

- Program Type: Master's
- Requirements for this program are current for Fall 2011
- 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
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, null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 24 major credits and 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
Twin Cities Campus
Biomedical Informatics and Computational Biology Minor
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: bicbgrad@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 2011
- 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)

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

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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.**

*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: bicbgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

- Program Type: Doctorate
- Requirements for this program are current for Fall 2011
- 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**
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.

Rochester
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 S.E.
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 2014
- 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 within one and a half hours of the Twin Cities or Rochester area. Both full-time Level II Fieldwork sites will be located in Minnesota with some exceptions. Students will need to arrange for housing 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 Program in Occupational Therapy (OT) is a 22-25 month, 78-credit, graduate-level professional program completed over the course of 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 exam, 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.

The program has been continuously accredited since its inception in 1946. In 2007, a new location was accredited making the OT program available in both Minneapolis and Rochester, Minnesota.

Accreditation
This program is accredited by Accreditation Council for Occupational Therapy Education (ACOTE), American Occupational Therapy Assn

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 in order to apply to the Program in Occupational Therapy.

Required prerequisites
Core Prerequisite Courses
There are seven core prerequisite courses required for admission to the Program in Occupational Therapy. Five of the seven must be completed at the time of application. All prerequisite courses must be completed no later than the end of summer session of the year of admission. There is one non-core prerequisite, Medical Terminology, which may be taken for college credit or online. Prerequisite courses 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.
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.
Intro to Sociology (3 cr)
or Cultural Anthropology (3 cr)

Non-Core Prerequisite
Medical Terminology (1 cr)
An online course equivalent to 1 college credit may be substituted.

Other requirements to be completed before admission:
The GRE must be completed within the past five years. Note: requiring applicants to take the GRE is pending ACOTE approval. See the program web site for details. http://cahp.umn.edu/requirements

Computer Competency:
Admitted applicants are expected to 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.

Practical Experience:
Minimum of 20 hours of OT observation in at least two practice areas OR completion of an Orientation to OT course.
Recommended:
-Additional OT observation experience, above that which is required.
-Work, volunteer or observation experience in health or education related fields (e.g. physical therapy, special education, speech pathology, long term care, home health).
-Research opportunities outside of the classroom.

Special Application Requirements:
-Applicants must meet Minimum Technical Standards 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 an F1 or F2 visa due to federal regulations regarding online degree programs. Applicants with other visa types should contact cahpinfo@umn.edu for information on admission eligibility.
-Applicants should complete a prerequisite planning sheet found on the web site under Prerequisite Planning and Pre-Program Advising in order to determine which prerequisites have been fulfilled. 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. Send this information to cahpinfo@umn.edu.
- Criminal Background Studies: The Minnesota Department of Health requires criminal background studies on all students admitted to the OT Program. Failure to pass the background study may preclude successful completion of the program. A felony conviction may affect a graduate's ability to sit for the National Board for Certification in Occupational Therapy 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
Admitted students are provided detailed instructions for how to request a criminal background study soon after beginning the program.
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: 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.

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 or 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.

Students will complete two 12-week, full-time, Level II fieldwork experiences after completing didactic coursework. All Level II fieldwork must be completed within 24 months of the didactic 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 interprofessional colleagues as they practice professional level skills. Five Level I fieldwork experiences provide guided practice in the role of occupational therapy.

**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. Students practice during Level I fieldwork while engaged in the community. 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 at least one fieldwork site.
**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

Accountancy M.Acc

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: macct@umn.edu
Website: http://www.carlsonschool.umn.edu/master-accountancy

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30
- 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 of Accountancy (MAcc) program offers students a one-year program with a broad selection of graduate courses in accounting, taxation, finance, supply chain and operations, information systems, and marketing. Students may choose to complete the program on a part-time basis and finish in three to four semesters. The majority of the courses are offered in the evenings (M-Th; 5:45-9:05pm).

The curriculum has been designed and developed by Carlson School faculty with extensive input and ongoing consultation with executives from the professional community. The ongoing collaborative efforts with the professional community are a key component in the pursuit of the mission for the MAcc program. For the students, such efforts ensure relevant, practical, and challenging courses that enhance their professional development.

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 have a bachelor's degree in accounting (or equivalent coursework) or finance from an accredited college or university. Students may apply during their senior year but must complete the bachelor's degree prior to entering the MAcc program.

Special Application Requirements:
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 MAcc 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.

The MAcc program requires 30 credits, including 12 required credits from three specific courses (see below); and 18 elective credits from a designated pool of courses in accounting, taxation, finance, information and decision sciences, supply chain and operations, and marketing.

If bachelor's degree is in finance or from a foreign institution, required courses may be increase and elective courses reduced as determined by adviser upon admission.

Students who did not take a U.S. tax course and/or a U.S. business law course in their bachelor's degree will be required to take ACCT 5135 Fundamentals of Federal Income Tax (4 cr.) and/or BLAW 6158 The Law of Contracts & Agency (4 cr.) in the MAcc program and reduce their elective credits by four/eight.

**Required Accountancy Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 8001</td>
<td>Internal Control</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>ACCT 8002</td>
<td>Securities and Exchange Commission (SEC) and Standard Setting</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>IDSC 8003</td>
<td>Accounting and Information Systems</td>
<td>4.0 cr</td>
</tr>
</tbody>
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**Elective Master of Accountancy Courses (18 credits)**

Take 18 - 20 credit(s) from the following:

- ACCT 5126 - Internal Auditing (2.0 cr)
- ACCT 5160 - Financial Statement Analysis (2.0 cr)
- ACCT 5236 - Introduction to Taxation of Business (2.0 cr)
- ACCT 5310 - International Accounting (2.0 cr)
- ACCT 5420 - MAcc directed study (1.0 - 4.0 cr)
- ACCT 6160 - Accounting for Mergers and Acquisitions, and Derivatives (2.0 cr)
- ACCT 8006 - Advanced Audit (4.0 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)
- 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)
- IDSC 6421 - Financial Information Systems and Technology (2.0 cr)
- IDSC 6423 - Enterprise Systems (2.0 cr)
- IDSC 6471 - Knowledge Management (2.0 cr)
- MBA 6120 - Data Analysis and Statistics for Managers (3.0 cr)
- MBA 6315 - The Ethical Environment of Business (2.0 cr)
- MBT 5200 - Tax Accounting Methods and Periods (4.0 cr)
- MBT 5220 - Tax Research, Communication, and Practice (4.0 cr)
- MBT 5230 - Corporate Taxation I (2.0 cr)
- MBT 5346 - ASC 740 Computations and Analysis (2.0 cr)
- MBT 5370 - Taxation of Property Transactions (2.0 cr)
- MBT 5382 - Transfer Pricing (2.0 cr)
- MBT 5500 - Business, Government, and Economic Tax Policy (2.0 cr)
- MCOM 5510 - Persuasive Writing in Business (2.0 cr)
- MKTG 6055 - Buyer Behavior (4.0 cr)
- SCO 6041 - Project Management (2.0 cr)
- SCO 6056 - Managing Supply Chain Operations (4.0 cr)
- SCO 6059 - Quality Management and Lean Six Sigma (4.0 cr)
- SCO 6072 - Managing Technologies in the Supply Chain (2.0 cr)
Twin Cities Campus
Business Administration M.B.A.
Graduate Business Career Center
Curtis L. Carlson School of Management

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 2014
• Length of program in credits: 57 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 master of business administration can be achieved in any one of three ways: through the Full-Time M.B.A., the Part-Time M.B.A., or the Executive M.B.A. The program offers courses on the west bank of the University of Minnesota Twin Cities campus at the Carlson School of Management and in Hanson Hall. Most Full-Time M.B.A. courses meet Monday-Friday between 8 a.m. and 5:25 p.m.; Part-Time M.B.A. courses meet Monday-Thursday evenings from 5:45 to 9:05 p.m. and on Saturdays from 8-11:20 a.m. and 12:30-3:50 p.m.; Executive M.B.A. courses meet predominately on alternate weekends.

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
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. 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).

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 33 to 42 major credits and 22 to 24 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.

The Carlson Full-Time M.B.A. program offers an intense curriculum of coordinated core courses that provide a sound foundation in essential managerial disciplines, along with electives customized to fit the student's career path. The Full-Time M.B.A. involves a rigorous time commitment, varying from 30 to 50 hours spent on campus per week, with students expected to complete the 64 credits required for the degree in two years.

The Carlson Part-Time M.B.A. curriculum includes a set of core courses that offer an in-depth study of the foundational and functional areas of business, as well as advanced electives, international study options, and areas of emphases which allow students to tailor a program to their long-term career goals.

The Carlson Executive M.B.A. 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, predominately on alternate weekends, and do not meet during the summer.

**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 M.B.A. 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 64 credits.

Full-Time M.B.A. Core Requirements

MBA 6300 - Strategic Management (3 cr)
MBA 6150 - Managerial Communications (1 cr)
MBA 6120 - Data Analysis and Statistics (3 cr)
MBA 6030 - Financial Accounting (3 credits)
MBA 6220 - Operations Management (3 cr)
MBA 6230 - Financial Management (3 cr)
MBA 6210 - Marketing Management (3 cr)
MBA 6235 - Managerial Accounting (2 cr)
MBA 6110 - Management and Organizational Behavior (2 cr)
MBA 6140 - Managerial Economics (2 cr)
MBA 6240 - Information Technology Management (2 cr)
MBA 6315 - Business Ethics (2 cr)
iBUS 6400 - Global Discovery (3 cr)

Carlson Enterprise (10 credits)

Electives (22 credits)

**Part-Time Master of Business Administration**

The Carlson Part-Time M.B.A. curriculum includes core courses that offer an in-depth study of the foundational and functional areas of business. Advanced electives, international study options, and areas of emphases allow students to tailor a program that meets their long-term career goals. To graduate, students must earn 48-57 credits. Up to 9 credits of core courses may be waived based on prior academic coursework.
Part-Time M.B.A. Core Requirements in Recommended Sequence
MBA 6300 - Strategic Management (3 cr)
MBA 6120 - Data Analysis and Statistics (3 cr)
MBA 6030 - Financial Accounting (3 cr)
MBA 6220 - Operations Management (3 cr)
MBA 6230 - Financial Management (3 cr)
MBA 6210 - Marketing Management (3 cr)
MBA 6035 - Managerial Accounting (3 cr)
MBA 6110 - Management and Organizational Behavior (2 cr)

Information Technology Management Coursework (2 credits)
Choose 1 of the following:
IDSC 6040 - Information Technology Management (2 cr)
IDSC 6050 - Information Technology and Solutions (2 cr)

Economics Coursework (2-4 credits)
Choose 1 of the following:
MBA 6140 - Managerial Economics (2 cr)
FINA 6341 - World Economy (4 cr)

Ethics Coursework (2 credits)
MBA 6315 - Business Ethics (2 cr)

International Experience (4 credits)
All students are required to complete international course work or participate in an experiential learning abroad program.

Elective Courses
After completion of the core courses, M.B.A. students pursue a number of elective courses to reach the 48-57 credits required for degree completion. Elective courses are chosen from a broad range of department offerings.

Carlson Executive Master of Business Administration
The Carlson Executive M.B.A. 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, predominately on alternate weekends, 7:30 a.m. to 4:30 p.m., and do not meet during the summer.

China Executive M.B.A.

Full-time Dual Degree

Juris Doctor/Master of Business Administration

Doctor of Medicine/Master of Business Administration

Master of Healthcare Administration/Master of Business Administration

India

Master of Public Health/Master of Business Administration

Vienna Masters of Business Administration

Vienna
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.
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:
Ph.D. 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: brons003@umn.edu
Website: http://www.carlsonschool.umn.edu/phd-BA

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

The Ph.D. 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 (including the management information systems and decision science subfields); marketing; supply chain and operations; strategic management and entrepreneurship (covering the subfields of strategy, international management and entrepreneurship), and work and organizations (covering the subfields of industrial-organizational psychology, organizational behavior, personnel and labor economics, and industrial relations).

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 Ph.D. 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 a doctoral minor, students must complete a cohesive program of at least 16 credits (minimum of four courses, preferably at the PhD level) of graduate work in one of the seven business administration areas of concentration. This program of study is developed in consultation with the PhD coordinator for the area of concentration chosen for the minor.
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 Ph.D. Program, Suite 4-205, 321 19th Avenue South, Minneapolis, MN 55455
(612-624-0875; fax: 612-624-8221)
Email: brons003@umn.edu
Website: http://www.carlsonschool.umn.edu/phd-BA

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• 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.

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 (including the management information systems and decision science subfields); marketing; supply chain and operations; strategic management and entrepreneurship (covering the subfields of strategy, entrepreneurship, and international management); and work and organizations (including the subfields of industrial-organizational psychology, organizational behavior, personnel and organizational economics, and industrial relations).

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 on the GMAT; 1380 total of the verbal and quantitative sections of GRE General tests taken prior to August 2011, or 320 total on the revised GRE general test (August 2011 and after).

Special Application Requirements:
Applicants should submit to the Carlson School PhD Program Office the following items: (1) an official copy of the GMAT or GRE from a test taken no more than five years prior to application to the PhD Program in Business Administration; 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 ApplyYourself online application system. The application deadline is December 31 each year for fall admission consideration. Applications for the Marketing area should be submitted by December 15 for early review. Applications are evaluated on a rolling basis beginning mid-December for the Marketing area, and January for the other six areas of concentration. Admission decisions continue until available positions are filled.

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Information current as of September 12, 2014
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
  - 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, 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 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 adviser; but, in general, a degree program includes Ph.D. seminars in the field of specialization, as well as courses in research methodology and in a minor or supporting program. Students in all areas must complete at least minimum 40 semester credits of graduate coursework. While some areas may require a first-year examination or presentation, all areas require a written and oral preliminary examination at the end of the second year, as well as a research paper requirement and dissertation proposal defense.

Areas of Concentration

Accounting

This area of concentration requires a minimum of 40 credits of coursework including the major area (at least 12 credits of accounting seminars), minor or supporting field (at least 16 credits), and methodology courses. Supporting coursework is typically taken across fields relevant to the students' research interests, e.g. finance, economics, statistics, etc. Students also must work under one of two accounting research paradigms: analytic or empirical.

-OR-

Finance

The Ph.D. program views finance as a subfield of applied economics. Students achieve a strong foundation in economic theory and empirical methods, while taking required finance seminars and supporting coursework. A minimum of 40 credits are required to move to the prelim stage. Supporting coursework typically consists of a sequence in micro-economic theory and econometric analysis. In addition, students complete at least 8 elective credits in fields such as economics, statistics, and accounting.

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 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)

-OR-
**Information and Decision Sciences**

Students are required to complete at least 46 semester credits of degree program coursework, including 14 credits of IDSC Ph.D. seminars, 8 credits of research methodology, and 16 credits of supporting or minor field coursework. Students are required to take IDSC 8511, 8521, 8531, 8541, and 8711. Research methods courses that students can take include regression, experimental design, multivariate statistics, and econometric modeling.

- **IDSC 8511** - Conceptual Topics and Research Methods in Information and Decision Sciences (4.0 cr)
- **IDSC 8521** - System Development (2.0 cr)
- **IDSC 8531** - Organizational Theory and Research in Information Systems (2.0 cr)
- **IDSC 8541** - Introduction to Economics of Information Systems (2.0 cr)
- **IDSC 8711** - Cognitive Science (4.0 cr)

**Marketing**

Students are required to complete all scheduled marketing Ph.D. seminars plus a minimum of 12 credits of research methodology courses outside the department. Minor or supporting program coursework is determined by the student and adviser, and must total at least 16 credits (these credits could overlap with the research methods coursework requirements).

**Supply Chain and Operations**

This area of concentration requires seven (21 credits) supply chain and operations (SCO) Ph.D. seminars (SCO 8651, 8652, 8711, 8721, 8735, 8745, and 8755) and a minimum of 40 credits of degree program coursework. Beyond the 21 credits, students take at least 16 credits of supporting or minor coursework, which should include relevant methods coursework.

- **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)

**Strategic Management and Organization**

Students are required to take at minimum four core MGMT Ph.D. seminars, including both strategy seminars and the theory building course. They may choose 1-2 courses in entrepreneurship, organization studies or international business. Supporting coursework often includes a strong methods sequence, which can be tailored to individual student needs, as well as coursework that leads to a good understanding of the fundamentals of a specific external discipline (e.g., economics or sociology, etc.).

**Work and Organizations**

With the guidance of WOrg faculty, each Ph.D. student chooses coursework to fulfill their degree requirements. Students must complete four core WOrg courses (HRIR 8801, 8802, 8803, and 8812) in addition to three analytical courses (econometrics I, psychometrics, and advanced multiple regression), and four special topics seminars to deepen their expertise in specific areas. Students also take elective courses outside the WOrg program to gain expertise in theoretical and statistical areas.
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.

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.S. in Business Analytics 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 full-time, one-year, 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. Students are expected to complete the program on a full-time basis.

Accreditation
This program is accredited by This program will be STEM approved.

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:
Completion of some programming courses preferred.
Applicants must have completed at least one semester college-level Calculus course with a grade of "C" or better (or grade equivalent).

Special Application Requirements:
Applicants must complete the online application form. Applicants need to provide the name of each institution attended post-secondary within the online application with complete information. Transcripts should be sent to the MBA program office:

MBA Admissions and Recruiting
Carlson School of Management
321 Nineteenth Avenue South, Suite 1-110
Minneapolis, MN 55455.

A GMAT or GRE General Test that is not more than five years old is required for admission consideration.

Applicants must submit names and contact information for three references in the online application.

Applicants must submit a personal statement of career goals and describe their objectives for pursuing an MS in Business Analytics 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 MS in Business Analytics at this time in your career, and what are you hoping to accomplish by doing so? Why are you interested in pursuing an MS in Business Analytics at the Carlson School of Management? What do you feel makes you a strong candidate for the program? How will you contribute to the MS in Business Analytics Program overall?

Applicants must submit a current resume that includes job responsibilities and accomplishments in the online application. Applicants may be required to complete an admissions interview. Interviews for the MS in Business Analytics program are by invitation only.
Applicants may choose to submit an essay to comment on any item(s) in their application they consider worthy of further explanation. 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).

Applicants must submit their test score(s) from the following:
- GRE
- GMAT
- Pearson Test of English Academic

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. There 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 (12 credits)
- Financial Accounting (3 cr)
- Data Analysis and Statistics for Managers (3 cr)
- Analytics for Competitive Advantage (3 cr)
- At least one of the following:
  - Marketing Management (3 cr)
  - Operations Management (3 cr)
  - Strategic Management (3 cr)
  - Financial Management (3 cr)

Technical Fundamentals (12 credits)
- Programming & Application Development (3 cr)
- Data Management, Databases, and Data Warehousing (3 cr)
- Harvesting Big Data (3 cr)
- Project Management, Leadership, Communications & Team Dynamics (3 cr)

Specialty Courses (15 credits)
- Exploratory Data Analytics & Visualization (3 cr)
- Predictive Analytics (3 cr)
- Advanced Issues in Business Analytics (3 cr)
- Data-Driven Experimentation and Measurement (3 cr)
- Modeling and Heuristics for Decision Making Support (3 cr)

Capstone/Experiential Learning Experience (6 credits)
- SOBACO Project
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 2014
- 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 program gives you a chance to learn from world-class faculty who are distinguished professionals with real-life experience and in-depth knowledge of the tax industry and work closely with the Twin Cities business community. This 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, a course in government and economic tax policy provides breadth to complement the technical tax courses that make up the majority of credits. The program also offers a strategic business perspective with courses that explore the broader framework of general business decision making. This balance helps prepare graduates for greater responsibilities in business management and consulting.

Offered only in the evenings (M-Th; 5:45-9:05 pm), the program accommodates both part-time and full-time students. Historically, more than 80 percent of students are employed in the business community and take courses on a part-time basis. 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)

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 M.B.T. program but must be taken before being eligible to take any M.B.T. courses.

Special Application Requirements:
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. Applicants may submit their copy of their LSAT score.

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. 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 M.B.T. program requires 30 credits, including 12 required credits in specified courses and 18 elective credits. ACCT 2050 - Introduction to Financial Reporting and ACCT 5135 - Fundamentals of Federal Income Tax or equivalent courses are prerequisites to taking M.B.T. courses. Students without these prerequisites may be admitted to the program but these prerequisites must be completed before M.B.T. courses are taken.

All students are required to have completed BLAW 3058 - The Law of Contracts and Agency or an equivalent college level course at some point in their academic career before graduating with an M.B.T. degree.

**Required Business Taxation Courses (12 credits)**

- MBT 5220 - Tax Research, Communication, and Practice (4.0 cr)
- MBT 5200 - Tax Accounting Methods and Periods (4.0 cr)
- MBT 5230 - Corporate Taxation I (2.0 cr)
- MBT 5500 - Business, Government, and Economic Tax Policy (2.0 cr)

**Elective Business Taxation Courses (18 credits)**

In some cases, an M.B.A. course may be taken in place of an M.B.T. elective course with prior approval from M.B.T. adviser. 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 5340 - Taxation of Partners and Partnerships (2.0 cr)
- MBT 5346 - ASC 740 Computations and Analysis (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)
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 resource development, and speech communication.

An undergraduate course in microeconomics must be completed with a grade of at least C before enrolling.

Special Application Requirements:
Applicants must submit three letters of recommendation, a complete set of transcripts, a résumé, a personal statement 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.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 79
Program Requirements

Plan C: Plan C requires 40 major credits and 8 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 2 semesters must be completed before filing a Degree Program Form.

The M.A. 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.

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

Ecology, Evolution and Behavior M.S.

Ecology, Evolution & Behavior

College of Biological Sciences

Link to a list of faculty for this program.

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 2014
- 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.

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Information current as of August 05, 2014
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:** Plan B requires 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.

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 M.S. 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.

**Joint- or Dual-degree Coursework:** Joint Degree Program in Law, Health & the Life Sciences Student may take a total of 12 credits in common among the academic programs.
Twin Cities Campus
Ecology, Evolution and Behavior Minor

College of Biological Sciences

Contact Information:
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 2014
- 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.

A minimum of 6 credits selected from BIOL 5407, BIOL 5409, BIOL 5411, and EEB 4xxx, 5xxx, or 8xxx courses is required for a master's minor in EEB.

A minimum of 12 credits selected from BIOL 5407, BIOL 5409, BIOL 5411, and EEB 4xxx, 5xxx, or 8xxx courses is required for a doctoral minor in EEB.
Ecology, Evolution and Behavior Ph.D.

College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
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 2014
- 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 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.

A minimum of 24 graduate level course credits and 24 thesis credits are required in the major. At least 12 course credits are required for a minor. 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. Degree programs are planned by the student and an advisory committee of three to five faculty members.

Joint- or Dual-degree Coursework: Joint Degree Program in Law, Health & the Life Sciences
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 2014
- 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.
Biological Process Technology 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: mscie@umn.edu
Website: http://www.bti.umn.edu/MicE

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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 Ph.D. 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
Other requirements to be completed before admission:
Typically, applicants with a bachelor's degree in biological sciences, biochemistry, chemistry, or chemical engineering 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 3.40 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 February 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
  - Speaking test score: 0

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 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.

The M.S. requires 30 credits. Plan A students carry out a research project (10 credits) resulting in a M.S. thesis presented to the graduate faculty. Plan B students complete a summer (about 2 ½ months) preceptorship (4 credits) in a private company research laboratory or at a research institute in the University and prepare a Plan B project paper based on this research.

The two-year program comprises coursework in a specialized program of microbiology, molecular biology, immunology, and chemical engineering. The major program courses are the chemical engineering and microbiology courses. All students must take MICE 5355 - Advanced Ferment/Biocatalysis Laboratory. In addition, students must attend research seminars during the first-year spring semester and the following year present a research seminar in a biotechnology seminar series.

Students may choose supporting coursework (at least 6 credits) from specified fields, including biochemistry, food science, pharmacology, plant biology, genetics, cell biology, bioinformatics, and engineering.

Plan B students complete a preceptorship in a private company research laboratory or at a research institute in the University, and prepare a Plan B paper based on the research project. Presentation of the original laboratory research thesis/project to the graduate faculty is required at the end of the second year.
Twin Cities Campus
Microbial Engineering Minor
Biological Process Technology 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: mice@umn.edu
Website: http://www.bti.umn.edu/MicE

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

Microbial engineering is an interdisciplinary program that combines an understanding of basic principles in microbiology, biochemistry, molecular biology, chemical engineering, and related sciences. Students are trained in the industrial application of microorganisms, cultured cells, and immunologic agents. Students learn both modern basic microbiology and biological engineering. Courses may be chosen from specific fields including biochemistry, microbiology, food science, genetics and cell biology, or pharmacognosy. The program is coordinated by the BioTechnology Institute (BTI) and involves faculty from 10 departments and 5 institutes of the University.

Note: The minor in microbial engineering is offered at the doctoral level only.

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 10 credits, and doctoral students must complete at least 12 credits. Credits must be selected in consultation with the Director of Graduate Studies of MicE (Microbial Engineering).
Twin Cities Campus

Plant Biological Sciences M.S.

Plant Biology

College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant Biological Sciences Graduate Program, 1445 Gortner Avenue, Room 256, St. Paul, MN 55108 (612-625-4222; fax:612-625-1738)
Email: pbiogp@umn.edu
Website: http://www.cbs.umn.edu/explore/departments/plantbio/gradprog

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. 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. Seminars are an integral part of 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.

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. Students may apply at any time; however, submission of all application materials by December 15 is required in order to ensure priority consideration for fellowships and teaching 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
- 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 2 semesters must be completed before filing a Degree Program Form.

PBIO 5960 - Itasca PBS Graduate Student Experience (1 cr)
PBS 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3 cr)
PBS 8900 (SEC 001) - PBS Colloquium (1 cr)
PBS 8900 (SEC 003) - Graduate Student Seminar (1 cr)
PBS 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
PBS 8994 - Directed Research (1-5 cr)
GRAD 8101 - Teaching in Higher Education (3 cr; A-F grade option)
Twin Cities Campus

Plant Biological Sciences Minor

Plant Biology
College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant Biological Sciences Graduate Program; 1445 Gortner Avenue, Room 256, St. Paul, MN 55108 (612-625-4222; fax: 612-625-1738)
Email: pbiogp@umn.edu
Website: http://www.cbs.umn.edu/plantbio/gradprog

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. 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. Seminars are an integral part of 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.

For students majoring in other fields, a master's minor in plant biological sciences may be obtained by completing 6 credits. Discuss courses with DGS.
To obtain the doctoral minor, Ph.D. students must complete 12 credits. Discuss courses with DGS.
Twin Cities Campus

Plant Biological Sciences Ph.D.

Plant Biology

College of Biological Sciences

Link to a list of faculty for this program.

Contact Information:
Plant Biological Sciences Graduate Program, 1445 Gortner Avenue, Room 256, St. Paul, MN  55108 (612-625-4222; fax: 612-625-1738)
Email: pbiogp@umn.edu
Website: http://www.cbs.umn.edu/explore/departments/plantbio/gradprog

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 biological sciences encompasses all aspects of the basic biology of both higher and lower plants. Major emphases include molecular and physiological approaches to development; physiological, structural, and functional studies at the cellular and organismal levels; systematic and evolutionary biology; and molecular genetics and applied biotechnology. 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. Seminars are an integral part of the 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:
Prospective students are expected to have completed a year of coursework in at least three of the following four areas: differential and integral calculus; organic and inorganic chemistry; biology; and physics. For students with demonstrated ability, background deficiencies as determined by the admissions committee can be made up during the first year of graduate studies. All admitted students are assigned to an adviser in the graduate program before they begin their studies.

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. Students may apply at any time; however, submission of all application materials by December 15 is required in order to ensure priority consideration for fellowships and teaching 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
- 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**

- 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 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.

- PBIO 5960 - Itasca PBS Graduate Student Experience (1 cr)
- PBS 8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (3 cr)
- PBS 8900 (SEC 001) - PBS Colloquium (1 cr)
- PBS 8900 (SEC 003) - Graduate Student Seminar (1 cr)
- PBS 8901 - Preparation of Research Proposal (1 cr)
- PBS 8123 - Research Ethics in Plant and Environmental Sciences (0.5 cr)
- PBS 8888 Doctoral Thesis Credits (24 cr)
- PBS 8994 - Directed Research (1-5 cr)
- GRAD 8101 - Teaching in Higher Education (3 cr; A-F grade option)
Twin Cities Campus
Addiction Studies Postbaccalaureate Certificate
CCE Addiction Studies
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
Addiction Studies, Degree and Certificate Programs, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000; fax: 612-625-1511)
Email: cceinfo@umn.edu
Website: http://www.cce.umn.edu/Addiction-Studies-Graduate-Certificate/index.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 19
- This program does not require summer semesters for timely completion.
- Degree: Addiction 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.

The Addiction Studies graduate certificate provides students with a strong theoretical and practical foundation in substance abuse treatment modalities, counseling skills, professional and ethical responsibilities, and client advocacy.

The curriculum is designed to meet the ongoing training and education needs of addiction counselors, social workers, psychologists, mental health practitioners, and prevention specialists. Students have the opportunity to develop and refine clinical skills and knowledge in addictive disorders in a multidisciplinary 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 post-secondary institution or its foreign equivalent.

Special Application Requirements:
Although students may take one or two program courses before applying for official admission into the certificate program, the program recommends that students apply for admission as soon as possible. Once accepted into the program, students will receive timely program updates and course registration information along with admitted student benefits.

Complete the Post-Baccalaureate Application for Certificate Admission form. The application form includes instructions, deadlines, and materials needed to apply. Students who have questions or who miss the deadline may call 612-624-4000 or send an email to cceinfo@umn.edu for advising.

Application Deadlines
Fall semester: July 15
Spring semester: November 15
Summer term: April 15

Note: Students who have graduated from a B.A. or B.S. program must apply for the graduate-level certificate.

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 2.8 is required for students to remain in good standing.

To be awarded the Addiction Studies Certificate, students must:
- complete a minimum of 19 credits within four years of their admission date;
- take core courses for a letter grade, earning a B- or better;
- obtain a cumulative GPA of 2.8 or better for all certificate coursework.

In addition to the Certificate requirements, students wanting Minnesota Licensed Alcohol and Drug Counselor licensure must complete an internship (ADDS 5996). Credit amounts will be determined based on student's previous internship or field placement experience.
- Students may enroll for the internship sequence after the academic portion is completed.
- Students must attend an internship information meeting and be approved by addiction studies faculty.
- Students should review the Internship Manual before or during their first class in the certificate program.

Course Group Description: The following courses are required for completion of the Certificate. Possible course substitutions may be made based on student's previous coursework.

**Core Courses (12 Credits)**
- 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)
- ADDS 5041 - Methods and Models I: Motivational Counseling (2.0 cr)
- ADDS 5081 - Multicultural Foundations of Behavioral Health (3.0 cr)

**Elective Courses (7 Credits)**
Take exactly 7 credit(s) from the following:
- 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 5091 - Assessment and Treatment Planning I (3.0 cr)
- IBH 6021 - Methods and Models III: Synthesis Seminar in Client Centered Care (2.0 cr)
- IBH 6222 - Adolescents and Co-occurring Substance Use and Mental Health Disorders (2.0 cr)

**Minnesota Licensed Alcohol and Drug Counselor Requirements**
To fulfill the educational requirements and be eligible for licensure, you must complete the following course AddS 5996 Internship in Substance Abuse Counseling (2-8 credits)

You must have the content in the following courses, or have taken courses with equivalent content and received a B- or better, to meet the 12 core functions specified by the Minnesota statute's licensing requirements:
AddS 5011, AddS 5021, AddS 5031, AddS 5041, AddS 5071, AddS 5081, AddS 5091, AddS 5996.
Twin Cities Campus
Arts and Cultural Leadership M.P.S.
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education, 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: cceacl@umn.edu
Website: http://www.cce.umn.edu/acl

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• Length of program in credits: 32
• 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.

This program prepares students for both administrative and leadership roles in professional leadership of arts and cultural-related nonprofit organizations. It is aimed at career administrators in nonprofit arts and cultural organizations looking for a graduate degree to boost their advancement in the field and/or to interact with other students/faculty in discussing artistic and cultural leadership, planning, and policy. It is available to career administrators working in fields not directly related to the arts, but who want new careers in arts and/or cultural related nonprofit organizations.

The program of study leads to a master's degree that is: individualized, allowing students to tailor electives and a capstone project to their unique interests; interdisciplinary, including required interdisciplinary seminars and elective coursework drawn from other related academic departments at the University; and career focused, with a capstone project centered on an issue or topic expressly related to the student's career interest.

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 U.S. institution or its foreign equivalent.

Other requirements to be completed before admission:
At least 3 years of relevant work experience with an arts and/or cultural organization 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 reference, 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 summer term and 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
• IELTS
  - Total Score: 6.5
Program Requirements

Plan C: Plan C requires 32 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The ACL Final Project (ACL 8002, 3 credits) 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 adviser(s), a project that meets a need within that group and reflects both the interest of the students and their academic achievement. The ACL Final Project consists of two parts: an applied project which includes an accompanying report, and an academic paper.

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 32 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 (17 credits)

ACL 8001 - Introduction to Interdisciplinary Inquiry (3.0 cr)
ACL 5200 - Trends and Impacts in Arts and Cultural Leadership (3.0 cr)
ACL 5220 - Philanthropy, Development, and Strategic Leadership (3.0 cr)
ACL 5230 - Ethics and the Law (3.0 cr)
ACL 8201 - Leadership: Skills and Practice (1.0 cr)
ACL 8202 - Nonprofit Board Practicum (1.0 cr)
ACL 8002 - Final Project Seminar (3.0 cr)

Selected applications courses (6 credits)

Required: At least two of the following courses with selection based on prior experiences.

Take 2 or more course(s) totaling 6 or more credit(s) from the following:

• PA 5011 - Management of Organizations (3.0 cr)
• PA 5101 - Management and Governance of Nonprofit Organizations (3.0 cr)
• PA 5104 - Strategic Human Resource Management (3.0 cr)
• PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
• PA 5111 - Financing Public and Nonprofit Organizations (3.0 cr)
• PA 5251 - Strategic Planning and Management (3.0 cr)
• PA 5103 - Leadership and Change in an Innovation Society (3.0 cr)

Electives (9 credits)

Elective courses can be selected from related academic departments. Studio or applied courses, such as a course in painting or piano, may not be included as electives. Electives should relate to the professional tasks required of arts and cultural leaders or enhance student's understanding of the arts within a broader cultural context. Examples include, but are not limited to the courses listed below.

Take 9 or more credit(s) from the following:

• ACL 5950 - Special Topics (1.0 - 4.0 cr)
• TH 5780 /inactive/ (2.0 - 4.0 cr)
• LS 5100 - Liberal Studies Seminar (1.0 - 4.0 cr)
• JOUR 4263 - Strategic Communication Campaigns (3.0 cr)
• JOUR 5251 - Psychology of Advertising (3.0 cr)
• MUS 5950 - Topics in Music (1.0 - 4.0 cr)
• MST 5011 - Museum History and Philosophy (3.0 cr)
• MST 5012 - Museum Practices (3.0 cr)
• Other electives chosen in consultation with student's adviser.
Twin Cities Campus
Biological Sciences M.B.S.
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education, Master of Biological Science Program, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000; fax: 612-626-2800)
Email: ccembs@umn.edu
Website: http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 U.S. 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. GRE scores may also be submitted, but are not required.

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
- 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 mentor. 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-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 advisers, students complete 30 credits. M.B.S. 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. Coursework is taken from the regular graduate-level coursework. An overall GPA of 3.00 is required for the degree to be awarded.
Twin Cities Campus
Biological Sciences Minor
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education, Master of Biological Science Program, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000, fax: 612-626-2800)
Email: ccembs@umn.edu
Website: http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 Education 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.**

*CCE Graduate Programs Instruction*

**College of Continuing Education**

Link to a list of faculty for this program.

**Contact Information:**


Email: ccehort@umn.edu


- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (max 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 summer term and 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

- MELAB
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 course, HORT 6002 - Problem Solving in Horticulture, accounts for 4 of the minimum 30 credits required for the degree and is not considered part of the horticulture core course requirements.

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.

The course program must include a minimum of 30 semester credits in courses 4xxx or above, with a minimum of 21 credits in 5xxx or higher courses. Courses must include 15 credits of horticulture courses, 11 credits in a related field, and 4 credits of HORT 6002 - Capstone.

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 MPS 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 adviser and the program 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.

A maximum of 3 credits of HORT 5090 - Directed Studies may be applied toward the minimum horticulture core course requirements.

The student's course program must be approved by the DGS and MPS 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.
Twin Cities Campus
Innovation Studies Postbaccalaureate Certificate
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
(612-624-4000; fax: 612-626-2800)
Email: ccegis@umn.edu
Website: http://www.cce.umn.edu/is

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 16
- This program does not require summer semesters for timely completion.
- Degree: Innovation Studies 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 certificate is built on two premises: (1) that the economic order of the 21st century will be determined more by intellectual capital and knowledge worker productivity than by the traditional resources of labor, capital, and raw materials; and (2) that an individual’s success in the new economic order will be determined more by such personal characteristics as knowledge, inventiveness, adaptability, and self-reliance, than by the institutional structures and protections traditionally provided to workers by employers. Workers can no longer rely, in other words, on any established company or organization to provide secure, long-term employment. Today, they are much more on their own, requiring them to develop new skills in self-leadership, self-marketing, and team formation.

These shifts are nothing less than revolutionary, propelled by ever-advancing information and communications technologies. Likewise, they will be sustained by educational systems geared to preparing human capital for continuous innovation. Associated implications for international and global cooperation, collaboration, and competitiveness will be addressed throughout the innovation studies certificate seminars.

The focus of the certificate in innovation studies will be the individual, with emphasis on developing the requisite insights and skills needed to support a shift from an institutional model to a self-reliance model that rewards innovative leadership and problem solving. The curriculum will draw on a broad, growing body of interdisciplinary literature that deals with such topics as the impact of accelerating change on the nature of work and social institutions, the expansion and globalization of business and industry, geo-political change, socio-cultural change, ecological/environmental issues, population issues, the evolution of technology, and adaptive human behavior.

Potential students for the certificate are adults with bachelor degrees or better who develop or innovate significant portions of their work, or who wish to learn the principles and general skills of doing so. These are knowledge workers whose professional life pivots on thought, collaboration, and decision making to help envision or produce new goods and services. Familiar job titles for this target audience include:

- Organizational planners and strategists
- Managers from both the private and public sectors
- Engineers and scientists seeking to develop commercially successful new products
- Teachers and consultants in both the public and private sectors
- Financial planners and analysts
- Entrepreneurs and “intrapreneurs,” in both profit and non-profit organizations

The program is beneficial to anyone wanting to be better aligned with the future in her or his current position or wishing to make a strategic, innovation-focused career change.

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.
To be admitted, students must have a bachelor's degree from an accredited post-secondary U.S. institution or its foreign equivalent.

**Special Application Requirements:**
To be admitted, prospective students must show evidence that they are prepared to successfully undertake graduate-level work, and that they understand the nature of the program. Applicants must:
- hold a baccalaureate degree from an accredited college or university;
- submit transcripts from their undergraduate institution(s) and any subsequent credit coursework;
- submit a two-page statement of purpose that explains why this program is a good fit for them; and
- submit a current résumé, describing professional and lifework experiences.

Letters of reference from past or current employers and/or professors are optional.

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
- **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**

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 certificate consists of at least 16 credits: 7 credits in two required core seminars and 9 credits in innovation studies electives. The core seminars include a 3-credit introductory course, IS 5001 - Introduction to Innovation Studies and a 4-credit capstone final project, IS 5002, which concludes the program. In addition to the core, students choose 9 credits of innovation studies seminars from a group of existing or prospective IS 5100 or IS 5950 topics seminars. These electives allow a student to focus on areas of innovation studies that offer the highest potential level of integration into his or her own educational and professional goals.
Twin Cities Campus
Integrated Behavioral Health M.P.S.
CCE Addiction Studies
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education Information Center, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN, 55108 (612-624-4000)
Email: cceinfo@umn.edu
Website: http://cce.umn.edu/Master-of-Professional-Studies-in-Integrated-Behavioral-Health/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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
- 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. There 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 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.

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 seven 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 cceinfo@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.

Core Courses

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)
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)
IBH 6011 - Foundations in Differential Diagnosis (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 6051 - Advanced Group Practice (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 (2.0 cr)
IBH 6091 - Intersection of Career and Mental Health (2.0 cr)
IBH 6101 - Family Dynamics and Therapy (3.0 cr)
IBH 6111 - Research and Evaluation Methods (3.0 cr)
IBH 6996 - Internship for Integrated Behavioral Health (1.0 - 8.0 cr)
Twin Cities Campus
Liberal Studies M.L.S.
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education, Master of Liberal Studies Program, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108, (612-624-4000; fax: 612-626-2800)
Email: ccemls@umn.edu
Website: http://www.cce.umn.edu/mls

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30
- This program does not require summer semesters for timely completion.
- Degree: Master of Liberal 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 graduate major in Liberal Studies (LS) offers an interdisciplinary curriculum that includes an introductory seminar, a choice of liberal studies seminars, a choice of electives from disciplines throughout the University, and a final project seminar. Although LS seminars from M.L.S. are scheduled for early evenings and some Saturday mornings, most graduate-level courses offered during the day are also open to M.L.S. 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.

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:
The faculty committee reviewing each application looks for indications that the student can succeed in graduate study, that there is a good "fit" between the M.L.S. program and the student's stated educational objectives, and that the student can express him/herself well in writing. The faculty also looks for positive qualities and other experiences the student will bring to the program.

Special Application Requirements:
The application package must include official transcripts of all baccalaureate and post-baccalaureate work, two letters of reference, an updated resume, a three- to four-page written statement of purpose, and an additional writing sample of 10 to 20 pages. Application deadlines are in spring for summer term and fall semester admission, and in 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
- 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: The Plan C final project must be prepared as part of LS 8002 - Final Project for Graduate Liberal Studies and must be approved by at least two faculty members and the 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 3.0 is required for students to remain in good standing.

The program requires at least 30 credits. Introduction to Interdisciplinary Inquiry (LS 8001, 3 cr) and the Final Project (LS 8002, 3 cr) seminars are required. Students must take at least 9 credits of liberal studies seminars. The remaining 15 credits are composed of graduate-level electives from disciplines throughout the University of Minnesota, or directed study, directed research, advanced interdisciplinary inquiry, or additional liberal studies seminars. Courses are selected with the help of the student's graduate faculty adviser.
Twin Cities Campus
Liberal Studies Minor
CCE Graduate Programs Instruction
College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
College of Continuing Education, Master of Liberal Studies Program, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108, (612-624-4000; fax: 612-626-2800)
Email: ccemls@umn.edu
Website: http://www.cce.umn.edu/mls

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

We are not accepting applications for the minor at this time. The graduate minor in Liberal Studies requires 6 credits of LS 5100 or LS 5950.

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

Transportation Studies Postbaccalaureate Certificate

CCE Certificate Programs

College of Continuing Education

Link to a list of faculty for this program.

Contact Information:
Transportation Studies Certificate, Information Center, College of Continuing Education, University of Minnesota, 20 Ruttan Hall, 1994 Buford Avenue, St. Paul, MN 55108 (612-624-4000; fax: 612-625-6381)
Email: cceinfo@umn.edu
Website: http://www.cce.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 16
- This program does not require summer semesters for timely completion.
- Degree: Transportation 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.

Note: This program is not currently admitting students. Please contact the program for more information.

The transportation studies program allows students to gain advanced interdisciplinary knowledge of transportation by taking a set of core courses along with a series of focused electives. The certificate program is structured into two program tracks—civil engineering and planning/public policy—to meet the core course requirement. Students select one course from each of the two program tracks. Students are also required to complete one of two 1-credit seminars focusing on intelligent transportation systems or various civil engineering topics as a part of their core coursework. In addition to the foundation, students acquire further expertise in a specific area related to transportation by taking at least 9 graduate credits in a field chosen by the student and approved by the director of graduate studies. These credits may consist of any combination of courses that will further the student's knowledge of a specific transportation-related subject area or areas. A broad array of topical areas and course offerings are available, including advanced traffic engineering and related mathematical disciplines; transportation pavements or structures; management, logistics, regional planning, or human factors; historical, political, or economic 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.

Admission requires a B.S. or B.A. from an accredited U.S. institution or foreign counterpoint.

Other requirements to be completed before admission:
The applicant's undergraduate degree should be in a field related to transportation issues through work experience, community involvement, political leadership, or other activity. Applicants must document study in one or more of the following technical course topics, demonstrating proficiency in physical science and/or quantitative analysis: intermediate economics, theory, statistics, calculus, physics.

Special Application Requirements:
Prospective students must submit a statement explaining how their work experience, community involvement, political leadership, or other activity has prepared them for the program. Prospective students may supplement this statement with letters of recommendation from employers, community leaders, etc., if appropriate.

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.

The core courses are structured into two program tracks: the civil engineering track includes CE 5211 and CE 5214; the planning/public policy track includes PA 8202 and CE 5212/PA 5232. Students select one course from each of the two program tracks.

Students are also required to complete ME 8772/CE 8213 or CE 8200, a 1-credit seminar, as part of their core coursework. Elective courses consist of any combination of courses in a transportation-related subject area. The courses must be approved by the director of graduate studies. For more information on courses, visit www.cts.umn.edu/Education/Certificate.
Twin Cities Campus
Architecture M.Arch.
School of Architecture
College of Design

Link to a list of faculty for this program.

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 2014
- Length of program in credits: 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 three non-professional research degrees, the master of science (M.S.) in architecture, including a sustainable design track or concentrations in heritage conservation and preservation or metropolitan 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 sustainable design, heritage conservation and preservation, or metropolitan design. The nonprofessional M.S. 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 M.S. in architecture. Students may take a total of 24 credits in common between the two academic programs. See information on the M.S. 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 90 major credits and up to null credits outside the major. There 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.

The professional M.Arch. curriculum requires completion of a total of 90 credits (80 course credits and a 10-credit design studio Plan C Master's Final Project). M.Arch. students can expect to complete the program in six semesters (three years), including the Master's Final Project. The fall semesters include integrated core curriculum of studio, building and environmental technologies, history-theory, or digital methods. The spring semesters are organized as half-semester elective modules in studio-like projects and seminars in urban/suburban-rural, building technology and sustainable practices, history-theory-culture themes. May term study abroad options are available for qualified students in any summer semester.
**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 S.E., Minneapolis, MN 55455 (612-624-7866; fax: 612-624-5743)
Email: archinfo@umn.edu
Website: [http://arch.cdes.umn.edu](http://arch.cdes.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 33 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) M.S. in Architecture, Sustainable Design Track (plan A or B); 2) M.S. in Architecture, Heritage Conservation and Preservation Track (plan A or B); 3) M.S. in Architecture, Metropolitan Design Track (plan A, B, or C); and, (4) M.S. in Architecture, Research Practices Concentration (plan C only). Each of these master of science degree 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](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 percent of the 5,600 hours of mandatory internship for registration as an architect. To receive the IDP credit, the M.S. degree must be earned after receiving the M. Arch degree. The M.S. Metropolitan Design Track requires summer semester coursework. The other three M.S. programs 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](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 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.

In addition to the Heritage Conservation Track, the Metropolitan Design Track, and the Sustainable Design Track, the program also offers a concentration in Research Practices. The M.S. in Architecture, Research Practices Concentration (MS-RP) requires minimally 30 credits, is a plan C only, and addresses two goals: providing a structured path to licensure totaling seven years and integrating research with practice. The program takes advantage of many of NCARB’s recent changes to IDP and ARE®, as well as leveraging the historically strong connection between practice and academy in our Minneapolis/St. Paul community.

Joint- or Dual-degree Coursework: M.Arch./M.S. Dual Degree The M.S. can be also be completed by students not enrolled in the M. Arch. 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 M.S. Sustainable Design program admits candidates 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 program'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.

Heritage Conservation & Preservation
This sub-plan is limited to students completing the program under Plan A or Plan B.

The M.S. in Architecture-Heritage Conservation and Preservation 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 program 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 program focuses on the philosophy, policy, technology, economics, and social implications of heritage preservation. Students completing the M. Arch degree may overlap 24 credits with the M.S.

Metropolitan Design
This sub-plan is limited to students completing the program under Plan A, Plan B, or Plan C.

The Master of Science in Metropolitan Design is an advanced program intended for individuals who are keenly interested in the study of cities and their metropolitan regions. The MS-MD Program combines strong design instruction supported by applied research courses in urban design history and theory. The objective of the program 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. The program 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 MS-MD degree after they have successfully completed their professional programs.
Twin Cities Campus
Design M.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 (612-626-1219)
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (including interactive design)
- Housing studies
- Interior design (including evidence-based design) only

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 are required to take 4 credits in the core, 24 credits in the major field, and 6 credits in the related field or minor. Master's Plan A students are required to take 10 thesis credits. The program requires a minimum number of credits in theory and methods. Students may be required to complete additional credits upon recommendation of their committee.

The Plan B project culminates in a paper and project. 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.

Students may be required to complete additional credits upon recommendation of their 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. 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.

**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; and interactive design.

**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.

**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. The evidence-based design emphasis provides students with the opportunity to explore theoretical, process, and applied aspects of this design practice approach.
Twin Cities Campus
Design M.F.A.
Design, Housing & Apparel
College of Design

Contact Information:
Director of Graduate Studies, Design Graduate Program, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108 (612-626-1219)
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.F.A. is available in the graphic design track only.

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
- 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 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:** M.F.A. 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 are required to take 4 credits in the core, 36 credits in the major field, 8 credits in the related field or minor, and 12 credits for the creative project. The program requires a minimum number of credits in theory and methods. Students may be required to complete additional credits upon recommendation of their 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.

**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; and interactive design.
Twin Cities Campus
Design M.S.
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 (612-626-1219)
Email: dhagrad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (including interactive 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
- IELTS

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Information current as of August 07, 2014
- 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 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 are required to take 4 credits in the core, 24 credits in the major field, and 6 credits in the related field or minor. Master's Plan A students are required to take 10 thesis credits. The program requires a minimum number of credits in theory and methods. Students may be required to complete additional credits upon recommendation of their committee.

The Plan B project culminates in a paper and project. 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. Students may be required to complete additional credits upon recommendation of their 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. 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.

**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 multicultural communication, visual representation of information, human interaction with designed objects, social and cultural implications of design, color systems and perception, design history, and design education. Students and faculty collaboratively develop designed objects and information resources that will enhance people's lives.

**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.

**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. The evidence-based design emphasis provides students with the opportunity to explore theoretical, process, and applied aspects of this design practice approach.
Twin Cities Campus
Design Minor
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 (612-626-1219)
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 2014
- 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.
Twin Cities Campus
Design Ph.D.
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 (612-626-1219)
Email: dha.grad@umn.edu
Website: http://dha.design.umn.edu/programs/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 (including interactive 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
- IELTS
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.

At least 2 semesters must be completed before filing a Degree Program Form.

Students are required to take 4 credits in the core, 24 credits in the major field, 12 credits in the related field or minor, and 24 credits of dissertation credits. The program requires a minimum number of credits in theory and methods. Students may be required to complete additional credits upon recommendation of their 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. 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.

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; and interactive design.

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. The evidence-based design emphasis provides students with the opportunity to explore theoretical, process, and applied aspects of this design practice approach.

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. Upon completion of the graduate degree, students seek housing careers in state and federal agencies, nonprofit community organizations, housing regulation, and higher education.
Twin Cities Campus

Housing Studies Postbaccalaureate Certificate

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 (612-626-1219)
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 2014
- 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, residential environment and energy use, rural housing issues, housing management, and housing finance.

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
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 certificate consists of at least 15 credits: 2 credits in the required course and at least 13 credits from the elective options. Courses are drawn primarily from the Department of Design, Housing, and Apparel. Some elective courses require prerequisites that may be waived with instructor permission according to University policy.
Twin Cities Campus

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.  612-626-1219.
Email: cklarqui@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 spacecraft 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
• IELTS
  - Total Score: 7
• MELAB
  - Final score: 82

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 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 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 M.S. is offered under two plans: Plan A (with thesis) and Plan C. Plan A requires completion of 20 major course credits plus 10 thesis credits. Plan C requires completion of 24 major course credits plus 6 non-major credits.
Human Factors and Ergonomics Minor

Contact Information:
Human Factors and Ergonomics Graduate Program, c/o DHA, 240 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108. 612-626-1219
Email: ckilarqui@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 spacecraft 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
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.

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.
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. 612-626-1219
Email: cklarqui@umn.edu
Website: http://humanfactors.design.umn.edu/

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 health care processes and technology, computer interfaces, and spacecraft 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 - Reading Score: 24
  - Internet Based - Writing Score: 24
• IELTS
  - Total Score: 7
• MELAB
  - Final score: 82

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
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.

Major Course Requirements: 42 course credits, including
- 3 credits in statistics
- 3 credits in experimental design
- 3 credits in Human Factors Foundations
- 3 credits in Physical Human Factors
- 3 credits in Cognitive Human Factors

The balance of credits may come from any category on the course list. To ensure students receive interdisciplinary exposure to multiple perspectives, they must select courses (excluding statistics and experimental design courses) from at least three different departments. Training in Research Ethics is required.
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 S.E., 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 2014
- Length of program in credits: 88
- 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 (M.L.A.) is a first professional degree required for students who wish to become licensed landscape architects. The program introduces students to the practice and discipline of landscape architecture, providing them with the artistic, technical, cognitive and communication skills, and the scientific and aesthetic knowledge necessary to practice in the profession and in other environmental fields.

The M.L.A. program is a three-year degree for students already possessing a baccalaureate degree. The program requires 88 graduate credits. Students with baccalaureate degrees in landscape architecture or architecture may apply to the three-year M.L.A. and be accepted with advanced standing.

Coursework for the M.L.A. 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. At the core of the M.L.A. curriculum are six design studios, one in each of the six semesters of the 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.

Other requirements to be completed before admission:
M.L.A. program applicants must have completed a baccalaureate degree. M.S. program applicants must have completed an accredited baccalaureate or graduate degree in landscape architecture or a baccalaureate degree in a related discipline.

Special Application Requirements:
M.L.A. program applicants must apply by January 15 for entry the following fall in order to receive first consideration for admission, fellowships, and assistantships. In addition to completing the Graduate School application requirements, applicants must submit all of the following: three recommendations, responses in English to the two questions pertaining to landscape architecture, all essays required by the Graduate School's electronic application system. International students must submit scores from the TOEFL, IELTS, or the MELAB. The department may give advanced standing for specific required professional degree courses when an applicant has taken a course elsewhere and provides evidence that enables it to be judged equivalent to those offered by the department. An 8.5" x 11" portfolio containing examples of creative work is preferred for all M.L.A. applications, and is required to obtain advanced standing in design. Portfolios should be sent directly to the department. Applicants with degrees in related design professions such as architecture, environmental design, or planning should clearly indicate their interest in being evaluated for admission with advanced standing with a direct letter to the director of graduate studies. GRE scores are not required for entry to the M.L.A., however, they can be helpful to applicants seeking fellowships and assistantships. A cumulative GPA of 3.00 or higher is preferred. Because of resource limitations, students are admitted for entry into the M.L.A. program only for the fall semester. More detailed information about the above departmental application requirements and procedures, including a downloadable checklist in PDF format, may be found at the department website, http://landarch.cdes.umn.edu/prog/admissions.php.
International applicants must submit score(s) from one of the following tests:

- **TOEFL**
  - Internet Based - Total Score: 86
  - Paper Based - Total Score: 600
- **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 82 major credits and 6 credits outside the major. The final exam is written.

**Plan C:** Plan C requires 82 major credits and 6 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** A capstone design project is required.

This program may not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

The M.L.A. program, which is accredited by the national Landscape Architecture Accreditation Board (LAAB), is designed for students who wish to become registered professional landscape architects. Areas of required coursework within the program include design, technology and ecology, graphic and written communication, landscape history, and research methods. To develop a special focus or to explore areas in more depth, students are encouraged to select from among the graduate seminars offered to fulfill elective requirements. To meet LAAB standards, 88 graduate credits are required for students without previous design experience. Because coursework is organized in a sequential framework of six design studios, commitment to the program for three successive years is essential.

Students who hold an accredited professional bachelor's degree in landscape architecture may complete the M.L.A. with 30 credits, including 12 credits of landscape architecture studio courses, 3 credits of landscape architecture research issues and methods, and 15 elective credits, 6 of which must be outside of the department. Up to 9 credits earned as part of the M.L.A. may be applied to the M.S.
Twin Cities Campus
Landscape Architecture M.S.
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 S.E., 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 2014
- 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 M.S. is for students with a clear focus in research related to landscape architecture. M.S. 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, 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 4 semesters must be completed before filing a Degree Program Form.
The M.S. requires 30 credits, including at least 6 credits within landscape architecture, 10 thesis credits, and at least 6 credits in an area of focus outside of landscape architecture.


**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 S.E., 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 2014  
- 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 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 director of graduate studies.
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 S.E., 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 2014
- 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 07, 2014
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Program Requirements
Use of 4xxx courses towards program requirements is not permitted.

Required Courses
ARCH 5711
ARCH 5721
ARCH 5731
ARCH 8255 or ARCH 52xx or ARCH xxxx (6 cr, studio)

Electives
(Students should choose a minimum of 2 courses from the following list.)
ARCH 5313 - Visualization/Communications Techniques 3 cr (Fall)
ARCH 5441 - Minnesota Architecture and Landscape 3 cr (Sp.)
ARCH 5501 - Architecture and Ecology 3 cr (Fall)
ARCH 5539 - Daylighting and Architecture Design 3 cr (Sp.)
ARCH 5542 - Building Energy Systems (DGS prior permission) 3 cr (Fall)
ARCH 5671 - Historic Preservation 3 cr (Fall)
HSG 5467 - Housing and the Social Environment 4 cr (Fall, Sp.)
LA 5201 - Making Landscape Spaces and Types 3 cr (Fall)
LA 5400 - Re-greening Cities and Bioregions 3 cr (Fall)
LA 5571 - Landform Systems and Spatial Performance 3 cr (Fall)
LA 5755 - Infra. Nat. Systems and the Spaces of 3 cr (Fall)
PA 5204 - Urban Spatial and Social Dynamics 3 cr (Fall, Sp.)
PA 5212 - Managing Urban Growth and Change 3 cr (Fall)
PA 5231 - Transit Planning and Management 3 cr (Fall)
PA 5261 - Housing Policy 3 cr (Fall)
PA 5511 - Community Economic Development 3 cr (Fall)
PA 8202 - Networks and Places: Transportation, Land Use, Design 4 cr (Fall)
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
Website: http://www.design.umn.edu/prospective_students/programs/museumstudies.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 toward program requirements is permitted under certain conditions with adviser approval.

The master's and doctoral minors require 7 and 12 credits respectively. Each requires the introductory seminar (MST 5011, 3 cr), the museum practices course (MST 5012, 3 cr), and at least one credit of internship (MST 5020). Additional credits for the doctoral minor may be internship or directed study (MST 8993).
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 (612-626-1219)
Email: cklarqui@umn.edu
Website: http://product.design.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 adviser 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 director of graduate studies for the minor.
Twin Cities Campus

Additional Licensure

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:
College of Education and Human Development Student Services, 360 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455, 612-625-3339
Email: cehdinfo@umn.edu
Website: 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 2014
- 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

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.

**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 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 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 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.

**ASD Licensure Required Courses**
EPsy 4613, 5611, 5614, 5616, 5618, 5621, 5622, 5625, 5631, 5632, 5633, 5661, 5662, 5663, 5664, 5681, 5705, 5742

**Career/Tech Ed: Comm Tech**
**Career/Tech Ed: Construction**
**Career/Tech Ed: Creative Dsgn**
**Career/Tech Ed: Early Child**
**Career/Tech Ed: Manufacturing**
**Career/Tech Ed: Medical**
**Career/Tech Ed: Accomm Special**
**Career/Tech Ed: Transportation**
**Career/Tech Ed: Hospitality Sv**

**Chemistry Education 9-12**
**Comm Arts/Lit Educ 5-8/9-12**
**Comm Arts/Lit Education 5-8**

**Computer, Keyboarding & Related Technology Applications K-12**

**Deaf and Hard of Hearing**

**Developmental and Adaptive Physical Education**

**Developmental Disabilities**

**Director of Community Ed**
Students must have a bachelor's degree plus 24 credits. Additionally, they should have 320 hours of field experience.

**Required courses**

- **OLPD 5389** - Community Education Leadership (3.0 cr)
- **OLPD 5394** - Leadership in Community Education Finance and Law (1.0 cr)

Additional course or experiential requirements may be determined through the pre-assessment completed as part of OLPD 5385.

**Director of Special Education**

Students must 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.

**Required courses**

- **OLPD 5321** - The Principal as Leader of High-Performing Schools (3.0 cr)
- **OLPD 5368** - Leadership for Special Education Services (3.0 cr)
- **OLPD 5392** - Special Education Finance: Program Models, Policy, and Law (2.0 cr)

**Early Childhood Educ Birth-Gr3**

**Earth & Space Science Ed 9-12**

**Emotional and Behavioral Disorders**

**English as a Second Lang K-12**

**Health Education**

The master of education (M.Ed.)/additional licensure program is designed for current licensed teachers who would like to add health to their teaching license. Students will also have the option of completing their M.Ed. while in the additional licensure program. The program can be completed within a 12-month period. Courses are required to be taken in the summer, fall and spring semesters. A large portion of the program is delivered via on-line courses and/or hybrid courses and is scheduled outside of teaching and coaching hours.

**Required Kinesiology Courses**

- **KIN 5201** - Health Education Foundations (3.0 cr)
- **KIN 5202** - Current Issues in Health (2.0 cr)
- **KIN 5203** - Health Media, Consumerism, and Communication (2.0 cr)
- **KIN 5204** - Methods in Health Education (3.0 cr)
- **KIN 5205** - Health Education Curriculum (3.0 cr)
- **KIN 6201** - Clinical Experience I: Health Education (4.0 cr)
- **KIN 6202** - Clinical Experience II: Health Education (2.0 - 6.0 cr)

**Prerequisites**

The following prerequisites are needed for the Health Education additional licensure. Proof of CPR/First Aid certified may substitute for KIN 3113. Comparable courses from other universities may be submitted for possible approval.

- **KIN 3001** - Lifetime Health and Wellness [SOCS] (3.0 cr)
- **PUBH 3001** - Personal and Community Health (2.0 cr)
- **KIN 3113** (inactive) (3.0 cr)

**Learning Disabilities K-12**

**Life Science Education 9-12**

**Mathematics Education 5-8**

**Mathematics Education 5-8/9-12**

**Oral/Aural**
Parent and Family Education

Physical Education K-12

Physics Education 9-12

Principal K-12
Students must 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.

Required courses
- OLPD 5321 - The Principal as Leader of High-Performing Schools (3.0 cr)
- OLPD 5388 - Leadership for Master(ful) Scheduling (2.0 cr)

Reading

School Counseling K-12

School Psychologist

Science Education 5-8

Social Studies Educ 5-8/9-12

Social Studies Education 5-8

Superintendent
Students must 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.

Required courses
- OLPD 5322 - Leaders in the Superintendency and Central Office (3.0 cr)
- OLPD 5393 - Leading School Finance Elections (1.0 cr)

Teacher Coordinator of Work-based Learning

Technology Education 5-12

Visual Arts Education K-12

WorldLang/Cultures: Japanese K-12

WorldLang/Cultures: Arabic K-8

WorldLang/Cultures: Arabic K-12

WorldLang/Cultures: Chinese K-12

WorldLang/Cultures: French K-8

WorldLang/Cultures: French K-12

WorldLang/Cultures: German K-8

WorldLang/Cultures: German K-12
WorldLang/Cultures: Hebrew K-8
WorldLang/Cultures: Hebrew K-12
WorldLang/Cultures: Italian K-8
WorldLang/Cultures: Italian K-12
WorldLang/Cultures: Japanese K-8
WorldLang/Cultures: Latin K-8
WorldLang/Cultures: Latin K-12
WorldLang/Cultures: Norweg K-12
WorldLang/Cultures: Ojibwe K-12
WorldLang/Cultures: Polish K-12
WorldLang/Cultures: Russian K-8
WorldLang/Cultures: Russian K-12
WorldLang/Cultures: Spanish K-12
WorldLang/Cultures: Swedish K-12
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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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
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 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.

**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 depending on whether the student is also pursuing a license as reflected by their optional sub-plan.

**Program Sub-plans**

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Adult Basic and Continuing Education**

This sub-plan reflects students who are also pursuing licensure in addition to the degree. For the purposes of the the MEd, the course requirements are the same as described above, but participation in this sub-plan will influence which elective courses an adviser may approve to equal the 34 credits needed for this program.

**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, 330 Wulling Hall 3345A, 86 Pleasant Street 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 2014
- 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, 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 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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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:
U.S. 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.

The adult literacy certificate requires a minimum of 14 credits. Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

Adult Literacy
minimum of 6 credits from modules below

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 OLPD 5203 - Methods of Teaching Adult Literacy (3.0 cr)

Adult Education
minimum 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
minimum 3 credits
OLPD 5296 - Field Experience in Adult Education (1.0 - 6.0 cr)

Electives
Minimum 2 credits. The following courses can be substituted for one adult literacy class and/or be counted as electives.
SLS 5721 [Inactive](3.0 cr)
or SLS 5724 [Inactive](3.0 cr)
or other course with approval of program adviser
Twin Cities Campus
Advanced Practices in Second Language Teaching 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 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 2014
- 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

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Information current as of September 19, 2014
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 - Second Language Acquisition Basics for Teachers (2.0 cr)
- LGTT 5110 - Technology in the Second Language Classroom (2.0 cr)

Elective Courses (6 credits)

Take 3 or more course(s) totaling 6 or more credit(s) from the following:

- 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
Agricultural 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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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.

Master of education (M.Ed.)/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 M.Ed. degree. Students have five years to complete their degree, beginning with the first course(s) used in the program, and must maintain a 2.80 minimum overall grade point average (GPA).

This program includes two components: initial licensure and the M.Ed. degree. After successfully completing licensure requirements and appropriate work experience, students are recommended for state licensure to teach agricultural education in grades 5-8 and 7-12. This program may also provide initial preparation for Minnesota State College and Universities (MnSCU) licensure in farm business management 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 2.50.

Relevant professional experience or a relevant undergraduate major is also required.

Other requirements to be completed before admission:
Candidates for both plans must have at least one year of professional experience before the degree is awarded.

Special Application Requirements:
In addition to other required materials, when applying online applicants must submit Statements #1 and 2, a résumé and two letters of recommendation from individuals who can attest to the student's potential in the field. Admissions is done on a rolling basis with the following semestery deadlines: March 1 (Summer), July 1 (Fall), and November 1 (Spring)

International applicants must submit score(s) from one of the following tests:
Program Requirements

Plan C: Plan C requires 15 major credits and 15 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.

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.

License

After successfully completing licensure requirements and appropriate work experience, students are recommended for state licensure to teach agricultural education in grades 5-8 and 7-12. This program may also provide initial preparation for Minnesota State College and Universities (MnSCU) licensure in farm business management education.

Please see OLPD website for more information about Licensure requirements in addition to the M.Ed.

http://www.cehd.umn.edu/OLPD/grad-programs/licensure.html

Required Courses

AFEE 5995 - Integrating Paper - Master of Education: Agricultural and Extension Education (1.0 - 4.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)
6 credits minimum in additional AFEE courses credits in consultation with adviser: At least 2 credits from each of the following three areas: curriculum; methods; and program planning/organization/management
16 credits in agricultural, food, and environmental sciences or related fields of study credits in consultation with adviser (A maximum of 12 credits of AFEE 5220: Special Topics in Agriculture Education and Extension (1-3 cr) may be applied to this requirement.)
AFEE 5290 - Seminar: Current Issues in Agricultural Education and Extension (1.0 - 3.0 cr)
or AFEE 5280 - Current Issues for the Beginning Agricultural Education Teacher (1.0 - 3.0 cr)
or Equivalent course chosen in consultation with an adviser

Electives

in consultation with adviser, if needed to meet 30 credit degree requirement

Professional Studies

This sub-plan is for individuals who are interested in agri-industry training and development, sales and sales management, extension service, or other areas of agriculturally based business.

With guidance from faculty advisers, students choose at least 30 semester credits that may include coursework, independent study, internships, workshops, school-based experiences, and an integrating paper. Students can also enroll in courses offered during the summer and at off-campus school sites.

Required Courses

AFEE 5995 - Integrating Paper - Master of Education: Agricultural and Extension Education (1.0 - 4.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)
10 credits selected from the following two areas credits in consultation with adviser: methods and program planning/organization/management
12 credits in agricultural, food, and environmental sciences or related fields of study credits in consultation with adviser (A maximum of 8 credits of AFEE 5220: Special Topics in Agriculture Education and Extension (1-3 cr) may be applied to this requirement.)
AFEE 5290 - Seminar: Current Issues in Agricultural Education and Extension (1.0 - 3.0 cr)
or an equivalent course chosen in consultation with an adviser

Electives
Electives in consultation with adviser, if needed, to meet 30 credit degree requirement
Twin Cities Campus
Applied Developmental Psychology 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 Parkway, Minneapolis, MN 55455 (612-624-0526; fax: 612-624-6373).
Email: borde021@umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 21
- This program does not require summer semesters for timely completion.
- Degree: Appl Developmental Psychology 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 in applied developmental psychology allows graduate students to study and experience applications of developmental science issues, policies, and problems concerning children and child development at the local, state, and national level. Through the combination of theory and field experience, students learn how to help solve pressing real-life problems and to improve the lives of children. The 21-credit program explores such topics as ethical issues in applied developmental psychology; media and children's programming; nutrition and hunger; accidents and safety issues; children in the judicial system; the design and role of children's museums; and the development of children's toys, games, and recreational activities. Professionals in this field need to develop an in-depth understanding of how public policy affects children's lives, how to make pure research comprehensible and practical without losing its complexity, and how to work in interdisciplinary teams.

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 this program is currently suspended.

Special Application Requirements:
Admission is based primarily on the applicant's academic record, GRE scores, and research experience.

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 3.00 is required for students to remain in good standing.

CPSY 8360 Section 7 (2 cr) gives an overview of applied developmental science problems and provides a framework for the second two components of the program. CPSY 8301 (4 cr) and 8302 (4 cr) are the core courses in developmental psychology covering biological, cognitive, and social aspects of development. They are fundamental to understanding the developmental perspective. CPSY 8996 (5 cr) integrates and applies information learned in coursework. The course is individually designed based on each student's prior experience and interests. Students focus on practical and/or public policy applications of developmental research in settings such as the Search Institute, the Minnesota Children's Museum, the guardian ad litem program in the local courts, the Center for 4-H Youth Development, and the National Institute on Media and the Family. This field experience may be taken in one to three semesters or a summer session, but must be at least 5 credits and total 188 hours. A major paper describing the field experience and integrating relevant basic research literature with practical availability taking place in the field setting is expected. Electives (6 cr) may include 5xxx or 8xxx courses approved by the training directors and chosen to complement the student's area of interest.

Required Courses
Students must take CPSY 8360 for 2Cr. and CPSY 8996 for 5 Cr.
CPSY 8360 - Special Topics in Developmental Psychology (1.0 - 3.0 cr)
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)
Electives (6 cr) may include 5xxx or 8xxx courses approved by the training directors and chosen to complement the student's area of interest.
Twin Cities Campus

Applied Kinesiology M.Ed.

Kinesiology, School of

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
School of Kinesiology, 220 Cooke Hall, 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: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.Ed.) 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 in their current work responsibilities. The M.Ed. in applied kinesiology examines human movement, physical performance, and organizational structures of sport, exercise and movement science, sport and recreation management, and physical activities for persons with disabilities. The subplans in K-12 physical education, health education, and developmental and adapted physical education prepare future educators to assume leadership roles in K-12 schools.

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. Five program options are available:
1. Sport and exercise science: general preparation in a variety of areas or in-depth preparation in one area of applied kinesiology
2. Sport management: a primary focus on the management of sport and physical activity settings
3. Developmental and adapted physical education (DAPE): prepares students for Minnesota teaching licensure in DAPE for grades preK-12
4. Physical education: designed to help students become inquiring, analytical, and reflective professional educators knowledgeable about the science of movement who are prepared for leadership roles in the schools.
5. Health education: designed to prepare students in important aspects of health and well-being and who are enthusiastic and prepared for leadership roles in the schools.

Note: Candidates for the DAPE M.Ed./additional license must hold a current Minnesota teaching license in physical education.

Accreditation
This program is accredited by National Association for Colleges of Teacher Education (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 2.50.

A bachelor's degree, preferably in physical education or kinesiology.

Special Application Requirements:
Each Track has a different application due date, please see web site: http://www.cehd.umn.edu/kin/programs.asp

All applicants must submit the following items:
- Official transcripts from all postsecondary institutions the student has attended or is currently attending, except the University of Minnesota. Transcripts must be received from the issuing school in a sealed and stamped envelope, and mailed to School of Kinesiology, Cooke Hall, 1900 University Ave. Se., Minneapolis, MN 55455.
- Any student with a U.S. bachelor's degree or a comparable foreign degree from an accredited college or university may apply to
CEHD. Official transcripts of all previous post-secondary academic study must be submitted. Transcripts from coursework completed at a university outside of the United States must be evaluated by a professional credential evaluation center.

- Developmental and adapted physical education (DAPE) subplan applicants must submit a copy of current K-12 physical education license(s).

All applicants must upload or submit the following items with their online applications:
- A résumé
- A personal statement describing the applicant's career goals and rationale for interest in the M.Ed. program (limit two pages)

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 20 to 30 major credits and 0 to 10 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.

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.

**Developmental and Adapted Physical Education**

The M.Ed. in Applied Kinesiology-Developmental and Adapted Physical Education (DAPE) subplan is designed for students who currently hold a Minnesota teaching license in physical education and who wish to expand their knowledge and experience to teaching developmental and adapted physical education.

The M.Ed. in Applied Kinesiology -- DAPE subplan requires a minimum of 30 graduate-level credits. Students who currently have their Minnesota teaching license in physical education generally obtain their additional license in DAPE in the School of Kinesiology and take an additional 7 course credits to earn the M.Ed. Students must maintain a 3.0 GPA.

**DAPE Required Courses**

The M.Ed. requires 16 credits of Kinesiology courses, 13 credits of Educational Psychology courses, and 1 elective credit. Students register for 4 credits of KIN 5196 and 3 credits of KIN 5995.

**Required Kinesiology Courses**

- **KIN 5103** - Developmental/Adapted Physical Education (3.0 cr)
- **KIN 5104** - Physical Activities for Persons with Disabilities (3.0 cr)
- **KIN 5196** - Practicum: Developmental/Adapted Physical Education (1.0 - 4.0 cr)
- **KIN 5995** - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)

Take either KIN 4981 or KIN 5981 in consultation with adviser.
- **KIN 4981** - Understanding Kinesiology Research (3.0 cr)
- or **KIN 5981** - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)

**Required Educational Psychology Courses**

- **EPSY 5613** - Foundations of Special Education I (3.0 cr)
- **EPSY 5614** - Assessment and Due Process in Special Education (4.0 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)

Elective courses
Students must take a minimum of 1 additional course credit in Kinesiology in consultation with adviser. An elective course taken outside Kinesiology must be approved by the adviser.

Physical Education
The physical education initial licensure program at the University of Minnesota is designed to help students become inquiring, analytical, and reflective educators with a strong experiential base on which to apply the principles and methods learned in their University courses. This program has a subset of prerequisite courses. Contact the School of Kinesiology for more information.

The Master of education (M.Ed.)/initial licensure program is for individuals with bachelor's degrees who wish to become licensed teachers. This graduate-level program provides rigorous, professional teacher preparation in accordance with the Minnesota Standards for Effective Practice for Teachers and the Physical Education Content Standards adopted by the Minnesota Board of Teaching.

Required Core Coursework
Students take 21 credits of kinesiology courses in pedagogical and theoretical foundations of education, curriculum, and clinical experience. Courses required are listed below and should be taken in consultation with the adviser. Students must register for 4 credits of KIN 6598 and 2 credits of KIN 5995.

KIN 6151 - Theoretical Foundations of Curriculum and Instruction in Physical Education (2.0 cr)
KIN 6521 - Pedagogy I: Elementary Physical Education (4.0 cr)
KIN 6522 - Pedagogy II: Secondary Physical Education (4.0 cr)
KIN 6598 - Clinical Experience III: Physical Education (2.0 - 6.0 cr)
KIN 5152 - Curriculum Development in Physical Education (2.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)
Take either KIN 4981 or KIN 5981 in consultation with adviser.

KIN 4981 - Understanding Kinesiology Research (3.0 cr)
or KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)

Elective Courses
Students take 9 credits of elective coursework in consultation with the adviser.

Health Education
The health education initial licensure program is designed to help students become inquiring, analytical, and reflective professional educators in health and health-related issues. The program seeks to develop thoughtful practitioners who can respond to the latest developments related to health and well-being and who are enthusiastic and prepared for leadership roles in the schools.

Master of education (M.Ed.)/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 Minnesota Standards for Effective Practice for Teachers and the Physical Education Content Standards adopted by the Minnesota Board of Teaching.

Teachers who are currently licensed by the state of Minnesota may obtain a Health Education Additional License offered by the School of Kinesiology.

The M.Ed. in Applied Kinesiology -- Health Education subplan requires a minimum of 30 graduate-level credits. Students must maintain a 3.0 GPA. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education. For more information on the initial licensure program, go to the School of Kinesiology website.

Required Core Courses
Students take 22 credits of kinesiology courses in theoretical foundations of health education, curriculum, and clinical experience. Courses required are listed below and should be taken in consultation with the adviser. Students must register for 4 credits of KIN 6202 and 2 credits of KIN 5995.

KIN 5201 - Health Education Foundations (3.0 cr)
KIN 5202 - Current Issues in Health (2.0 cr)
KIN 5203 - Health Media, Consumerism, and Communication (2.0 cr)
KIN 5204 - Methods in Health Education (3.0 cr)
KIN 5205 - Health Education Curriculum (3.0 cr)
KIN 6202 - Clinical Experience II: Health Education (2.0 - 6.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)
Take either KIN 4981 or KIN 5981 in consultation with adviser.
KIN 4981 - Understanding Kinesiology Research (3.0 cr)
or KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)

Elective Courses
Students take 8 credits of elective coursework in consultation with the adviser.

Sport and Exercise Science: Professional Studies
Students will complete a total of 30 course credits, including a minimum of 20 kinesiology course credits and a maximum of 10 credits of non-KIN electives. This emphasis has three concentrations: Sport Performance, Athletic Training, and Health Promotion. A maximum total of 9 credits of 4xxx-level courses are allowed with adviser's consent. Students must maintain a minimum 3.0 GPA.

Required Courses
Students must consult with their adviser to determine their appropriate concentration and coursework. All concentrations require the following courses. Students register for 4 credits of KIN 5995.
KIN 4981 - Understanding Kinesiology Research (3.0 cr)
KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)

Recommended KIN Elective Courses
A minimum of 13 credits should be chosen from the following list with adviser consultation. KIN 5720, KIN 5992 and KIN 5696 are limited to 3-4 credits.
KIN 4385 - Exercise Physiology (4.0 cr)
or KIN 4641 - Training and Conditioning for Sport (3.0 cr)
or KIN 4520 - Current Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 4741 - Strength and Power Development and Program Design (3.0 cr)
or KIN 4841 - Athletic Performance and Environmental Considerations (3.0 cr)
or KIN 4941 - Applied Sport Science (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 5136 - Psychology of Coaching (3.0 cr)
or KIN 5142 - Applied Sport Nutrition for Athletic Performance (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 - Competitive Sport for Children and Youth (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 5723 - Psychology of Sport Injury (3.0 cr)
or KIN 5725 - Organization and Management of Physical Education and Sport (3.0 cr)
or KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)
or KIN 5696 - Practicum in Kinesiology (1.0 - 6.0 cr)

Recommended non-KIN electives
A maximum of 10 credits of non-KIN courses may be taken. Students should consult with their adviser to determine the most appropriate courses based on academic background and future career goals.
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PHSL 5444 - Muscle (3.0 cr)
or PHAR 5201 - Applied Health Sciences Terminology (2.0 cr)
or PHAR 5205 - Obesity: Issues, Interventions, Innovations (2.0 cr)
or PHAR 5206 - Applied Health Literacy and Communication (3.0 cr)

Sport Management: Professional Studies
Students will complete a total of 30 credits, including 22 core course requirements and a minimum of 8 electives. 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.

Required Courses
Students must register for 3 credits of KIN 5995, which must be taken in the last semester of study.
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)
Must be taken prior to KIN 5995:
KIN 4981 - Understanding Kinesiology Research (3.0 cr)
or KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)

Elective Courses
Students choose a minimum of 8 elective credits in consultation with adviser. Recommended electives are listed, however one (1) course may be selected from outside Kinesiology, such as in 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 5111 - Sports Facilities (3.0 cr)
KIN 5115 - Event Management in Sport (3.0 cr)
KIN 5371 - Sport and Society (3.0 cr)
KIN 5461 - Issues in the Sport Industry (3.0 cr)
KIN 5511 - Sport and Gender (3.0 cr)
KIN 5804 - National Collegiate Athletic Association (NCAA) Compliance (2.0 cr)
KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
**Twin Cities Campus**

Autism Spectrum Disorders 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, 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](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 2014
- Length of program in credits: 13
- 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 disorders (ASD) is designed to prepare teachers and related service personnel to design and deliver services to children and youth with ASD and their families.

ASD are developmental disorders of neurobiological origin that can affect intellectual functioning, social abilities, and language and communication skills.

This 13-credit program offers 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 psychology and education 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 campus. 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 (no more than one page)
- Completed 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.
- Foreign transcript evaluation (if applicable) from an accredited reviewer (ECS [http://www.ece.org/](http://www.ece.org/) or WES [http://www.wes.org/students/index.asp](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
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 moment 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 (13 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 5633 - Module 3: Speech-generating Devices and High-Tech AAC (1.0 cr)
EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorders (3.0 cr)
Twin Cities Campus
Business and Industry 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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
• Requirements for this program are current for Fall 2014
• 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.

Note: This program is no longer accepting new students.

Program Delivery
This program is available:
• via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
This program no longer accepts new students

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 14 to 30 major credits and 0 to 16 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.

Required Coursework
NOTE: 6 credits of other program related courses must be taken if these requirements have already been completed. An additional course option (OLPD 5425) in lieu of OLPD 5475 used to be available but is no longer offered by OLPD. Number of credits of OLPD 5476 determined by adviser. Related coursework and elective options determined in consultation with adviser and based on student's subplan where applicable.

OLPD 5405 - Critical Issues in Business and Industry (3.0 cr)
OLPD 5475 - Curriculum Development for Business and Marketing Education (3.0 cr)
OLPD 5476 - Field Based Projects in Business and Industry (1.0 - 4.0 cr)
OLPD 5496 - Occupational Experience in Business and Industry (1.0 - 10.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)
10 credits of 5xxx courses consistent with the student's focus area to be chosen in consultation with an adviser.
Electives as needed to reach 30 credits total with adviser approval
Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

Business and Marketing Education
Sub-plan used to help adviser and student determine courses taken to meet the 10 credits of 5xxx-level coursework and elective requirements.

Industrial Education
Sub-plan used to help adviser and student determine courses taken to meet the 10 credits of 5xxx-level coursework and elective requirements.

Postbaccalaureate B.M.E.
Sub-plan used to help adviser and student determine courses taken to meet the 10 credits of 5xxx-level coursework and elective requirements.

Postbaccalaureate Ind
Sub-plan used to help adviser and student determine courses taken to meet the 10 credits of 5xxx-level coursework and elective requirements.
Twin Cities Campus
Career and Technical 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, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455
(612-624-1700; fax: 612-624-2231)
Email: opdo@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 2014
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Technical 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.

This certificate is designed for current instructors and those preparing to instruct in technical and community college settings, or individuals seeking a credential for workplace advancement.

Completion of Teacher Education Series (TES) requirements for this certificate program prepares students for state teaching licensure in secondary and postsecondary career and technical education. Licensure is granted by the Minnesota State Colleges and Universities (MnSCU) system and the Minnesota Department of Education (MDE).

Seventy-five percent of the certificate coursework must be completed at the University of Minnesota. Most courses will be offered on the University's Twin Cities campus, but additional courses may be offered elsewhere.

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:
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 towards program requirements is not permitted.

A minimum GPA of 2.80 is required for students to remain in good standing.

A 12-credit Regents-approved career and technical education certificate is available to students who wish to obtain a credential after completing the Teacher Education Series (TES) and approved electives.

Required courses
Minimum 8-10 credits
Students must complete the four required TES courses, listed below. For participants with no previous pedagogy courses, an additional 2 credit graduate level course related to pedagogy determined in consultation with the adviser will be required, but can be waived for those with previous pedagogy training or experience.
OLPD 5806 - Philosophy and Practice of Career and Technical Education (2.0 cr)
OLPD 5808 - Student and Trainee Assessment (2.0 cr)
OLPD 5829 - Course Development for Business and Industry (2.0 cr)
OLPD 5861 - Instructional Methods for Business and Industry (2.0 cr)

Students are encouraged to consult faculty adviser about appropriate elective course(s) to complete the program's 12-credit requirement. Elective courses must be approved by a faculty adviser.
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)
Website: http://www.cehd.umn.edu/icd

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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. Students may choose to complete this master's degree (typically Plan B) during their progress toward the Ph.D. See the Child Psychology Ph.D. for more information.

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 16 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 16 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.

Plan A requires a minimum of 20 course credits (a minimum of 16 in the child psychology major and 4 additional credits chosen with the adviser) and 10 thesis credits. Plan B requires 30 course credits (a minimum of 16 credits in the child psychology major, 6 additional credits chosen with the adviser, and 8 credits of CPSY 8994 for the plan B project). A plan B project equivalent to 120 hours of work is required.

Major Courses
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
- CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
- CPSY 8311 - Landmark Issues and Great Controversies in Child Development (2.0 cr)
- EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
- EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)

Additional Credits As Needed, Selected with Adviser
Plan A
Take 10 or more credit(s) from the following:
• CPSY 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Take 8 or more credit(s) from the following:
• CPSY 8994 - Research Problems in Child Psychology (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.
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: icdapply@umn.edu
Website: http://www.cehd.umn.edu/icd

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 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 child psychology director of graduate studies prior to declaring 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.

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

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Ph.D. in child psychology focuses primarily on training for research in normal human development, and most students take positions in academic or research settings. 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. General program 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.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
The equivalent of three semester (or four quarter) courses in psychology and one course in statistics are required.

New students are normally admitted in fall semester. Application deadline is December 1st of the preceding year. Applicants must submit, via the online application system, a departmental application for graduate work, scores from the General Test of the GRE that are less than five years old, three letters of recommendation from persons familiar with their scholarship and research potential, a complete set of unofficial transcripts, and a clearly written statement of career interests, goals, and objectives. The three letters of recommendation also must be received by the deadline. The TOEFL should be submitted when applicable. Official transcripts are only required if an offer of admission is made. For full application instructions see: http://www.cehd.umn.edu/icd/FutureStudents/CPSY/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
44 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 Ph.D. 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 44 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 8311 - Landmark Issues and Great Controversies in Child Development (2.0 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)
Take 5 or more credit(s) from the following:
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• CPSY 8660 - Advanced Developmental Psychology (1.0 - 4.0 cr)

Statistical Analysis
EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
EPSY 8252 - Methods in Data Analysis for Educational Research 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)

Additional Credits as Needed, Selected 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 2014
- 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 Ph.D. 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 M.D./Ph.D. 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 Ph.D. 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 adviser 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.

**Doctoral**

**Required Courses for Clinical Movement Science/Clinical Physiology Ph.D. Minor**
- 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 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)
- 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)
- 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 Physiology (3.0 cr)
  or NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
  or NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
- NURS 8171 - Qualitative Research Design and Methods (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)
  or 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 - Rehabilitation Science Instrumentation and Methodology (4.0 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 8282 - Problems in Human Movement (4.0 cr)

**Master's**

**Required Courses for Clinical Movement Science/Clinical Physiology Master's Minor**
- CPMS 5101 - Introduction to Clinical Physiology and Movement Science (3.0 cr)

**Electives**
Electives are chosen in consultation with the adviser. NURS 8173 and SAPH 8173 are cross-listed.
- 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)
- NURS 5222 - Advanced Physiology (3.0 cr)
  or NURS 8173 - Principles and Methods of Implementing Research (3.0 cr)
  or NURS 8175 - Quantitative Research Design and Methods (3.0 cr)
- NURS 8171 - Qualitative Research Design and Methods (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)
  or PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
  or RSC 5814 - Age, Exercise, and Rehabilitation (2.0 cr)
  or RSC 5841 - Rehabilitation Science Instrumentation and Methodology (4.0 cr)
  or RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
  or RSC 8135 - Advanced Kinesiology (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)
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 - Rehabilitation Science Instrumentation and Methodology (4.0 cr)
or RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)
or RSC 8135 - Advanced Kinesiology (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)
Clinical Physiology and Movement Science Postbaccalaureate Certificate

Twin Cities Campus

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 2014
- 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.
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 8172 - 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 Physiology (3.0 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 - Rehabilitation Science Instrumentation and Methodology (4.0 cr)

*or* RSC 8130 - Current Literature Seminar (1.0 - 3.0 cr)

*or* RSC 8135 - Advanced Kinesiology (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 - Rehabilitation Science Instrumentation and Methodology (4.0 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
Community and 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 (612-625-2545; fax: 612-624-8277)
Email: cigs@umn.edu
Website: http://cehd.umn.edu/ci

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2014
• Length of program in credits: 15
• This program does not require summer semesters for timely completion.
• Degree: Community and 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 community and learning certificate is designed to prepare individuals who work in community-based organizations and programs for the informal educational responsibilities that often accompany their roles.

This 15-credit certificate program prepares students to foster learning outside of the classroom and in their communities. Students will develop informal teaching and learning skills based on engagement and collaboration, and building trust and respect among participants.

The program is designed for individuals involved in community life. Examples include public health worker, youth worker, youth program leader, youth program evaluator, community program developer, community activist, community organizer, community educator, community program evaluator, environmental educator, civic engagement educator, political organizer, and teacher.

Certificate goals include providing students with:
- broad understanding of the history of democratic educational traditions and practices in community settings;
- greater knowledge of and experience with the pedagogy of teaching and learning in informal learning and everyday life situations; and
- leadership abilities that support individual and group learning, civic engagement, and empowerment.

The program is offered by the Department of Curriculum and Instruction (C&I). The certificate can also provide a portal to additional study, since courses may be applied toward a graduate-level 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 2.80.

Applicants must hold a bachelor's degree from an accredited college or university.

Special Application Requirements:
This program is not recommended for international students because required courses and electives may not be offered frequently enough to meet visa requirements for courses taken each semester, unless the student is also enrolled in another degree-granting program and is completing this certificate in conjunction with it.

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 3.00 is required for students to remain in good standing.

Note: Certificate coursework completed with undergraduate student status cannot be applied to graduate-level degree programs.

Required Courses

The certificate requires students to complete 15 credits from the following courses.

Students must complete required courses totaling 6 credits:
YOST 5972 - Education in the Community (3.0 cr)
YOST 5974 - The Democratic Learning Community (3.0 cr)

Elective Credits

In addition, students must complete at least 9 credits from the following courses (and may not include more than one 4xxx course). Note: Students seeking graduate credit for PHIL 4324, PHIL 4325, or PHIL 4326 must also register concurrently for PHIL 8300.

To enroll in SW 8505 - Advanced Community Organization and Advocacy, students must be doctoral students in social work, or receive the approval of their adviser and the course instructor.

YOST 5952 - Everyday Lives of Youth (3.0 cr)
YOST 5954 - Experiential Learning: Pedagogy for Community and Classroom (3.0 cr)
YOST 5958 - Community: Context for Youth Development Leadership (3.0 cr)
PHIL 4324 [Inactive] (3.0 cr)
PHIL 4325 - Education and Social Change [AH, CIV] (4.0 cr)
PHIL 4326 - Lives Worth Living: Questions of Self, Vocation, and Community [CIV, AH] (4.0 cr)
PHIL 8300 - Workshop in Moral and Political Philosophy (1.0 cr)
PA 5012 - The Politics of Public Affairs (3.0 cr)
SW 8505 - Advanced Community Organization and Advocacy (3.0 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 S.E., 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 2014
- 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 (M.Ed.)/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)

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.

Art Education

This sub-plan is limited to students completing the program under Plan C.

The M.Ed./professional studies program in Art Education is designed for experienced art teachers and others who want to acquire advanced knowledge and leadership skills in the field of art 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 M.Ed./professional studies - Art Education sub-plan requires 12 credits of core coursework, 12 credits of Art 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 (3.0 cr)
CI 5186 - School-Related Projects (1.0 - 4.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)

Art Education Requirements (12 credits)

CI 5075 and CI 5078 are required; CI 5075 can be taken for 1-3 credits. Other courses listed can be taken for desired amount of variable credits provided 12 total credits between required and elective courses for Art Education are completed.
CI 5075 - The Social and Historical Foundations of Art Education (1.0 - 3.0 cr)
CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)

Art Education Electives

CI 5049 and CI 5050 can be taken for 1-4 credits.
Take 7 - 9 credit(s) from the following:
• CI 5049 - Art Media Techniques (1.0 - 4.0 cr)
• CI 5050 - Issues in Art Education (1.0 - 4.0 cr)
• CI 5069 - Curriculum Innovations in Art Education (3.0 cr)

Electives (6 credits)

Courses will be selected in consultation with faculty adviser.

Elementary Education

This sub-plan is limited to students completing the program under Plan C.

ALERT: the M.Ed./professional studies degree program in Elementary Education is currently suspended. We are not accepting applications at this time.

The M.Ed./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 M.Ed./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 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)

Elementary Education Requirements (15 credits)
Courses will be selected in consultation with faculty adviser.

**Electives (12 credits)**
Courses will be selected in consultation with faculty adviser.

**English Education**
This sub-plan is limited to students completing the program under Plan C.

The M.Ed./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 M.Ed./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 - Culturally Diverse Books 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 Film, Television, and Media Studies (3.0 cr)
- CI 5475 - Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing (3.0 cr)
- CI 5641 - Language, Culture, and Education (3.0 cr)
- CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)

**Electives (6 credits)**
Courses will be selected in consultation with faculty adviser.

**Environmental Education**
This sub-plan is limited to students completing the program under Plan C.

**Environmental Education**
This sub-plan is limited to students completing the program under Plan C.

ALERT: the M.Ed./professional studies degree program in Environmental Education is currently suspended. We are not accepting applications at this time.

The M.Ed./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 M.Ed./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 three credits, chosen in consultation with the faculty adviser, 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 adviser from the following fields: natural sciences, social sciences, humanities, education, natural resources, and agriculture.
Interdisciplinary Studies
This sub-plan is limited to students completing the program under Plan C.

The M.Ed./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. 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 M.Ed./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.

Interdisciplinary Studies 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 (3.0 cr)
• CI 5540 - Special Topics: Science Education (1.0 - 8.0 cr)
• CI 5150 - Curriculum Topics (1.0 - 6.0 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.

Learning Technologies
This sub-plan is limited to students completing the program under Plan C.

The M.Ed./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 M.Ed. program, students may earn a certificate while earning the M.Ed. degree.

The M.Ed./professional studies - Learning Technologies sub-plan (option 1, with Online Distance Learning or Multimedia Design and Development certificate) requires 9 credits of core coursework, 12 credits of Learning Technologies coursework and 9 credits of electives for a total of 30 credits.

The M.Ed./professional studies - Learning Technologies sub-plan (option 2, with K-12 Technology Integration certificate) requires 9 credits of core coursework, 16 credits of Learning Technologies coursework and 5 credits of electives for a total of 30 credits.

M.Ed.-LT: Options 1 or 2

M.Ed. - LT w/ Online Distance Learning or Multimedia Design & Development certificate
Core Coursework (9 credits)
CI 5190 should be taken for 3 credits
CI 5331 - Introduction to Learning Technologies (3.0 cr)
CI 5177 - Practical Research (3.0 cr)
CI 5190 - Directed Individual Study in Curriculum and Instruction (1.0 - 6.0 cr)

LT Requirements (12 credits)
Take 4 or more course(s) totaling 12 or more credit(s) from the following:
• 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)
• 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 5367 - Interactive Multimedia Instruction (3.0 cr)

Electives (9 credits)
3 credits under EPSY-designation; 6 credits related to technology use or education for a total of 9 credits.
-OR-

M.Ed. - LT w/ K-12 Technology Integration certificate
Core Coursework (9 credits)
CI 5190 should be taken for 3 credits
CI 5331 - Introduction to Learning Technologies (3.0 cr)
CI 5177 - Practical Research (3.0 cr)
CI 5190 - Directed Individual Study in Curriculum and Instruction (1.0 - 6.0 cr)

LT Requirements (16 credits)
Required courses are listed; additional 3 credits will be selected with faculty adviser for a total of 16 credits. CI 5330 should be taken for 3 credits.
OLPD 5310 - Data-Driven Decision Making I (1.0 cr)
CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
CI 5330 - Special Topics in Learning Technologies (1.0 - 3.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)
CI 5361 - Teaching and Learning with the Internet (3.0 cr)

Electives (5 credits)
Courses must be related to technology use or education.

Mathematics Education
This sub-plan is limited to students completing the program under Plan C.

The M.Ed./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 M.Ed./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 (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 5170 - Historical Topics in the Mathematics Classroom (1.0 - 3.0 cr)
• MTHE 5171 - Teaching Problem Solving (3.0 cr)
• MTHE 5172 - Teaching Probability and Statistics (3.0 cr)
• MTHE 5355 - Mathematics for Diverse Learners (3.0 cr)

Electives (10 credits)
Courses will be selected in consultation with faculty adviser. 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.

The M.Ed./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 M.Ed./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 adviser.

Social Studies
This sub-plan is limited to students completing the program under Plan C.

ALERT: the M.Ed./professional studies degree program in Social Studies Education is currently suspended. We are not accepting applications at this time.

The M.Ed./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 M.Ed./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 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)

Social Studies Requirements (15 credits)
Courses will be selected in consultation with faculty adviser.

Electives (12 credits)
Courses will be selected in consultation with faculty adviser.

Second Languages and Cultures
This sub-plan is limited to students completing the program under Plan C.

The M.Ed./professional studies program in Second Languages and Cultures (SLC) 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 languages and cultures education. The SLC program addresses the needs and interests of second language educators in a variety of teaching contexts, including world languages, English as a second/foreign language (ESL/EFL), bilingual, and immersion settings. 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.

Three M.Ed.- SLC options are offered. Option 1 requires a final project. Option 2 combines the M.Ed. with the certificate program in Dual Language and Immersion Education and requires a final project. Option 3 combines the M.Ed. with the certificate program in Advanced Practices in Second Language Teaching and does not require a final project.

The M.Ed./professional studies - Second Languages and Cultures sub-plan (option 1) requires 12 credits of core coursework, 12 credits of Second Languages and Cultures coursework and 6 credits of electives for a total of 30 credits.

The M.Ed./professional studies - Second Languages and Cultures sub-plan (option 2, with Dual Language & Immersion Education certificate) requires 12 credits of core coursework, 16 credits of Second Languages and Cultures coursework and 2 credits of electives for a total of 30 credits.

The M.Ed./professional studies - Second Languages and Cultures sub-plan (option 3, with Advanced Practices in Second Language Teaching certificate) requires 8 credits of core coursework and 22 credits of Second Languages and Cultures coursework for a total of 30 credits.

M.Ed.-SLC: Options 1, 2, or 3

M.Ed. - SLC
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 (3.0 cr)
CI 5186 - School-Related Projects (1.0 - 4.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)
   or LGTT 5101 - Applications of Technology in Language Teaching (3.0 cr)

SLC 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 adviser

-OR-

M.Ed. - SLC w/ Dual Language & Immersion Education certificate
Core Coursework (12 credits)
CI 5660 should be taken for 2 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 (3.0 cr)
CI 5186 - School-Related Projects (1.0 - 4.0 cr)
CI 5351 - Technology Tools for Educators (3.0 cr)
   or LGTT 5101 - Applications of Technology in Language Teaching (3.0 cr)

SLC Requirements (16 credits)
CI 5660 should be taken for 2 credits
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)
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 5673 - Immersion 101: An Introduction to Immersion Teaching (2.0 cr)
   or CI 5674 - Immersion 101: An Introduction to Immersion Teaching in Character-based Languages (2.0 cr)

Electives (2 credits)
Course will be selected in consultation with faculty adviser

-OR-

M.Ed. - SLC w/ Advanced Practices in Second Language Teaching certificate
Core Coursework (8 credits)
CI 5655 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
CI 5657 - Practical Research (3.0 cr)
LGTT 5110 - Technology in the Second Language Classroom (2.0 cr)

SLC Requirements (22 credits)
CI 5621 - Culture as the Core in the Second Language Classroom (2.0 cr)
CI 5622 - Second Language Acquisition Basics for Teachers (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 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)
Take 3 or more course(s) totaling 6 or more credit(s) from the following:
• 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
Disability Policy and Services 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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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.
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 certificate coordinator 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 credits and at least 200 hours.
Twin Cities Campus
Dual Language and Immersion Education 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 2014
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: 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 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, 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 United States 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:
- 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 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:
Applicants 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)

Courses will be selected in consultation with the faculty adviser for a total of 6 credits.
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: icdapply@umn.edu
Website: http://www.cehd.umn.edu/icd/

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 52 to 56
- 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 of education (M.Ed.) 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 teaching 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, creating positive classroom communities, all forms of professional writing and lesson planning, authentic assessment, documentation of student learning, reflective practice, professional development, and ethics.

Master 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 content standards adopted in fall 2010 by the Minnesota Board of Teaching.

This program includes two components: initial licensure and the M.Ed. degree. After successfully completing initial licensure requirements, students are recommended for state licensure in Minnesota to teach early childhood education (birth-third grade). After completing all M.Ed. degree requirements, including a master's paper, students are awarded the M.Ed. degree. Students have five years from initial enrollment in the program to complete their M.Ed. degree, and must maintain a 2.80 GPA to be eligible for the M.Ed.

Two groups of students typically apply to this M.Ed./initial licensure program.
1. Early Childhood Education: Foundations graduates--These applicants have completed or are completing the separate CEHD undergraduate Early Childhood Education Foundations program. Upon admission to the graduate program, this group typically completes the licensure portion in two semesters plus one summer, with an additional semester to complete the master's degree.
2. All other applicants--These applicants have not completed the undergraduate Early Childhood Education: Foundations program. This group typically completes the licensure portion of the program in five semesters, with an additional semester to complete the master's degree. Students who wish to take coursework part-time may do so, which will extend the time needed to complete the program. Required coursework is scheduled throughout the day, as well as in the evening.

Accreditation
This program is accredited by National Association for Colleges of Teacher Education (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 2.80.
A bachelor's degree must be completed at the time of matriculation. The preferred bachelor's degree is Early Childhood Education: Foundations.

Required prerequisites

Prerequisite Coursework
Prerequisite coursework is required to meet the Standards of Effective Practice for Teachers (SEPT) and content standards adopted in fall 2010 by the Minnesota Board of Teaching: "The teacher understands the central concepts, tools of inquiry, and structures of the discipline s/he teaches." Prerequisites may be completed after admission to the program.

- CPSY 2301 - Introductory Child Psychology (4.0 cr)
- CPSY 4331 - Social and Personality Development (3.0 cr)
- CPSY 4343 - Cognitive Development (3.0 cr)
- CPSY 4993 - Directed Experiences 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)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- ED 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 unrelated to early childhood education are eligible to apply with the understanding that they will take approximately 30 additional credits to meet state licensure standards.

Special Application Requirements:
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. If you are admitted, the University will then request official copies of this material. If you completed coursework at a university outside of the United States, your transcripts must be evaluated by a professional credential evaluation center by requesting a course-by-course evaluation. This transcript evaluation does not need to be submitted when you apply, but it is needed by the end of the first term to meet state licensing requirements.

2. Resume

3. Three Admission Statements

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 Basic Skills Test [Reading (test code 001), Writing (test code 002), and Mathematics (test code 003)] prior to beginning the program.

See full application instructions at: http://www.cehd.umn.edu/icd/futurestudents/ece/graduate/

Application Deadlines:
December 15 for summer or fall enrollment
September 15 for spring enrollment

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
    - Paper Based - Total Score: 650

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 52 to 56 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.

Students complete foundations, methods, and student teaching coursework for licensure. Some of the coursework may be taken for undergraduate credit, before admission into the program. A minimum of 30 graduate-level credits are required for the M.Ed. degree.

M.Ed. Required Coursework

Major Courses

CPSY 5251 - Social and Philosophical Foundations of Early Childhood Education (2.0 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 5801 - Assessment and Decision Making in School and Community Settings (3.0 cr)

CPSY Methods Courses

CPSY 5252W - Facilitating Social and Emotional Learning in Early Childhood Education [WI] (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 - 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:
  • CI 5181 - Clinical Experience in Elementary School Teaching (2.0 - 10.0 cr)
Take 4 - 6 credit(s) from the following:
  • CPSY 5281 - Student Teaching in Early Childhood Education (1.0 - 6.0 cr)

M.Ed. Completion

CPSY 5187 - Master's Paper in Early Childhood Education (2.0 - 4.0 cr)
Twin Cities Campus
Education Sciences 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/MITER/default.html

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 19
- Length of program in credits (Doctorate): 19
- 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 education sciences minor reflects an interdisciplinary effort that combines research in education with research in the basic arts and sciences to address problems of education. The minor draws on coursework from education, educational psychology, cognitive neuroscience, child development, psychology, and public policy. Coursework includes professional socialization courses presenting a general introduction to educational research and experimental methods; two advanced courses in research methods and statistics; and two advanced courses in cognition and learning.

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 includes a total of 19 credits: four courses of required coursework (13 credits), a 3-credit cognition & learning elective, and a 3-credit research methods and statistics elective.

Note: Students may not use course credits to satisfy requirements for both a graduate major and for the education sciences 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
Coursework includes a total of 19 credits: four courses of required coursework (13 credits), a 3-credit cognition & learning elective, and a 3-credit research methods and statistics elective.

Note: Students may not use course credits to satisfy requirements for both a graduate major and for the education sciences minor.

Required Coursework
EPSY 8311 must be taken 3 semesters for a total of 3 credits.
Take 13 or more credit(s) from the following:
- EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
- EPSY 8311 - Education Sciences Proseminar (1.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)

Cognition & Learning Elective
Take 3 or more credit(s) from the following:
- 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 8056 - Seminar: Psychology of Language (3.0 cr)

Research Methods and Statistics Elective
Take 3 or more credit(s) from the following:
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
- PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
- SOC 8801 - Sociological Research Methods (4.0 cr)

Master's
Coursework includes a total of 19 credits: four courses of required coursework (13 credits), a 3-credit cognition & learning elective, and a 3-credit research methods and statistics elective.

Note: Students may not use course credits to satisfy requirements for both a graduate major and for the education sciences minor.

Required coursework
EPSY 8311 must be taken 3 semesters for a total of 3 credits.
Take 13 or more credit(s) from the following:
- EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
- EPSY 8311 - Education Sciences Proseminar (1.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)
- EPSY 8222 - Advanced Measurement: Theory and Application (4.0 cr)

Cognition & Learning Elective
Take 3 or more credit(s) from the following:
- 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 8056 - Seminar: Psychology of Language (3.0 cr)

Research Methods and Statistics Elective
Take 3 or more credit(s) from the following:
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- PSY 5065 - Functional Imaging: Hands-on Training (3.0 cr)
- PSY 5960 - Topics in Psychology (1.0 - 4.0 cr)
- SOC 8801 - Sociological Research Methods (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 S.E., Minneapolis, MN 55455 (612-625-2545; fax: 612-624-8277).
Email: cigs@umn.edu
Website: [http://cehd.umn.edu/ci](http://cehd.umn.edu/ci)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 42
- 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 M.A. degree includes formal tracks in art education; elementary education; learning technologies; literacy education; mathematics education; science education; second languages and cultures 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 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 advisers 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
  - 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 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 26 major credits and 6 to 9 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: All M.A. 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 adviser's supervision.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: For SLC 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 adviser.

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.

Art Education

The M.A. program's art 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 artistic development.
The Art Education track (Plan A) requires 10 credits of required major coursework plus an additional 5 credits of coursework to be selected in consultation with faculty adviser, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 31 credits.

The Art Education track (Plan B) requires 4 credits of required major coursework plus an additional 14 credits of coursework selected in consultation with faculty adviser, 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

Art Ed - Plan A
Total: 31 credits
Major Coursework
Required courses are listed; others selected in consultation with faculty adviser 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 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
Minor or Related Field
Selected in consultation with faculty adviser 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-

Art Ed - Plan B
Total: 30 credits
Major Coursework
Required courses are listed; others selected in consultation with faculty adviser 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)
Research Coursework
CI 8095 is required and should be taken for 3 credits; other courses selected in consultation with faculty adviser 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 adviser for a total of 6 credits

Elementary Education
The M.A. 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 3 credits of required major coursework plus an additional 12 credits of coursework to be selected in consultation with faculty adviser, 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 adviser, 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 adviser for a total of 15 credits
CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
Minor or Related Field
Selected in consultation with faculty adviser 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-
Elem Ed - Plan B
Total: 30 credits

Major Coursework
Courses will be selected in consultation with faculty adviser for a total of 18 credits

Research Coursework
A problems course (CI 8x95) is required and should be taken for 3 credits; other courses selected in consultation with faculty adviser for a total of 6 credits

Minor or Related Field
Selected in consultation with faculty adviser for a total of 6 credits

Learning Technologies
The learning technologies (LT) M.A. track prepares people for research and practice related to multimedia, design, K-12 technology integration, and online distance learning. M.A. 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 M.A.'s LT track is targeted at students interested in a stronger research orientation than those who pursue the master of education degree. M.A. students, who often continue to a Ph.D. 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 6 credits of required major coursework plus an additional 12 credits of coursework to be selected in consultation with faculty adviser, 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 adviser, 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
18 credits are required. 6 credits of required courses are listed; 12 remaining credits must be taken in a technology certificate area.
CI 5331 - Introduction to Learning Technologies (3.0 cr)
CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)

Minor or Related Field
Selected in consultation with faculty adviser 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; 12 remaining credits must 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 adviser 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 adviser for a total of 6 credits

Literacy Education
The M.A. 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.
The Literacy Education track (Plan A) requires 3 credits of required major coursework plus an additional 12 credits of coursework to be selected in consultation with faculty adviser, 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 adviser, 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 adviser for a total of 15 credits
  CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
Minor or Related Field
Selected in consultation with faculty adviser 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-
Lit Ed - Plan B
Total: 30 credits
Major Coursework
Courses will be selected in consultation with faculty adviser for a total of 18 credits
Research Coursework
  CI 8495 is required and should be taken for 3 credits; other courses selected in consultation with faculty adviser 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 adviser for a total of 6 credits

Mathematics Education
The M.A. program's mathematics education track prepares students for research and practice related to K-12 mathematics and engineering education. The M.A. is targeted at students interested in a stronger research orientation than those who pursue the master of education (M.Ed.) degree. M.A. students, who often continue on to a Ph.D. 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 9 credits of required major coursework plus an additional 6 credits of coursework to be selected in consultation with faculty adviser, 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 3 credits of required major coursework plus an additional 12 credits of coursework selected in consultation with faculty adviser, 6 credits of required research coursework plus an additional 3 credits of research coursework selected in consultation with faculty adviser, 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 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
  MTHE 5314 - Teaching and Learning Mathematics (3.0 cr)
  CI 8572 - Learning Theory and Classical Research in STEM Education (3.0 cr)
Major Coursework - Additional Choices
Choose any two of the following for a total of 6 credits. Any variable credit courses should be taken for 3 credits.
  MTHE 5170 - Historical Topics in the Mathematics Classroom (1.0 - 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 adviser 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
Required courses are listed; others selected in consultation with faculty adviser for a total of 15 credits
MTHE 5314 - Teaching and Learning Mathematics (3.0 cr)

Research Coursework
Required courses are listed and MTHE 8995 should be taken for 3 credits; other courses selected in consultation with faculty adviser 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 adviser for a total of 6 credits

Science Education
The M.A. 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 12 credits of required major coursework plus an additional 3 credits of coursework to be selected in consultation with faculty adviser, 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 adviser, 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; others selected in consultation with faculty adviser for a total of 15 credits. CI 8570 should be taken for 3 credits.
CI 5535 - Foundations of Science Education (3.0 cr)
CI 8133 - Research Methods in Curriculum and Instruction (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 adviser 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-

Sci Ed - Plan B
Total: 30 credits

Major Coursework
Required courses are listed; others selected in consultation with faculty adviser 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 adviser for a total of 6 credits.

**Minor or Related Field**

Selected in consultation with faculty adviser for a total of 6 credits.

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### Second Languages and Cultures Education

The second languages and cultures (SLC) education 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 SLC track engage in coursework and projects that balance theory and research with practical application. In addition to the regular curriculum, the second languages and cultures education track offers a specialization in English as a Second Language for Higher Education. This program 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 U.S. and abroad.

In addition to the regular curriculum, the second languages and cultures education track offers a specialization in English as a Second Language for Higher Education. This program 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 U.S. and abroad.

The SLC track (Plan A) requires 15 credits of required major coursework, which includes 3 credits of coursework dependent upon focus area (ESL or non-ESL), plus an additional 3 credits of research methodology coursework to be selected in consultation with faculty adviser, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 34 credits.

The SLC track (Plan B) requires 15 credits of required major coursework, plus an additional 3 credits of coursework depending upon focus area (ESL or non-ESL), 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.

The SLC track, specialization in ESL for Higher Education (Plan A) requires 23 credits of required major coursework, plus an additional 3 credits of coursework selected in consultation with faculty adviser, 6 credits in a minor/related field, and 10 masters thesis credits for a total of 42 credits.

The SLC track, specialization in ESL for Higher Education (Plan B) requires 23 credits of required major coursework, plus an additional 3 credits of coursework selected in consultation with faculty adviser, and 9 credits in a minor/related field for a total of 35 credits.

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### Plan A or Plan B

**SLC - Plan A**

Total: 34 credits

**Major Coursework**

- Required courses are listed; others selected in consultation with faculty adviser for a total of 18 credits
- CI 8213 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 5651 - Foundations of Second Languages and Cultures Education (3.0 cr)
- CI 5662 - Second Language Curriculum Design (3.0 cr)
- CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
- CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (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)

**Minor or Related Field**

Selected in consultation with faculty adviser 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)

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**SLC - Plan B**

Total: 30 credits

**Major Coursework**

- Required courses are listed; others selected in consultation with faculty adviser for a total of 18 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 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)

**Research Coursework**
CI 8695 is required and should be taken for 3 credits; other courses selected in consultation with faculty adviser for a total of 6 credits
CI 8695 - Problems: Second Languages and Cultures Education (1.0 - 6.0 cr)

**Minor or Related Field**
Selected in consultation with faculty adviser for a total of 6 credits

**ESL w/ Higher Education specialization - Plan A**
Total: 42 credits.

**Major Coursework**
Required courses are listed; others selected in consultation with faculty adviser for a total of 26 credits. CI 5660 should be taken for 1 credit.
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 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)
CI 5654 - Practicum in Teaching English as a Second Language (ESL) in Higher Education (6.0 cr)

**Minor or Related Field**
Selected in consultation with faculty adviser 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)

**ESL w/ Higher Education specialization - Plan B**
Total: 35 credits

**Major Coursework**
Required courses are listed; others selected in consultation with faculty adviser for a total of 26 credits. CI 5660 should be taken for 1 credit.
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 5628 - Analyzing Learner Language in Second Language Acquisition (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)
CI 5654 - Practicum in Teaching English as a Second Language (ESL) in Higher Education (6.0 cr)

**Minor or Related Field**
Selected in consultation with faculty adviser for a total of 9 credits

**Social Studies Education**
The M.A.'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 adviser, 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 3 credits of required major coursework plus an additional 15 credits of coursework to be selected in consultation with faculty adviser, 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 adviser for a total of 16 credits. CI 8796 has to be taken for a minimum of 1 credit.
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- CI 5762 - Developing Civic Discourse in the Social Studies (3.0 cr)
- CI 8133 - Research Methods in Curriculum and Instruction (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 adviser 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
Required courses are listed; others selected in consultation with faculty adviser for a total of 18 credits
- CI 5762 - Developing Civic Discourse in the Social Studies (3.0 cr)

Research Coursework
CI 8795 is required and should be taken for 3 credits; other courses selected in consultation with faculty adviser 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 adviser for a total of 6 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 S.E., Minneapolis, MN 55455 (612-625-2545; fax: 612-624-8277)
Email: [ciis@umn.edu](mailto:ciis@umn.edu)
Website: [http://cehd.umn.edu/ci](http://cehd.umn.edu/ci)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 languages and cultures 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.

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 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.

**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 S.E., 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 2014
- 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.

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, postsecondary, and research settings, educational service agencies, and business and industry.

The Ph.D. degree includes formal tracks in the following: art education; culture and teaching; elementary education; learning technologies; literacy education; science, technology, engineering and mathematics (stem) education; second languages and cultures 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 Ph.D. 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, 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
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 towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

A total of 78 credits is required for the Education, Curriculum and Instruction Ph.D. 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 Ph.D. 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 adviser.

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.

Art Education
The Ph.D. program's art 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 Ph.D. 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.

15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
OLPD 8812 - Quantitative Research in Education (3.0 cr)

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.

15 credits of core coursework are required, plus an additional 6 credits of track specific coursework. 33 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
- CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- OLPD 8812 - Quantitative Research in Education (3.0 cr)

**CaT Specific Courses**
- CI 8159 will be taken twice for a total of 6 credits.
- CI 8159 - Culture and Teaching Colloquium (3.0 cr)

**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.

15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
- CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- OLPD 8812 - Quantitative Research in Education (3.0 cr)

**Learning Technologies**
The Ph.D.'s learning technologies (LT) track prepares students for research and practice related to multimedia, design, K-12 technology integration, and online distance learning. Ph.D. 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 Ph.D. 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.

15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
- CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- OLPD 8812 - Quantitative Research in Education (3.0 cr)
**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 advisers 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.

15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 24 doctoral thesis credits are also required.

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**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, and engineering education. Students pursuing this track will choose an area of emphasis in one of the three 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.

12 credits of core coursework are required, plus an additional 6 credits of research coursework and 9 credits of track specific coursework. 27 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 24 doctoral thesis credits are also required.

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<td>Methods in Data Analysis for Educational Research I</td>
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<tr>
<td>EPSY 8252</td>
<td>Methods in Data Analysis for Educational Research II</td>
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**Second Languages and Cultures Education**

The Ph.D. track in second languages and cultures (SLC) 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 Ph.D. track is designed to assume roles as university faculty members, researchers, policy makers, and educational leaders. Independent scholarship is the cornerstone of the Ph.D.

The SLC Ph.D. 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.
15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
- CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- OLPD 8812 - Quantitative Research in Education (3.0 cr)

**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 Ph.D. 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.

15 credits of core coursework are required. 39 additional course credits will need to be selected in consultation with the student's faculty adviser, which includes 12 credits outside the track. 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)
- CI 8133 - Research Methods in Curriculum and Instruction (3.0 cr)
- CI 8148 - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- OLPD 8812 - Quantitative Research in Education (3.0 cr)
Twin Cities Campus

Educational Psychology M.A.

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 2014
- Length of program in credits: 30 to 50
- 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; 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:
Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. Official transcripts from all colleges and universities attended should accompany the application. The GRE is required for all tracks. Applications to CSPP (deadline January 15), and special education (deadline December 1) are accepted for fall admission only. Applications to psychological foundations and quantitative methods in education are accepted for fall admission (deadlines December 1 and March 1) as well as summer admission (deadline March 1) and spring admission (deadline October 15). School psychology does not offer the MA as a terminal degree.

Applicants must submit the following test score(s):
GRE General Test
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 to 40 major credits, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 30 to 50 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 3.00 is required 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 or 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 48-50 credits distributed as follows: 9 credits EPSY core courses, 25 credits in counseling theory and practice and 14-16 credits in the area of emphasis. All courses must be taken on an A-F grade basis. 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 and 3 credits in learning/cognition or social/personality.

- 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)

Counseling Theory & Practice Requirements

- EPSY 8402 - Individual Counseling: Theory and Applications (3.0 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 8501 - Counseling Pre-Practicum (3.0 cr)
- EPSY 8431 - Master's Research Seminar: CSPP (3.0 cr)

Courses in Area of Emphasis
Students must take additional courses (14-16 credits) in their area of emphasis.

Community Emphasis
Students must take 4 credits of EPSY 8503, 4 credits of EPSY 8504, 2 credits electives (in consultation with adviser), and either EPSY 5415 or EPSY 5400 twice for 2 credits each.

- EPSY 8503 - Counseling Practicum I (1.0 - 4.0 cr)
- EPSY 8504 - Counseling Practicum II (1.0 - 4.0 cr)

Elective course (minimum 2 cr.) in consultation with adviser
Take either EPSY 5415 or EPSY 5400 Child/Adol Thry & Issues (2 cr.) and EPSY 5400 Child/Adol Dev & Family Issues (2 cr.).
EPSY 5415 - Child and Adolescent Development and Counseling (4.0 cr)
or EPSY 5400 - Special Topics in Counseling Psychology (1.0 - 4.0 cr)

-OR-

Student Personnel/Higher Ed Emphasis
Students must take 4 credits of EPSY 8503 and 4 credits of EPSY 8504. EPSY 5421/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)
Elective course (minimum 2 cr.) in consultation with adviser

-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
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: 9 credits EPSY core requirements, 3 credits research methodology, and 12 credits in an area of emphasis. Plan A students take 10 thesis credits; Plan B students take 6 research credits and 3 additional credits.

Ed Psych Core Course Requirements
Psychological Foundations students must take 9 credits (3 credits in learning/cognition or social/personality depending on area of emphasis, 3 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.

Learning/Cognition or Social/Personality
learning/cognition
Students in the Social area of emphasis must take one of these courses.
Take 3 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)

or social/personality
Students in the Learning area of emphasis must take one of these courses.
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)

Statistics
Take 3 or more credit(s) from the following:
• EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
• EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)
• EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
• EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (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)

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Information current as of September 19, 2014
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 M.A. 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 adviser.

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 5112 - Knowing, Learning, and Thinking (4.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
- EPSY 5200 - Special Topics: Psychological Foundations (1.0 - 4.0 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 8115 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 8116 - Reading for Meaning: Cognitive Processes in the Comprehension of Texts (3.0 cr)

- OR -

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 5200 - Special Topics: Psychological Foundations (1.0 - 4.0 cr)
- EPSY 8290 - Special Topics: Seminar in Psychological Foundations (1.0 - 6.0 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 - Plan A only

3 additional credits are required for Plan A, 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.

Graduate study in quantitative methods in education (QME) prepares students for a wide variety of careers, including positions in college and university teaching and research, research and evaluation centers, testing publishing firms, public school systems, state departments of instruction, and private industry. The goal of the QME track is to provide students with broad but rigorous methodological skills so that they may conduct research on methodologies, may help to train others in methodology, or will have the skills necessary to conduct research in related fields.

The QME track offers emphases in measurement, evaluation, statistics, and statistics education. Students typically choose one of these areas in addition to achieving competence in all aspects of the curriculum.
Students take 30 credits distributed as follows: 9 credits EPSY core requirements, 18 credits QME core requirements (6 credits can 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 adviser.

**Ed Psych Core Course Requirements**

Students must take 3 credits in statistics, 3 credits in measurement/evaluation and 3 credits in learning/cognition or 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 or Social/Personality**

3 credits required from learning/cognition or social/personality.

**Learning/cognition**

Take 3 or more credit(s) from the following:

- EPSY 5101 - Intelligence and Creativity (3.0 cr)
- EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 8112 - Mathematical Cognition (3.0 cr)
- EPSY 8115 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)

**or 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)
- PSY 5101 - Personality Psychology (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 - Theories of Social Psychology (3.0 cr)

**Plan B Paper**

Students take 3 credits for their Plan B paper.

EPSY 5991 - Independent Study in Educational Psychology (1.0 - 8.0 cr)

**QME Core Course Requirements**

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 - Methods in Data Analysis for Educational Research I (3.0 cr)
- EPSY 8252 - Methods in Data Analysis for Educational Research 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
EPSY 5271 - Becoming a Teacher of Statistics (3.0 cr)
MathEd (MTHE) course in consultation with adviser (3 credits)

School Psychology
School psychology does not offer the M.A. as a terminal degree; rather, the M.A. is required to obtain the Specialist Certificate or Ph.D. in educational psychology.

Students take 30 credits distributed as follows: 9 credits EPSY core requirements and 11-19 credits School Psychology course requirements. Plan A students must take 10 thesis credits; Plan B students take 2 research credits (EPSY 8994).

EPSY Core Course Requirements
Students must take 3 credits in statistics, 3 credits in measurement/evaluation and 3 credits in learning/cognition or 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 - Methods in Data Analysis for Educational Research I (3.0 cr)

Measurement/Evaluation
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)

Learning/Cognition or Social/Personality
EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)
or EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)

Plan B Paper
For students completing the M.A. program under Plan B.
Take 2 or more credit(s) from the following:
• EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

School Psychology Course Requirements
Plan A students choose 11 credits and Plan B students choose 19 credits from the list below.
Take 11 - 19 credit(s) from the following:
• EPSY 5216 - Introduction to Research in Educational Psychology and Human Development (3.0 cr)
• EPSY 5802 - Foundations of Developmental Psychology Across the Lifespan (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 - Assessment Practicum in School Psychology (2.0 cr)
• EPSY 8815 - Individual and System Socio-Emotional Interventions (3.0 cr)
• EPSY 8816 - Individual and Systems Academic Interventions (3.0 cr)
• EPSY 8817 - School Psychological Consultation (3.0 cr)
• EPSY 8818 - Intervention Practicum in School Psychology (1.0 cr)
• EPSY 8821 - Issues in School Psychology (3.0 cr)
• EPSY 8822 - Research in School Psychology (1.0 - 3.0 cr)
• EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)
• EPSY 8849 - Assessment in Early Childhood (3.0 cr)
• EPSY 8800 Special Topic: Emotion and Psychopathology (3 cr.)

Special Education
The special education track offers opportunities for research and specializations in autism spectrum disorders, 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 32 credits distributed as follows: 9 credits EPSY core courses, 10 credits Special Ed course requirements, 3 elective credits (in consultation with adviser). Plan A students must take 10 thesis credits; Plan B students take 8 credits in Research Problems (EPSY 8994) and 4 additional credits (in consultation with adviser).

EPSY Core Course Requirements
Students must take 3 credits in statistics, 3 credits in measurement/evaluation and 3 credits in learning/cognition or 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 - Methods in Data Analysis for Educational Research I (3.0 cr)
- EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)
- EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
- EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (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 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

measurement
Take 3 or more credit(s) from the following:
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 cr)
- EPSY 8221 - Psychological Scaling (3.0 cr)
- EPSY 8822 - Advanced Measurement: Theory and Application (4.0 cr)
- EPSY 8825 - Operational Measurement: Test Score Quality Assurance, Standard Setting, and Equating (3.0 cr)
- EPSY 8826 - Item Response Models: Theory and Applications (3.0 cr)
- EPSY 8826 - Factor Analysis (3.0 cr)
- EPSY 5862 - Psychological Measurement: Theory and Methods (3.0 cr)
- PSY 5865 - Advanced Psychological and Educational Measurement (4.0 cr)

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)
- EPSY 8247 - Advanced Interviewing and NVIVO (3.0 cr)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

Learning/Cognition or Social/Personality
3 credits required in learning/cognition or social/personality

learning/cognition
Take 3 or more credit(s) from the following:
- EPSY 5101 - Intelligence and Creativity (3.0 cr)
- EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 8112 - Mathematical Cognition (3.0 cr)
- EPSY 8115 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 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)
• PSY 5101 - Personality Psychology (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 - Theories of Social Psychology (3.0 cr)

**Plan B**

For students completing the M.A. under Plan B.

Take 6 or more credit(s) from the following:

- EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

Electives selected in consultation with adviser (4 credits)

**Special Ed Course Requirements**

Students take 7 credits in Special Ed Foundations courses, 3 credits Special Ed elective course, and 3 additional elective credits (consult with adviser).

**special ed foundations courses**

Students must take these two courses.

- EPSY 5613 - Foundations of Special Education I (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 cr)

**special ed elective course**

Take 3 or more credit(s) from the following:

- EPSY 5615 - Advanced Academic Interventions (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 5621 - Assessment and Instructional Design for Students with Developmental Disabilities (3.0 cr)
- EPSY 5624 - Biomedical and Physical Impairments of Students with Developmental Disabilities (2.0 cr)
- EPSY 5625 - Education of Infants, Toddlers, and Preschool Children with Disabilities: Introduction (2.0 cr)

**additional elective course**

Elective course in consultation with adviser (minimum 3 credits)
**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

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 6
- 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 educational psychology program has five tracks: counseling and student personnel psychology (CSPP); 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**
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 15 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 15 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 2014
- Length of program in credits: 69 to 102
- 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 five tracks: counseling and student personnel psychology (CSPP); 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.

Other requirements to be completed before admission:
For the CSPP track, students are required to have completed a 450 hour supervised practicum at the MA level. They must also complete the following courses or the equivalent.
- EPsy 5261 Introductory Statistical Methods
- EPsy 5415 Child and Adolescent Development and Counseling
- EPsy 8132 Personality Development and Socialization
- EPsy 8406 Professional Ethics for Counselors and Psychologists
- EPsy 8402 Individual Counseling: Theory and Applications
- EPsy 8403 Social/Cultural Contexts: Counseling and Skills
- EPsy 8405 Career Development: Theory, Skills, and Counseling Applications
- EPsy 8431 M.A. Research Seminar
- EPsy 8501 Counseling Pre-Practicum
- EPsy 8503 Counseling Practicum I
- EPsy 8504 Counseling Practicum II
- EPsy 8407 Assessing and Counseling Clients with Psychological Disorders
- ALSO: Learning/Cognition

Special Application Requirements:
Applicants must apply online submitting a department application, three letters of recommendation, and a statement of goals and interests. In addition, school psychology applicants must also submit a critical issue essay, answering the following questions: Identify a critical problem facing contemporary schools in America or another country. What do you think are the social, political, and/or economic factors that are contributing to this problem? What specific solutions might you propose to tackle the problem?

Applications should be accompanied by official transcripts from all colleges and universities attended. The GRE is required for all tracks. An interview is required for those who make the initial cut in school psychology.
Applications to school psychology (deadline November 15), CSPP (deadline December 1), special education (deadline December 1) and psychological foundations (deadlines December 1 and March 1) are accepted for fall admission only. Applications to quantitative methods in education are accepted for fall admission (deadlines December 1 and March 1) as well as summer admission (deadline March 1) and spring admission (deadline October 15).

Applicants must submit the following test score(s):
- GRE General Test

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
45 to 78 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.

Counseling and Student Personnel Psychology
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 CSPP 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.

Students take 81 credits distributed as follows: 24 EPSY core requirements (2 credits can be satisfied by MA research course), 9 credits EPSY electives, 35 credits CSPP course requirements in counseling theory and practice, practica, and internships (9 credits can satisfy EPSY elective requirement), and 24 thesis credits.

Ed Psych Core Course Requirements
Students must take 3 credits in history/systems, 6 credits in learning/social/personality, 6 credits in statistics, 3 credits in measurement/evaluation, 6 credits in research methods, and 9 credits EPSY electives. Courses taken to satisfy EPSY core requirements must be taken on an A-F grade basis.

History/Systems
EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)
Learning/Social/Personality
Take 6 or more credit(s) from the following:

learning
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 8115 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
• EPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 cr)
• PSY 5015 - Cognition, Computation, and Brain (3.0 cr)

social/personality
• 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 8290 Special Topic: Key Issues in Social Psychology and Education (3 credits)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
• EPSY 5202 - Attitudes and Social Behavior (3.0 cr)
• EPSY 5204 - Psychology of Interpersonal Relationships (3.0 cr)
• EPSY 5205 - Applied Social Psychology (3.0 cr)
• EPSY 5207 - Personality and Social Behavior (3.0 cr)
• EPSY 8201 - Social Cognition (3.0 cr)
• EPSY 8202 - Close Relationships (3.0 cr)
• EPSY 8208 - Social Psychology: The Self (3.0 cr)
• SOC 8721 - Theories of Social Psychology (3.0 cr)

Statistics
Take 6 or more credit(s) from the following:
• EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
• EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)

Measurement/Evaluation
• EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)

Research Methods
6 credits required (2 credits can be satisfied by MA research course.)
• EPSY 8411 - Advanced Counseling Research (4.0 cr)

EPSY Electives
9 credits of EPSY electives can be satisfied by CSPP course requirements.

CSPP Course Requirements
Students must take EPSY 8509 three times for a total of 5 credits, EPSY 8512 for a total of 12 credits, EPSY 8522 two times for a total of 6 credits and EPSY 8994 for 2 credits. EPSY courses will satisfy 9 credits Ed Psych elective core requirement.
• EPSY 8412 - Seminar: Advanced Counseling Theory and Ethics (4.0 cr)
• EPSY 8413 - Personality Assessment of Adolescents and Adults (3.0 cr)
• EPSY 8452 - Psychological Aspects of Counseling Supervision (3.0 cr)
• EPSY 8509 - Supervision Practicum: CSPP (1.0 - 2.0 cr)
• EPSY 8512 - Internship: CSPP (1.0 - 12.0 cr)
• EPSY 8522 - Counseling Practicum: Advanced (3.0 cr)
• EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

Psychological Foundations
The psychological foundations of education track 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 psychological foundations track is to apply and generate knowledge of psychological processes and methodological procedures involved in learning and teaching.

The 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 9 credits (3 in history/systems, 3 in learning/cognition, 3 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 courses.
Take 3 or more credit(s) from the following:
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 5200 - Special Topics: Psychological Foundations (1.0 - 4.0 cr)

Social/Personality
Students in the social area of PsyF can satisfy this requirement with required social/personality courses.
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 5135 - Human Relations Workshop (4.0 cr)
• PSY 5135 - Psychology of Individual Differences (3.0 cr)
• PSY 5202 - Attitudes and Social Behavior (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)
• 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 - Methods in Data Analysis for Educational Research I (3.0 cr)
EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)
or
EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (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 adviser.

Courses in Area of Emphasis
Students must take additional courses in their area of emphasis in consultation with adviser. 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 5112 - Knowing, Learning, and Thinking (4.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5191 - Education of the Gifted and Talented (3.0 cr)
• EPSY 5200 - Special Topics: Psychological Foundations (1.0 - 4.0 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 8115 - Psychology of Instruction and Technology (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 8290 - Special Topics: Seminar in Psychological Foundations (1.0 - 6.0 cr)

- OR -

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 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:
• EPSY 8117 - Writing Empirical Paper and Research/Grant Proposals in Education and Psychology (3.0 cr)
• EPSY 8290 - Special Topics: Seminar in Psychological Foundations (1.0 - 6.0 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)

Quantitative Methods in Education
The quantitative methods in education (QME) track prepares students for a wide variety of careers, including positions in college and university teaching and research, research and evaluation centers, test publishing firms, public school systems, state departments of assessment, and private industry. The goal of the QME track is to provide students with broad but rigorous methodological skills so that they may conduct research on methodologies, may help to train others in methodology, or will have the skills necessary to conduct research in related fields.

The QME track offers emphases in measurement, evaluation, statistics, and statistics education. Students typically choose one of these areas in addition to achieving competence in all aspects of the curriculum.

Students take 72 credits distributed as follows: 27 credits EPSY core requirements, 9 credits EPSY electives, 18 credits QME core requirements, 12 additional courses 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 and additional courses will satisfy EPSY core requirements for 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
• EPSY 5101 - Intelligence and Creativity (3.0 cr)
• EPSY 5112 - Knowing, Learning, and Thinking (4.0 cr)
• EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8115 - Psychology of Instruction and Technology (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)

• 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)
• CPSY 8302 - Developmental Psychology: Social and Emotional Processes (4.0 cr)
• CPSY 8606 - Advanced Developmental Psychopathology (3.0 cr)
• PSY 5101 - Personality Psychology (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 - Theories of Social Psychology (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.

Measurement/Evaluation
3 credits of measurement or evaluation will be satisfied by QME core course requirements.

EPSY Electives
9 credits of EPSY electives can be satisfied by additional 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 adviser (minimum 18 credits total).
EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)
EPSY 5243 - Principles and Methods of Evaluation (3.0 cr)
EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
EPSY 8252 - Methods in Data Analysis for Educational Research 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 adviser). EPSY courses will satisfy 9 credits Ed Psych elective core requirement.

Evaluation Emphasis
Take 12 or more credit(s) from the following:
• EPSY 5246 - Evaluation Colloquium: Psychological Foundations (1.0 cr)
• EPSY 8221 - Psychological Scaling (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 8247 - Advanced Interviewing and NVIVO (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 8272 - Nonparametric Statistics in Education (3.0 cr)
• EPSY 8281 - Advanced Statistical Computing and Data Analysis (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 (3.0 cr)
• OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

-OR-

Measurement Emphasis
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 8221 - Psychological Scaling (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 8272 - Nonparametric Statistics in Education (3.0 cr)
• EPSY 8281 - Advanced Statistical Computing and Data Analysis (3.0 cr)
• EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)

-OR-

Statistics Emphasis
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 8221 - Psychological Scaling (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 8272 - Nonparametric Statistics in Education (3.0 cr)
• EPSY 8281 - Advanced Statistical Computing and Data Analysis (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
School psychology is fully accredited by the American Psychological Association, the Minnesota Board of Teaching, and the National Association of School Psychologists. Through coursework and practica/internships, students develop competencies in assessment, consultation, intervention and program development, research, and evaluation. Graduates are employed as psychologists in local schools, university clinics and hospitals, community mental health centers, and as trainers/researchers in universities. Since 1988, training has focused on the delivery of psychological services in schools and school communities to promote children's and adolescent's academic, social, and behavioral success.

The school psychology track integrates didactic and experiential components of training and applied research. Students develop specific competencies through a broad range of applied experiences, including field placements, practica assignments, and a full-year internship.

Students take 102 credits distributed as follows: 24 credits EPSY core requirements, 9 credits EPSY electives, 54 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 3 credits in history/systems, 3 credits in learning/cognition, 3 credits in social/personality, 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.
History/Systems
- EPSY 8905 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

Learning/Cognition
- EPSY 8114 - Seminar: Cognition and Learning (3.0 cr)

Social/Personality
- EPSY 8800 Special Topic: Emotion and Psychopathology (3 cr.)

Statistics
- EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
- EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)

Measurement/Evaluation
- EPSY 5221 - Principles of Educational and Psychological Measurement (3.0 cr)

Research Methods
Students must take EPSY 8822 for a total of 3 credits.
- EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
- EPSY 8822 - Research in School Psychology (1.0 - 3.0 cr)

EPSY Electives
- 9 credits of EPSY electives can be satisfied by school psychology course requirements.

School Psychology Course Requirements
Students must take EPSY 8813 twice for a total of 4 credits, EPSY 8818 twice for a total of 2 credits, EPSY 8831 for 3 credits, EPSY 8832 for 3 credits and EPSY 8842 for 6 credits. EPSY courses will satisfy 9 credits Ed Psych elective core requirement.
- EPSY 5802 - Foundations of Developmental Psychology Across the Lifespan (3.0 cr)
- EPSY 5851 - Engaging Diverse Students and Families (3.0 cr)
- EPSY 5853 - Biological Bases of Behavior (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 - Assessment Practicum in School Psychology (2.0 cr)
- EPSY 8815 - Individual and System Socio-Emotional Interventions (3.0 cr)
- EPSY 8816 - Individual and Systems Academic Interventions (3.0 cr)
- EPSY 8817 - School Psychological Consultation (3.0 cr)
- EPSY 8818 - Intervention Practicum in School Psychology (1.0 cr)
- EPSY 8821 - Issues in School Psychology (3.0 cr)
- EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)
- EPSY 8831 - Practicum: School Psychological Services (1.0 - 3.0 cr)
- EPSY 8832 - Clinical/Community Practice in School Psychology (1.0 - 3.0 cr)
- EPSY 8842 - Internship: School Psychological Services (1.0 - 10.0 cr)
- EPSY 8849 - Assessment in Early Childhood (3.0 cr)
- EPSY 88290 Special Topic: Key Issues in Social Psychology and Education (3 credits)

Special Education
The special education track 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 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 69 credits distributed as follows: 24 credits EPSY core requirements, 9 credits EPSY electives, 21 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 5112 - Knowing, Learning, and Thinking (4.0 cr)
      - EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
• EPSY 5114 - Psychology of Student Learning (3.0 cr)
• EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
• EPSY 5119 - Mind, Brain, and Education (3.0 cr)
• EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
• EPSY 8112 - Mathematical Cognition (3.0 cr)
• EPSY 8115 - Psychology of Instruction and Technology (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)

• 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 5132 - Personality Development and Socialization (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 Psychology (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 - Theories of Social Psychology (3.0 cr)

• history/systems

Take 0 or more course(s) from the following:
• EPSY 8805 - History and Systems of Psychology: Landmark Issues in Educational Psychology (3.0 cr)

Research Methods
EPSY 8215 - Advanced Research Methodologies in Education (3.0 cr)
EPSY 8706 - Single Case Designs in Intervention Research (3.0 cr)

Statistics
EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)
or
EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (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 5614 - Assessment and Due Process in Special Education (4.0 cr)
• EPSY 8221 - Psychological Scaling (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 8247 - Advanced Interviewing and NVIVO (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)

EPSY Electives
9 credits of EPSY electives can be satisfied by special ed course requirements.

Special Ed Course Requirements
Students take 21 Special Ed credits in consultation with adviser. EPSY courses will satisfy 9 credits Ed Psych elective core requirement.
EPSY 8600 Special Topics: Special Education Issues - Grant Writing Seminar (3 credits)
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 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 8708 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: schpsy@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 2014
• 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.

School psychology is fully accredited by the American Psychological Association, the Minnesota Board of Teaching, and the National Association of School Psychologists. Through coursework and practica/internships, students develop competencies in assessment, consultation, intervention and program development, research, and evaluation. Graduates are employed as psychologists in local schools, university clinics and hospitals, community mental health centers, and as trainers/researchers in universities. Since 1988, training has focused on the delivery of psychological services in schools and school communities to promote children's and adolescent's academic, social, and behavioral success.

The specialist certificate integrates didactic and experiential components of training and applied research. Students develop specific competencies through a broad range of applied experiences, including field placements, practica assignments, and a full-year internship.

The specialist certificate is designed for students who want to become practitioners. It meets the Minnesota certification requirements for school psychologists.

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 critical issue essay, answering the following questions: Identify a critical problem facing contemporary schools in America or another country. What do you think are the social, political, and/or economic factors that are contributing to this problem? What specific solutions might you propose to tackle the problem?

Applications should be accompanied by official transcripts from all colleges and universities attended. The GRE General Test is 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:
International applicants must submit score(s) from one of the following tests:

- 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
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 take 60 credits distributed as follows: 15 credits EPSY core courses, 6 credits EPSY electives, 2 credits Research Problems and 43 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 - Methods in Data Analysis for Educational Research 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 8114 - Seminar: Cognition and Learning (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)

Social/Personality
Special Topic: Emotion and Psychopathology (3 cr.)
EPSY 8800 - Special Topics in School Psychology (1.0 - 4.0 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 38 credits required courses, 2 credits research problems and 5 credits electives.

Required Courses
Students must take EPSY 8813 twice for 4 credits total, EPSY 8818 twice for 2 credit total, EPSY 8822 twice for 1 credit each, and EPSY 8842 for 6 credits. EPSY courses will satisfy 6 credits Ed Psych 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 8813 - Assessment Practicum in School Psychology (2.0 cr)
EPSY 8815 - Individual and System Socio-Emotional Interventions (3.0 cr)
EPSY 8816 - Individual and Systems Academic Interventions (3.0 cr)
EPSY 8817 - School Psychological Consultation (3.0 cr)
EPSY 8818 - Intervention Practicum in School Psychology (1.0 cr)
EPSY 8821 - Issues in School Psychology (3.0 cr)
EPSY 8822 - Research in School Psychology (1.0 - 3.0 cr)
EPSY 8823 - Ethics and Professional Standards in School Psychology (3.0 cr)
EPSY 8842 - Internship: School Psychological Services (1.0 - 10.0 cr)

Research Problems
2 credits are required
EPSY 8994 - Research Problems: Educational Psychology (1.0 - 6.0 cr)

Students must take 5 credits electives from the following list (1-2 credit registration for EPSY 8831 and EPSY 8832. Other courses may be taken with permission of adviser.
Take 5 or more credit(s) from the following:
• EPSY 5802 - Foundations of Developmental Psychology Across the Lifespan (3.0 cr)
• EPSY 8831 - Practicum: School Psychological Services (1.0 - 3.0 cr)
• EPSY 8832 - Clinical/Community Practice in School Psychology (1.0 - 3.0 cr)
• EPSY 8849 - Assessment in Early Childhood (3.0 cr)
Twin Cities Campus

Educational Psychology Specialist Certificate in Education and Special Education

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 2014
- 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.

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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The University of Minnesota is an equal opportunity educator and employer.
Information current as of September 19, 2014
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 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 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 - Methods in Data Analysis for Educational Research I (3.0 cr)
- EPSY 8261 - Statistical Methods I: Probability and Inference (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 5614 - Assessment and Due Process in Special Education (4.0 cr)
- EPSY 8221 - Psychological Scaling (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)

*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)
- EPSY 8247 - Advanced Interviewing and NVIVO (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 5112 - Knowing, Learning, and Thinking (4.0 cr)
- EPSY 5113 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
- EPSY 5115 - Psychology of Adult Learning and Instruction (3.0 cr)
- EPSY 5119 - Mind, Brain, and Education (3.0 cr)
- EPSY 5616 - Classroom Management and Behavior Analytic Problem Solving (3.0 cr)
- EPSY 8112 - Mathematical Cognition (3.0 cr)
- EPSY 8115 - Psychology of Instruction and Technology (3.0 cr)
- EPSY 8707 - Principles of Behavior Analysis and Learning (3.0 cr)
- PSY 5014 - Psychology of Human Learning and Memory (3.0 cr)
- PSY 5015 - Cognition, Computation, and Brain (3.0 cr)
- CPSY 8301 - Developmental Psychology: Cognitive Processes (4.0 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)
- PSY 5101 - Personality Psychology (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 - Theories of Social Psychology (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 adviser.
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)
Emerging Leaders in Independent Colleges 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
Wulling Hall, Rm. 330E
86 Pleasant St. SE
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 2014
- 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: Emerging Leaders in Independent Colleges 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.

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.

Other requirements to be completed before admission:
Two years of experience in a professional position in higher 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 towards program requirements is not permitted.

A minimum GPA of 3.0 is required for students to remain in good standing.

Course List
Take exactly 4 course(s) totaling exactly 12 credit(s) from the following:
- OLPD 5002 - Independent Colleges as Formal Organizations (3.0 cr)
- OLPD 5332 - Personal Leadership and the Independent College (3.0 cr)
- OLPD 5845 - The Entrepreneurial Independent College (3.0 cr)
- OLPD 5902 - Leading Change in Independent Colleges (3.0 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 (612-624-1294; 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 2014
- 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 (M.Ed.) 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 is 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 advisers, students choose at least 30 semester credits of work that may include courses, independent study, internships, and workshops.

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
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 deadlines are March 1 and October 1. Apply Online at https://app.applyyourself.com/?id=umtc-cehd.

For program specific application details see http://www.cehd.umn.edu/fsos/prospective/famed.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 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 M.Ed. 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)

**Major Coursework**
Additional courses offered that fulfill the major area of family education are within the department and include:
FSOS 5900 - Special Topics in Family, Youth, and Community (1.0 - 4.0 cr)
FSOS 5906 - Program Planning in Family Education (3.0 cr)
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)

**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 Specialty Teaching License**
This sub-plan is limited to students completing the program under Plan C.

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 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.

This program also prepares parent educators for parent education positions that do not require a Minnesota parent and family education license. For example, parent educators may find positions in health care and social service agencies and institutions and religious settings in Minnesota and in other states and countries.

Students may include licensure credits toward the M.Ed. degree.
For more information on Licensure please see the FSOS web site: http://www.cehd.umn.edu/fsos/programs/ParentEd/pfe-license.asp

**Parent Ed Teaching License Core Coursework**
- FSOS 5902 - Family Education Perspectives (3.0 cr)
- 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)

**Additional Courses**
Students seeking the M.Ed. and the Parent Ed teaching license are encouraged to take EDHD 5007 Technology for Teaching and Learning in the educational processes area, in addition to other course requirements.
Twin Cities Campus
Family Social Science M.A.
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: Master's
- Requirements for this program are current for Fall 2014
- 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 program of study uses methods of social science to examine family systems and their interactions with various environments. The curriculum supports study in several broad theme areas: family economic well-being, families and mental health, family diversity, and relationships and development across the life span.

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/default.asp.

Applicants for the master's program are reviewed only once per year. The application deadline is December 1 for admission fall semester of the following 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

**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 6 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, 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 M.A. program is offered under Plan A and Plan B. 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. The Plan A master’s is recommended for students who intend to pursue a Ph.D. degree.

Plan B requires at least 30 credits, including at least 26 course credits, of which 6 credits are outside the department in a related field, and at least 4 credits for a Plan B project. 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 Ph.D. degree. Consult the department for the most current information.
Twin Cities Campus
Family Social Science Minor
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 2014
- 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:
- FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
- FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
- FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
- FSOS 8014 - Quantitative Family Research Methods II (3.0 cr)
- Family Research Methods & Lab
  - FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
FSOS 5015 - Family Research Laboratory (1.0 cr)

Elective

3 credits to any FSOS 8xxx course.

**Master's**

**Required**

Take 6 or more credit(s) from the following:

- FSOS 8001 - Conceptual Frameworks in the Family (3.0 cr)
- FSOS 8101 - Family Stress, Coping, and Adaptation (3.0 cr)
- FSOS 8013 - Qualitative Family Research Methods (3.0 cr)
- FSOS 8014 - Quantitative Family Research Methods II (3.0 cr)

**Family Research Methods & Lab**

- FSOS 5014 - Quantitative Family Research Methods I (3.0 cr)
- FSOS 5015 - Family Research Laboratory (1.0 cr)
Twin Cities Campus
Family Social Science Ph.D.
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: Doctorate
- Requirements for this program are current for Fall 2014
- 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 program of study for the Ph.D. in family social science uses methods of social science to examine family systems and their interactions with various environments. The curriculum supports study in several broad theme areas: family economic well-being, families and mental health, family diversity, and relationships and development across the life span.

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:
Students may apply for admission to the Ph.D. program, family science specialization, after completing either a bachelor's degree or a master's degree. Students who enter the Ph.D. program with a bachelor's degree are expected to fulfill the requirements for an M.A. degree in the process of working toward the Ph.D. Students applying for the specialization in Couple and Family Therapy must have a clinical master's degree or have achieved equivalent clinical experience as determined by the Couple Family Therapy faculty. Students cannot earn a clinical master's degree in the Department of Family Social Science.

For more information about application requirements and procedures, consult the Family Social Science Prospective Students web page at http://www.cehd.umn.edu/fsos/prospective/default.asp.

Applicants for the doctoral program are reviewed only once per year. The application deadline is December 1, for admission to fall semester of the following 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
48 to 51 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 3.5 is required for students to remain in good standing.

Courses in the Ph.D. degree program must contribute to an organized program of study and research. The program includes at least 72 credits including 48 course credits and 24 dissertation credits. Coursework includes at least 20 credits in core family theory and research methods, 9 credits in statistics, and 19-22 credits in one of the two designated specializations of Family Science or Couple and Family Therapy. 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.

Required Courses
  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)

Statistics Requirement 1
  EPSY 8251 - Methods in Data Analysis for Educational Research I (3.0 cr)
  or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)

Statistics Requirement 2
  EPSY 8252 - Methods in Data Analysis for Educational Research II (3.0 cr)
  or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)

Additional Specialization Coursework

Family Science Coursework
  * Advanced Statistics or Methods (3 credits)
  * FSOS electives (6 credits)
  * Community/Engagement/Internship Experience (3 credits)
  FSOS 8794 - Directed Research in Family Social Science (1.0 - 6.0 cr)

-OR-
Couple Family Therapy Coursework
FSOS 8036 - Couple/Marriage and Family Therapy Research (3.0 cr)
FSOS 8034 - Marriage and Family Therapy Supervision (3.0 cr)
FSOS 8295 - Couple/Marriage Family Therapy Practicum (1.0 - 12.0 cr)
FSOS 8296 - Couple/ Marriage Family Therapy Internship (1.0 - 12.0 cr)
FSOS 8794 - Directed Research in Family Social Science (1.0 - 6.0 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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.Ed.)/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. 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.

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 19 credits in HRD-designated courses as described below.
OLPD 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
OLPD 5819 - Evaluating and Using Research in Organizations and Education (3.0 cr)

Required
OLPD 5605 - Strategic Planning through Human Resources (3.0 cr)
OLPD 5607 - Organization Development (3.0 cr)
OLPD 8602 - Advanced Organization Development (3.0 cr)
or OLPD 5615 - Training and Development of Human Resources (3.0 cr)
OLPD 8601 - Advanced Training and Development of Human Resources (3.0 cr)

Electives
Twelve (12) elective credits approved by a faculty adviser.

Additional HRD coursework
Six additional HRD 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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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:
• OLDP 5696 - Internship: Human Resource Development (1.0 - 10.0 cr)
• OLDP 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.
Infant and Early Childhood Mental Health Postbaccalaureate Certificate
Institute of Child Development
College of Education and Human Development

Contact Information:
Institute of Child Development, 51 East River Road, Minneapolis, MN 55455 (612-625-2252; fax: 612-624-6373).
Email: lepin008@umn.edu
Website: http://www.cehd.umn.edu/CEED/certificateprograms/iecmh/default.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 21
- This program requires summer semesters for timely completion.
- 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 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:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Other requirements to be completed before admission:
Admission to this program is currently suspended.

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
- 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.

Course requirements
- CPSY 5501 - Foundations in Infant and Early Childhood Mental Health I (3.0 cr)
- CPSY 5503 - Foundations in Infant and Early Childhood Mental Health II (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 - Assessment in Infant and Early Childhood Mental Health: DC 0-3R (2.0 cr)
- CPSY 5515 - Assessment in Infant and Early Childhood Mental Health: NCAST (2.0 cr)
- CPSY 5518 - Prevention and Intervention in Infant and Early Childhood Mental Health I (3.0 cr)
- CPSY 5521 - Prevention and Intervention in Infant and Early Childhood Mental Health II (3.0 cr)
- CPSY 5523 - Reflective Supervision in Infant and Early Childhood Mental Health: Community-based (1.0 cr)
- CPSY 5525 - Reflective Supervision in Infant and Early Childhood Mental Health: Clinical (1.0 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, 330 Wulling Hall, 86 Pleasant Street SE, 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 2014
- 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.

If taking PA 5190, only the special topic in Leading Engagement Processes can count towards the minor without advance approval by the DGS of 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
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 5941 - Leadership for the Common Good (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
Take 3 - 6 credit(s) from the following:
- OLPD 5736 - Public Engagement and Higher Education (3.0 cr)
- OLPD 6490 - Managing Civic Engagement (3.0 cr)
- PA 5190 - Topics in Public and Nonprofit Leadership and Management (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.

Required Final Course
All students must take one of the following:
- OLPD 6402 - Integrative Leadership Seminar (3.0 cr)
- MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
- PA 5105 - Integrative Leadership Seminar (3.0 cr)

Master's

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 5941 - Leadership for the Common Good (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
Take 3 or more credit(s) from the following:
- OLPD 5736 - Public Engagement and Higher Education (3.0 cr)
- OLPD 6490 - Managing Civic Engagement (3.0 cr)
- PA 5190 - Topics in Public and Nonprofit Leadership and Management (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.

Required Final Course
All students must take one course from the following:
- OLPD 6402 - Integrative Leadership Seminar (3.0 cr)
- MGMT 6402 - Integrative Leadership: From Theory to Practice (3.0 cr)
- PA 5105 - 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, 330 Wulling Hall, 86 Pleasant Street S.E., 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: Graduate free-standing minor  
- Requirements for this program are current for Fall 2014  
- 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://www.cehd.umn.edu/olpd/grad-programs/CIDE/gradminor.html) 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](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](http://www.cehd.umn.edu/olpd/grad-programs/CIDE/gradminor.html) 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 adviser, 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 adviser'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.

**Doctoral**

**Core Courses**
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 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 adviser prior to registration as special topics can vary and may or may not be appropriate for this minor.

Take 6 or more credit(s) from the following:

• AFEE 5361 - World Development Problems (3.0 cr)
• CI 8150 - Research Topics Curr & Instruc (1.0 - 6.0 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 5825 *(Inactive)* (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)

**Master's 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 should consult minor adviser prior to registration as special topics can vary and may or may not be appropriate for this minor.

Take 6 or more credit(s) from the following:

• AFEE 5361 - World Development Problems (3.0 cr)
• CI 8150 - Research Topics Curr & Instruc (1.0 - 6.0 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 5825 *(Inactive)* (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)
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 2014
- 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.

Doctoral
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 S.E., Minneapolis, MN 55455
(612-625-4006; fax: 612-624-8277)
Email: CIninfo@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 2014
- 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.

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Information current as of September 19, 2014
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 should be taken for 3 credits.

- CI 5330 - Special Topics in Learning Technologies (1.0 - 3.0 cr)
- CI 5351 - Technology Tools for Educators (3.0 cr)
- CI 5361 - Teaching and Learning with the Internet (3.0 cr)
Twin Cities Campus
Kinesiology M.S.
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: Master's
- Requirements for this program are current for Fall 2014
- 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 social and behavioral 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. M.S. students pursue an individualized program with an emphasis in one of the following areas: biomechanics and neuromotor control; exercise physiology; perceptual-motor control and learning; physical activity and sport science with concentrations in behavioral aspects of physical activity, sport and exercise psychology, 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.

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. Deadline for submission of all application materials is December 15 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
  • 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 adviser 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 M.S. 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 (including a minimum of 3 credits in statistics as determined by emphasis area) 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 (including a minimum of 3 credits in statistics as determined by emphasis area), and 6 additional credits in any of these areas. A maximum of 9 credits of 4xxx-level courses are allowed at the discretion of the adviser.

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 emphasis area. A GPA of at least 3.00 is required to maintain good standing and to graduate.

Required courses

The M.S. in Kinesiology has the following requirements. In addition, Plan A students must take 10 credits of KIN 8777; and Plan B students must take 4 credits of KIN 8995.

KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)
KIN 8980 - Graduate Research Seminar in Kinesiology (1.0 cr)

Minor or related field

At least 6 credits in a related field are required, including a minimum of 3 credits in statistics as required by the emphasis area.

Emphasis Areas

Kinesiology M.S. 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, 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 M.S. requirements, students choose courses from the following lists with adviser 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 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)
or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (3.0 cr)
or KIN 5375 - Competitive Sport for Children and Youth (3.0 cr)
or KIN 5511 - Sport and Gender (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 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)

Minor or Related Field
Plan A and Plan B students take 3 credits of statistics (EPSY 5261 or EPSY 8261). Plan A students take an additional 3 related-field credits and Plan B students take an additional 9 related-field credits in consultation with the adviser. Recommended courses for related fields are listed below. Possible minors include Public Health (8 credits) or Prevention Science (9 credits).

EPSY 5261 - Introductory Statistical Methods (3.0 cr)
or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
or PUBH 6902 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
or PUBH 6914 - Community Nutrition Intervention (3.0 cr)

-OR-

Biomechanics and Neuromotor Control
Only Plan A students are accepted in this emphasis. The study of the mechanical and electromyographic analysis of human motion is combined with neurophysiological knowledge about the various neuronal subsystems to provide a basis for understanding how the brain controls bodily and limb motion. KIN 8995 (3 cr) must be taken with the adviser to develop the thesis.

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)
or RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
or KIN 5235 - Advanced Biomechanics II: Kinetics (3.0 cr)
or RSC 5841 - Rehabilitation Science Instrumentation and Methodology (4.0 cr)
or KIN 8132 - Seminar: Motor Development (3.0 cr)
or KIN 8135 - Seminar: Motor Control and Learning (3.0 cr)
or KIN 8211 - Seminar: Perception and Action (3.0 cr)
or KIN 8995 - Research Problems in Kinesiology (1.0 - 12.0 cr)

Minor or related field
A minimum of 6 semester credits are required in one or more related fields (not KIN prefix). One statistics course and an additional course are required, chosen from the following list. Minor option: Clinical Physiology and Movement Science.

EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or NSC 5561 - Systems Neuroscience (4.0 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. In addition to the M.S. requirements, students choose courses from the following lists with adviser consultation.
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)
or KIN 5141 - Nutrition and Exercise for Health Promotion and Disease Prevention (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 8122 - Seminar: Exercise Physiology (2.0 cr)

Minor or related field
For Plan A and Plan B, a minimum of 6 course credits in statistics are required and may be chosen from the following list. Plan B students will choose an additional minimum of 6 credits in any related field with guidance from the adviser.
EPSY 5261 - Introductory Statistical Methods (3.0 cr)
or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or PUBH 6451 - Biostatistics II (4.0 cr)
Perceptual-Motor Control and Learning
Students study the learning of movement skills and the factors that mediate learning as well as the changes in movement behavior over the life span and the processes or factors underlying these changes. In addition to the M.S. requirements, students choose courses from the following lists with adviser consultation. Registration for KIN 5992 is limited to 3 credits.

Recommended courses
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)
- or KIN 4136 - Embodied Cognition (3.0 cr)
- or KIN 4441 - Movement Neuroscience (3.0 cr)
- or HUMF 5001 - Foundations of Human Factors/Ergonomics (3.0 cr)
- or HUMF 5722 - Human Factors Psychology (3.0 cr)
- or RSC 5135 - Advanced Biomechanics I: Kinematics (3.0 cr)
- or KIN 5992 - Readings in Kinesiology (1.0 - 9.0 cr)

Minor or related field
Plan A and Plan B students take one statistics course from the following list. In addition, Plan A students take a minimum of 3 credits and Plan B students take a minimum of 9 credits in any related field in consultation with the adviser.
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)

Sport and Exercise Psychology
Students will examine the thoughts, feelings and actions of participants in physical activity contexts such as sport, exercise, physical education, health and wellness and sports medicine. Multidisciplinary research and outreach are conducted through the Tucker Center for Research on Girls & Women in Sport and other entities. In addition to the M.S. requirements, students choose courses from the following lists with adviser 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:
- 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 - Competitive Sport for Children and Youth (3.0 cr)
- or KIN 5511 - Sport and Gender (3.0 cr)
- or KIN 5723 - Psychology of Sport Injury (3.0 cr)
- or KIN 8126 - Sports Medicine Psychology (3.0 cr)
- or KIN 8136 - Developmental Sport and Exercise Psychology (3.0 cr)

Minor or related field
Plan A and Plan B students take 3 credits of statistics (EPSY 5261 or EPSY 8261). Plan A students take an additional 3 related-field credits and Plan B students take an additional 9 related-field credits in consultation with the adviser. Recommended courses for related fields are listed below. Recommended minors include Prevention Science (9 credits); Educational Psychological Foundations (6 credits).
- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
- or EPSY 5401 - Counseling Procedures (3.0 cr)
- or PSY 5206 (Inactive) (3.0 cr)
- or PSY 5207 - Personality and Social Behavior (3.0 cr)

Sport Sociology
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 M.S. requirements, students choose courses from the following lists with adviser 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:
- KIN 5136 - Psychology of Coaching (3.0 cr)
- or KIN 5371 - Sport and Society (3.0 cr)
- or KIN 5511 - Sport and Gender (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)

Minor or related field

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Information current as of September 19, 2014
Plan A and Plan B students take 3 credits of statistics (EPSY 5261 or EPSY 8261). Plan A students take an additional 3 related-field course credits and Plan B students take an additional 9 related-field course credits in consultation with the adviser.

- EPSY 5261 - Introductory Statistical Methods (3.0 cr)
- or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 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 2014
- 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, 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 S.E., 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 2014
- 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.

Ph.D. students pursue an individualized program with an emphasis in biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and sport science, or sport 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.

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 15 ensures 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

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Listening Score: 14
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 23
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 Ph.D. requires 36 to 48 course credits and 24 thesis credits. The total course credits include a 12-credit core, at least 12 credits specific to the chosen area of emphasis, at least 6 research credits, and at least 6 supporting program credits. Students who choose to complete a formal minor must complete at least 12 minor-field credits. 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. A total of 24 thesis credits are required.

KIN 8980 - Graduate Research Seminar in Kinesiology (1.0 cr)
KIN 8995 - Research Problems in Kinesiology (1.0 - 12.0 cr)
KIN 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Emphasis Areas
Kinesiology Ph.D. students pursue an individualized program with an emphasis in biomechanics and neuromotor control, exercise physiology, perceptual-motor control and learning, physical activity and sport science, or sport management.

Biomechanics and Neuromotor Control
The study of the mechanical and electromyographic analysis of human motion is combined with neurophysiological knowledge about the various neuronal subsystems to provide a basis for understanding how the brain controls bodily and limb motion.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 6 credits must be KIN 8xxx.

KIN 5235 - Advanced Biomechanics II: Kinetics (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 5841 - Rehabilitation Science Instrumentation and Methodology (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 adviser.

EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)
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)
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 adviser. Recommended Kinesiology emphasis areas for supporting courses include Exercise Science, 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.

-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 6 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 Sport Nutrition for Athletic Performance (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 5485 - 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 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 adviser. 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 adviser.

EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)
or 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.

-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 infancy, early childhood, adolescence, or later adulthood.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 6 credits must be KIN 8xxx.

KIN 5235 - Advanced Biomechanics II: Kinetics (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 RSC 5841 - Rehabilitation Science Instrumentation and Methodology (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 adviser. 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 adviser.

EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
or EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
or EPSY 8282 - Statistical Analysis of Longitudinal Data (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 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)

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 adviser. Recommended Kinesiology emphasis areas for supporting courses include Biomechanics and Neuromotor Control, Exercise Science, 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, Recreation, and Sport (3.0 cr)
or KIN 5987 - Professional Skills and Grant Writing for Health Sciences (2.0 cr)

OR

Physical Activity and Sport Science
This emphasis centers on the broad context of human physical activity in areas such as competitive sport, fitness programs, lifestyle exercise, physical education, sports medicine and physical rehabilitation. Students can choose from three concentrations: behavioral aspects of physical activity, sport and exercise psychology, and sport sociology.

Emphasis courses
A minimum of 12 course credits must be selected from the following list. At least 6 credits must be KIN 8xxx. KIN 5720 is limited to 3 credits. Course credits for KIN 8696 determined in consultation with adviser.

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 - Competitive Sport for Children and Youth (3.0 cr)
or KIN 5720 - Special Topics in Kinesiology (2.0 - 4.0 cr)
or KIN 5511 - Sport and Gender (3.0 cr)
or KIN 5723 - Psychology of Sport Injury (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 course credits
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the adviser.

KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 8247 - Advanced Interviewing and NVIVO (3.0 cr)
or EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
or EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (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 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
or PSY 8209 - Research Methods in Social Psychology (3.0 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 a minor or supporting program. A minimum of 12 course credits are required for a University of Minnesota doctoral minor. Recommended minors include: EPSY, PREV, PSY, PUBH, SOC, or Integrative Therapies and Healing Practices offered by the Center for Spirituality and Healing.

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 adviser. Recommended concentrations for supporting courses include Behavioral Aspects of Physical Activity, Sport and Exercise Psychology, or Sport Sociology. Students should consult with their adviser for program guidance. Specific KIN course recommendations include:

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)

-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
The following courses are required for a total of 6 credits. Students will take three registrations of KIN 8980 for 1 credit each.
KIN 8980 - Graduate Research Seminar in Kinesiology (1.0 cr)
KIN 8128 - Doctoral Sport Management Seminar (3.0 cr)

Program courses
A minimum of 9 credits must be selected from the following list:
KIN 5111 - Sports Facilities (3.0 cr)
or KIN 5375 - Competitive Sport for Children and Youth (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 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 course credits
A minimum of 6-9 research skills course credits are required, selected from the following list or in consultation with the adviser.
KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)
or OLPD 6056 - Case Studies for Policy Research (3.0 cr)
or OLPD 5601 - Ethnographic Research Methods (3.0 cr)
or OLPD 5528 - Focus Group Interviewing Research Methods (3.0 cr)
or EPSY 5247 - Qualitative Methods in Educational Psychology (3.0 cr)
or EPSY 8247 - Advanced Interviewing and NVIVO (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 FSOS 8013 - Qualitative Family Research 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: 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 adviser. 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.
**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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.Ed.)/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
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)
OLPD 5387 - Leadership for Teaching and Learning (3.0 cr)
  or CI 5155 - Contemporary Approaches to Curriculum: Instruction and Assessment (3.0 cr)
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
  or CI 5177 - Practical Research (3.0 cr)
OLPD 5361 - Project in Teacher Leadership (3.0 cr)
  or CI 5178 (inactive) (3.0 - 6.0 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 S.E., 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 2014
- 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 (M.Ed.)/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. 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.

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 5401 - Literature for the Elementary School (3.0 cr)
  - CI 5402 - Introduction to Special Collections (3.0 cr)
  - CI 5403 - Writing For and By Children (3.0 cr)
  - CI 5404 - Culturally Diverse Books for Children and Adolescents (3.0 cr)
  - CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
  - CI 5411 - Teaching Reading in the Elementary School (3.0 cr)
  - CI 5412 - Reading Difficulties: Instruction and Assessment (3.0 cr)
  - CI 5415 - Literacy Development in the Primary Grades (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 (2.0 cr)
  - CI 5462 - Evaluating and Assessing Writing (3.0 cr)
  - CI 5472 - Teaching Film, Television, and Media Studies (3.0 cr)
  - CI 5475 - Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing (3.0 cr)

Electives (6 credits)

Courses will be selected in consultation with faculty adviser. 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 5337 (Inactive) (3.0 cr)
  - CI 5344 (Inactive) (1.0 cr)
  - CI 5361 - Teaching and Learning with the Internet (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 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (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 5852 - Everyday Lives of Youth (3.0 cr)
  - YOST 5854 - Experiential Learning: Pedagogy for Community and Classroom (3.0 cr)
  - COMM 5404 - Language and Culture (3.0 cr)
  - COMM 5406 - Communication and Gender (3.0 cr)
  - OLPD 5372 (Inactive) (3.0 cr)
  - ENGL 5090 - Readings in Special Subjects (1.0 - 4.0 cr)
• ENGL 5200  \textit{Inactive} (3.0 cr)
• ENGL 5300  \textit{Inactive} (3.0 cr)
• EPSY 5112 - Knowing, Learning, and Thinking (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 5612 - Understanding of Academic Disabilities (3.0 cr)
• EPSY 5613 - Foundations of Special Education I (3.0 cr)
Twin Cities Campus
Multicultural College Teaching and Learning M.A.
Postsecondary Teaching and Learning
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Postsecondary Teaching and Learning, 206 Burton Hall, 178 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-626-8705; fax: 612-625-0709)
Email: pstlinfo@umn.edu
Website: http://www.cehd.umn.edu/PsTL

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 Postsecondary Teaching and Learning (PsTL) 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 two-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:
In addition to the online application, students will also need to upload the following documents as part of their application: two letters of recommendation from persons familiar with the applicant's scholarship and research potential; and a current resume. In addition, the most important part of the application is a personal statement describing the applicant's interest in the program, professional/academic and/or community qualifications, what the applicant will bring to the diversity of the cohort and the profession, and how completion of the M.A. will build on the applicant's capacity to improve and transform teaching and learning at the postsecondary level. Complete applications received by December 1 will be considered for priority admission. Complete applications must be received by May 1 to be considered for Fall 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 18 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and 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: 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 Plan B capstone project will involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The PsTL 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 PsTL 8315 Plan B Capstone 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 18 credits in the major field (including practicum and internship) and a minimum of 6 elective credits including one 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 21 credits in the major field including two semesters of internship (6 credits), the 3 credit Plan B Capstone Seminar and a capstone project, as well as a minimum of 9 elective credits.

Required core courses

The following courses are required for both the Plan A and the Plan B.

- PSTL 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
- PSTL 5196 - Supervised Practicum in Multicultural Postsecondary Teaching and Learning (3.0 cr)
- PSTL 5206 - Action Research Methods to Improve College Teaching and Learning (3.0 cr)
- PSTL 5212 - Multicultural Theories of College Student Development Applied to Teaching and Learning (3.0 cr)
- PSTL 8296 - Supervised Internship in Postsecondary Teaching and Learning (3.0 - 6.0 cr)

Plan A and Plan B requirements

Plan A

All Plan A students must take 10 thesis credits and 6 elective credits including one research methods course to be selected in consultation with adviser.

- PSTL 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B

All Plan B students must take the Plan B Capstone Seminar and elective credits to be selected in consultation with adviser to reach required total of 30 credits.

- PSTL 8315 - Plan B Capstone Seminar (3.0 cr)
Multicultural College Teaching and Learning Minor
Postsecondary Teaching and Learning
College of Education and Human Development

Along with the 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 Postsecondary Teaching and Learning’s (PsTL) graduate minors in multicultural college teaching and learning are 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 PsTL 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.

Coursework planned with PsTL Director of Graduate Studies. Typically students select from:
PsTL 5105 Increasing Access and Success in Undergraduate Classrooms (3 cr)
PsTL 5106 Multicultural Teaching and Learning in Diverse Post-secondary Contexts (3 cr)
PsTL 5206 Action Research Methods to Improve Post-secondary Teaching and Learning (3 cr)
PsTL 5212 Multicultural Theories of College Student Development Applied to Teaching and Learning (3 cr)
PsTL 8010 Special Topics: Postsecondary Teaching and Learning (1-3 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
Coursework planned with PsTL Director of Graduate Studies to total 6 credits. Typically students select from:
PsTL 5105 Increasing Access and Success in Undergraduate Classrooms (3 credits)
PsTL 5106 Multicultural Teaching and Learning in Diverse Post-secondary Contexts (3 credits)

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PsTL 5206 Action Research Methods to Improve Postsecondary Teaching and Learning (3 credits);
PsTL 5212 Multicultural Theories of College Student Development Applied to Teaching and Learning (3 credits);
PsTL 8010 Special Topics: Post-secondary Teaching and Learning (1-3 credits).

Doctoral
Coursework planned with PsTL DGS to total 12 credits. Typically students select from:
PsTL 5105 Increasing Access and Success in Undergraduate Classrooms (3 credits);
PsTL 5106 Multicultural Teaching and Learning in Diverse Postsecondary Contexts (3 credits);
PsTL 5206 Action Research Methods to Improve Postsecondary Teaching and Learning (3 credits);
PsTL 5212 Multicultural Theories of College Student Development Applied to Teaching and Learning (3 credits);
PsTL 8010 Special Topics: Postsecondary Teaching and Learning (1-3 credits).
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 S.E., 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 2014
• 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 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
  - 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.

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Information current as of September 19, 2014
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 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 5336 - Planning for Multimedia Design and Development (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 2014
- 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, 330 Wulling Hall, 86 Pleasant Street 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: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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 Ed.D. programs choose from one of three complementary but distinct program tracks: education policy and leadership (EPL), higher education (HiEd), 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. 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 and the Higher Education tracks of the EdD 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
- 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 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 Ed.D. 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 Ed.D. 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
Current students in this Ed.D. track are required to take 47 course credits and 24 field study credits (thesis credits).

Research Courses
- Students should consult with advisers about the appropriate time to register for each course.
  - OLPD 8015 - Research Design and Educational Policy (3 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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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 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 M.A. and Ph.D. 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 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 March 1.

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
Program Requirements

Plan A: Plan A requires 16 to 18 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

Program Core
Offered only in the fall term and normally taken during the year in which the student is writing the master's thesis. Student must take 3 credits of OLPD 5087
OLPD 5087 - Seminar: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Program Specialization
Select one of the specializations below and choose two of its three core courses. Note: The Global Youth Policy and Leadership specialization is not being offered currently although individual courses may appear on occasion.

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)

or Global youth policy and leadership
OLPD 5141 - Global Youth Policy and Leadership: Comparative Youth Policy and Leadership (3.0 cr)
OLPD 5142 - Youth Futures in International and Global Contexts (3.0 cr)
OLPD 5381 - The Search for Children and Youth Policy in the U.S. (3.0 cr)

Research Design and Methods
3 credits to be selected in consultation with adviser.

Related Fields
The master's degree requires 6 semester credits taken outside the CIDE program track that directly relate to the student's area of study. Courses totaling 6 or more credits should be selected in consultation with the adviser 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 adviser approval:
- OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
- OLPD 5056 - Case Studies for Policy Research (3.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
- OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
- OLPD 5102 - Knowledge Constructions and Applications in International Development Contexts (3.0 cr)
- OLPD 5144 [Inactive](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)
- OLPD 8104 - Innovative Systems Thinking in Education and Culture (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)

**Plan B**
Total Plan B CIDE Credits: 30 credits

**Program Core**
This is an independent study with adviser to prepare Plan B paper. Student must take at least 3 credits of OLPD 5095.
- 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. Note: The Global Youth Policy and Leadership specialization is not being offered currently although individual courses may appear on occasion.

**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)

**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)

**Global youth policy and leadership**
- OLPD 5141 - Global Youth Policy and Leadership: Comparative Youth Policy and Leadership (3.0 cr)
- OLPD 5142 - Youth Futures in International and Global Contexts (3.0 cr)
- OLPD 5381 - The Search for Children and Youth Policy in the U.S. (3.0 cr)

**Research Design and Methods**
3 credits to be selected in consultation with adviser.

**Electives**
Take 12 or more credit(s) from the following list:

Notes: 8xxx courses should be taken only with the consent of the instructor.

The following course sections are also available for elective options:
- OLPD 5080 - Special Topics: Gender, Education, & International Development (3 cr)
- OLPD 8087 - Seminar: Educational Policy & Administration (1-2 cr) [Advanced Seminar in International Development Education: Care Gender Project]
- OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
- OLPD 5056 - Case Studies for Policy Research (3.0 cr)
- OLPD 5061 - Ethnographic Research Methods (3.0 cr)
- OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
- OLPD 5102 - Knowledge Constructions and Applications in International Development Contexts (3.0 cr)
- OLPD 5144 [Inactive](3.0 cr)
- OLPD 5302 - Educational Policy: Context, Inquiry, and Issues (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)
- OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)

**Related Fields (6 additional credits outside department)**
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 adviser and should constitute a solid coursework foundation for the student’s thesis. These courses may include additional methods courses taught outside the department.
Plan A or Plan B

Plan A

Program Core
Take 6 or more credit(s) from the following:
OLPD 5001 - Formal Organizations in Education (3.0 cr)
or OLPD 5041 - Sociology of Education (3.0 cr)
or OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
or OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
or OLPD 5302 - Educational Policy: Context, Inquiry, and Issues (3.0 cr)
or OLPD 5344 - School Law (3.0 cr)
or OLPD 5364 - Context and Practice of Educational Leadership (3.0 cr)

Research Design and Methods
Take 6 or more credits selected in consultation with adviser.

Related Fields (6 additional credits outside department)
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 adviser.

Electives
2-8 credits selected in consultation with adviser.

Thesis Credits
Take 10 or more credit(s) from the following:
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 adviser.

-OR-

Plan B

Require Coursework
OLPD 5001 - Formal Organizations in Education (3.0 cr)
OLPD 5302 - Educational Policy: Context, Inquiry, and Issues (3.0 cr)

Program Core
Take 6 credits total from the following two areas:

Leadership courses
Choose one of the following:
OLPD 5048 - Cross-Cultural Perspectives on Leadership (3.0 cr)
or 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)
or OLPD 5044 - Introduction to the Economics of Education (3.0 cr)
or OLPD 5128 - Anthropology of Education (3.0 cr)
or OLPD 5324 - Strategic Financial Planning and Policy for Educational Leaders (3.0 cr)
or OLPD 5344 - School Law (3.0 cr)
or OLPD 5346 - Politics of Education (3.0 cr)

Research Design and Methods
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)

Related Fields
6 additional credits outside of the EPL program track, selected in consultation with adviser. These usually include additional courses from the program core or other OLPD courses.

Electives
6-8 cr selected in consultation with adviser

Colloquium Paper
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.

Take 3 or more credit(s) from the following:
OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)

Evaluation Studies
Plan A
Total Plan A ES Credits: 31 credits minimum

Program Core (6 credits)
- 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
Two qualitative methods courses selected in consultation with adviser for a minimum of 6 credits.

Related Fields/Electives (9-10 credits)
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 adviser and should constitute a solid coursework foundation for the student's thesis.

Thesis Credits
Take 10 or more credit(s) from the following:
- OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Plan B
Total Plan B ES Credits: 31 credits minimum

Program Core (10 credits)
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
- OLPD 5524 - Evaluation Colloquium (1.0 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
Two qualitative methods courses selected in consultation with adviser for a minimum of 6 credits.

Related Fields
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 adviser and should constitute a solid coursework foundation for the student's thesis.

Other Electives
Coursework related to the student's specialization, selected in consultation with the adviser, and totaling a minimum of 6 credits. These may be OLPD or outside courses.

Colloquium Paper
The Plan B paper is prepared under the guidance of the adviser and committee. The final paper must represent no fewer than 120 hours of work.

Take 3 or more credit(s) from the following:
- 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 HiEd Credits: 34 credits

Required Coursework
- OLPD 5701 - U.S. Higher Education (3.0 cr)
- OLPD 5709 - Critical Issues in Higher Education (3.0 cr)

Program Area
Take 9 or more credit(s) from the following with adviser consultation and approval. Other courses as offered by higher ed program track faculty may also meet this requirement.

Only the topics listed below may be used for this requirement if taking OLPD 5080:
- Diversity & Equity in Higher Education (3 cr)
- Public Engagement in Higher Education (3 cr)
- External Relations in Higher Education (3 cr)
- Perspectives on Leadership (3 cr)
- Any taught by higher ed program faculty (3 cr)
- 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 5734 - Institutional Research in Postsecondary Education (2.0 - 3.0 cr)
or OLPD 8703 - Public Policy in Higher Education (3.0 cr)

Related Fields
The master's degree requires 6 semester credits taken outside the higher ed program track that directly relate to the student's area of study. These courses should be selected in consultation with the adviser 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
Students select courses in consultation with their adviser totaling a minimum of 3 credits.

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 HiEd Credits: 30 credits

Required Coursework
6 credits
OLPD 5701 - U.S. Higher Education (3.0 cr)
OLPD 5709 - Critical Issues in Higher Education (3.0 cr)

Program Area
Take 12 or more credit(s) from the following with adviser consultation and approval. Other courses as offered by higher ed program track faculty may also meet this requirement.

Only the topics listed below may be used for this requirement if taking OLPD 5080:
Diversity & Equity in Higher Education (3 cr)
Public Engagement in Higher Education (3 cr)
External Relations in Higher Education (3 cr)
Perspectives on Leadership (3 cr)
Any taught by higher ed program faculty (3 cr)
OLPD 5001 - Formal Organizations in Education (3.0 cr)
OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)
OLPD 5704 - College Students Today (3.0 cr)
OLPD 5721 - Race and Ethnicity in Higher Education (3.0 cr)
OLPD 5724 - Leadership and Administration of Student Affairs (2.0 - 3.0 cr)
OLPD 5734 - Institutional Research in Postsecondary Education (2.0 - 3.0 cr)
OLPD 8703 - Public Policy in Higher Education (3.0 cr)

Related Fields
The master's degree requires 6 semester credits taken outside the higher ed track that directly relate to the student's area of study. These courses should be selected in consultation with the adviser 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
Select courses in consultation with adviser for a minimum of 3 credits.

Colloquium Paper
Plan B paper is prepared under the guidance of adviser and committee. The final paper must represent no fewer than 120 hours of work.

Take 3 or more credit(s) from the following:
OLPD 5795 - Plan B Research Design (3.0 cr)

Human Resource Development

Plan A or Plan B

Human Resource Development

Plan A

General Aspects
OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)

Research
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
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 5607 - Organization Development (3.0 cr)
OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

Thesis Credits and Elective
Student must take 10 credits of OLPD 8777. Student must also take electives as needed to reach required grand total of 34 graduate-level coursework credits.

OLPD 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B

General Aspects
OLPD 5801 - Survey: Human Resource Development and Adult Education (3.0 cr)

Research
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
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 5607 - Organization Development (3.0 cr)
OLPD 5201 - Strategies for Teaching Adults (3.0 cr)

Plan B Project Paper
Plan B project/paper is prepared under the guidance of adviser and committee - must represent no fewer than 120 hours of work.
Students should register for between 3-6 credits

OLPD 5893 - Directed Study in OLPD (1.0 - 4.0 cr)

Electives
With approval of adviser as needed to total a minimum of 34 graduate-level coursework credits overall for this plan.
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, 330 Wulling Hall, 86 Pleasant Street 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: Doctorate
• Requirements for this program are current for Fall 2014
• 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 M.A. and Ph.D. programs choose from one of five complementary but distinct program tracks: education policy and leadership (EPL), evaluation studies (ES), higher education (HiED), 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
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 Ph.D. is available in five program tracks: education policy and leadership, evaluation studies, higher education, comparative and international development education or human resource development. All Ph.D. 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 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 Ph.D. requirements, the degree program is developed by the student and his or her adviser 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 (Ph.D.) 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 three specializations within CIDE are comparative and international development education; intercultural/international education; and global youth policy and leadership.

Department Core
16 credits

Professional socialization seminar
Taken fall term of first year.
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

Research courses
OLPD 8015 - Research Design and Educational Policy (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
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
Students choose two courses, with a minimum of one 8xxx course for specializations with 8xxx courses. Any specialization core course not being used as core class can become a CIDE elective. Note: The Global Youth Policy and Leadership specialization is not being offered currently although individual courses may appear on occasion.

Comparative and international development education
Take 6 or more credit(s) from the following:
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)  
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)

Global Youth Policy and Leadership
Take 6 or more credit(s) from the following:
OLPD 5141 - Global Youth Policy and Leadership: Comparative Youth Policy and Leadership (3.0 cr)  
OLPD 5142 - Youth Futures in International and Global Contexts (3.0 cr)  
OLPD 5381 - The Search for Children and Youth Policy in the U.S. (3.0 cr)

CIDE Elective Courses
Take exactly 8 credit(s) from the following:
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 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)  
or  
OLPD 5102 - Knowledge Constructions and Applications in International Development Contexts (3.0 cr)  
or  
OLPD 5144  (Inactive) (3.0 cr)  
or  
OLPD 5381 - The Search for Children and Youth Policy in the U.S. (3.0 cr)  
or  
OLPD 8104 - Innovative Systems Thinking in Education and Culture (3.0 cr)

Special topics/Seminar elective options
OLPD 8087 - Seminar in OLPD Advanced Seminar in International Development Education: Care Gender Project OR Professional Seminar in CIDE

OLPD 5080 - Special Topics in OLPD Special Topics: Gender, Education, and International Development (3 cr) OR Special Topics: Human Rights Education (3 cr)

Additional Coursework
To meet requirement that 12 credits be taken outside the CIDE program track or for a graduate minor.

Education Policy and Leadership
The doctor of philosophy (Ph.D.) 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 credits
Professional socialization seminar  
Taken fall term of first year
OLPD 8011 - Doctoral Research Seminar I (1.0 cr)
Research courses
OLPD 8015 - Research Design and Educational Policy (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 credits
OLPD 5001 - Formal Organizations in Education (3.0 cr)  
OLPD 5346 - Politics of Education (3.0 cr)  
OLPD 8020 - Leadership: From Theory to Reflective Practice (3.0 cr)  
OLPD 8302 - Educational Policy Perspectives (3.0 cr)

OLPD Electives
6 or more credits of electives selected with approval of adviser.

Additional Coursework
To meet requirement that 12 credits be taken outside the EPL program track or for a graduate minor. Courses not specifically listed should have adviser approval.

**Evaluation Studies**
The doctor of philosophy (Ph.D.) 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 credits
Taken fall term of first year
- OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

**Research Courses**
- OLPD 8015 - Research Design and Educational Policy (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**
20 credits. Student must take OLPD 8596 twice, in two different semesters.
- OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
- OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
- OLPD 5524 - Evaluation Colloquium (1.0 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**
To meet requirement that 12 credits be taken outside the ES program track or for a graduate minor. Courses not specifically listed should have adviser approval.

**Higher Education**
The doctor of philosophy (Ph.D.) 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 credits
- Professional socialization seminar
  Taken fall term of first year
  - OLPD 8011 - Doctoral Research Seminar I (1.0 cr)

**Research Design and Methods**
- OLPD 8015 - Research Design and Educational Policy (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**
21 credits
- 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)

**Higher Ed Electives**
9 credits focused on issues relevant to the Higher Education track with adviser approval

**Additional Coursework**
Minimum of 11 credits. To meet department requirement that at least 11 credits be taken outside the HE program track or for a graduate minor.

**Human Resource Development**
The doctor of philosophy (Ph.D.) 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**

**Professional socialization seminar**
- Taken fall term of first year

**OLPD 8011 - Doctoral Research Seminar I (1.0 cr)**

**Dept Research Courses**

- **OLPD 8015 - Research Design and Educational Policy (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

**Additional Research Courses**

In addition to the research/methodology courses mentioned in the department core the following are required for students in the HRD track.

- 3 credit statistics course selected in consultation with adviser
- 5 credits of a capstone year-long research course selected in consultation with adviser

**Specialization**

- One 8000 level theory seminar (3 cr)
- 2 or 3 8xxx level Special Topics seminars offered by various HRD faculty (2-3 credits each for a total of 6 cr)

**Skills and Special Topics Electives**

- 15 credits of electives in consultation with one's adviser
Twin Cities Campus
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 (612-625-3116; 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 2014
• 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:
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
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, 330 Wulling Hall, 86 Pleasant Street S.E., Minneapolis, MN 55455
(612-625-9087; fax: 612-624-3377)
Email: licensure@umn.edu
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 2014
- Length of program in credits: 22 to 25
- 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/grad-programs/Adm-Licensure/apply.html 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: K-12 principal, superintendent, and 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: director of community education
- A bachelor's degree plus 24 credits
- 320 hours of field experience

Exit requirements
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)
- **OLPD 5396** - Field Experience in PK-12 Administration: Authentic Practice in Leadership (3.0 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)
  - OR-

**Superintendent**

- **OLPD 5322** - Leaders in the Superintendency and Central Office (3.0 cr)
- **OLPD 5393** - Leading School Finance Elections (1.0 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 5321** - The Principal as Leader of High-Performing Schools (3.0 cr)
  - OR-

**Director of community education**

- **OLPD 5389** - Community Education Leadership (3.0 cr)
OLPD 5394 - Leadership in Community Education Finance and Law (1.0 cr)
Take 6 credits, in consultation with adviser, from outside of OLPD in the areas of:
- Adult Education (2 cr)
- Early Childhood (2 cr)
- School Age Programs (2 cr)
Twin Cities Campus
Prevention Science Minor
Institute of Child Development
College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Prevention Science Program, 154 Child Development, 51 East River Parkway, Minneapolis, MN 55455 (612-625-9778; fax: 612-624-6373)
Email: prevsci@umn.edu
Website: http://www.preventionscience.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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.

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 www.cehd.umn.edu/icd/PrevSci/concentrations.html.

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 master's or 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 plan for approval. Instructions and forms can be found at www.cehd.umn.edu/icd/PrevSci/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 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 director of graduate studies for prevention science.

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.

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
PREV 8001 - Prevention Science Core (3.0 cr)
Students should choose 6 additional credits of elective courses primarily from the student's area of concentration in consultation with the director of graduate studies.

Doctoral
Required Courses
PREV 8001 - Prevention Science Core (3.0 cr)
PREV 8005 - Prevention Science Capstone Course (1.0 cr)
Students should choose 9 additional credits of elective courses primarily from the student's area of concentration in consultation with the director of graduate studies.
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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- Length of program in credits: 12 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.

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 5364 - Context and Practice of Educational Leadership (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 program faculty 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.

Take 2 - 5 credit(s) from the following:

• OLPD 5095 - Problems: Organizational Leadership, Policy, and Development (1.0 - 3.0 cr)
  or focused elective coursework chosen with program faculty approval.
Twin Cities Campus
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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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 non-profit 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 master's or doctoral program is required. Admission to the minor, therefore, will be contingent upon enrollment in good standing within a recognized University degree-granting program.

Special Application Requirements:
Students apply for admission through the minor's director of graduate studies and faculty. 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, and education). Students from existing evaluation programs in OLPD and educational psychology are not eligible for 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.

Students need a minimum of 15 credits for the doctoral minor and a minimum of 9 credits for the master's minor. Individual programs are designed through consultation by the student, the major adviser, and the director of graduate studies of the program evaluation 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
Minor requirements
The program for an individual student will be developed by the student, the major adviser, 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 curriculum may apply for waiver of appropriate requirements and replace waived courses with additional electives to meet the 9 credit minimum.

OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)
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)

Doctoral
Minor Requirements
The program for an individual student will be developed in consultation among the student, the major adviser, and the director of graduate studies (DGS) of the program evaluation minor. With the permission from the program evaluation minor DGS, 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 to meet the 15 credit minimum.

OLPD 5521 - Cost and Economic Analysis in Educational Evaluation (3.0 cr)
OLPD 8502 - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)
OLPD 8596 - Evaluation Internship (1.0 - 9.0 cr)
OLPD 5501 - Principles and Methods of Evaluation (3.0 cr)
  or An alternative course approved by program evaluation steering committee.

Additional coursework
Additional coursework must be taken in courses 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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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 (M.Ed.) or master of arts (M.A.), 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 program coordinator of evaluation studies) are required
## Foundations of evaluation
Take 1 or more course(s) 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 8502** - Program Evaluation Theory and Models: Qualitative and Quantitative Alternatives (3.0 cr)

## Internship in evaluation
**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 program coordinator of evaluation studies.

Take 3 or more credit(s) from the following:

- **CI 8115** - Curriculum and Achievement Outcomes in a Diverse Society (3.0 cr)
- **CI 8148** - Conducting Qualitative Studies in Educational Contexts (3.0 cr)
- **CI 8914** - Critical Science Research (3.0 cr)
- **OLPD 5056** - Case Studies for Policy Research (3.0 cr)
- **OLPD 5061** - Ethnographic Research Methods (3.0 cr)
- **OLPD 5841** *(inactive)* (3.0 cr)
- **OLPD 5524** - Evaluation Colloquium (1.0 cr)
- **OLPD 8595** - Evaluation Problems (1.0 - 6.0 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)
- **PUBH 6724** - 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; fax: 612-624-3744)
Email: swadmis@umn.edu
Website: http://cehd.umn.edu/ssw

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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 M.S.W. 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, Families and Children, Health, Disabilities and Aging or Community Practice.

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
The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in a related discipline is not required, however, students with a bachelor's degree in social work from an accredited program are eligible for advanced standing.

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.

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 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 M.S.W. 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 M.S.W. 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 16 credits may be transferred from the following sources with School of Social Work approval: 16 credits completed as a graduate student in another accredited M.S.W. program; up to 6 credits as a non-degree-seeking student registered for social work graduate credit at the University of Minnesota.

Foundations Curriculum- Full Program (53 credit) Students

The 19-credit foundation curriculum is required for full program (53 credit) 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 5051 for 2 cr; 5101 for 3 cr; 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 - Models of Community Intervention (1.0 cr)
- SW 8154 - Organizations and Policy Advocacy (1.0 cr)
- SW 8841 - Social Work Research Methods (2.0 cr)
- SW 8010 - Seminar: Field Practicum I (1.0 - 8.0 cr)

Concentrations

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. In addition to the following requirements, students must complete 5 cr of electives at a minimum of 5-000 level.

**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**

Students must take two courses/6 cr of concentration electives.

- SW 8352 - Advanced Practice II: Families and Children (3.0 cr)
- SW 8461 - Advanced Clinical Social Work Practice with Adults (3.0 cr)
or SW 8462 - Advanced Clinical Practice With Children and Adolescents (3.0 cr)
or 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)

**Field Practicum and Advanced Evaluation**

SW 8020, Field Practicum II (6 cr) and SW 8842, Advanced Social Work Evaluation (3 cr) must be taken concurrently. SW 8842 must be taken for a total of 3 cr. The credits are split between fall and spring semesters. If a student registers for 2 cr in the fall, they must register for 1 cr in the spring and vice versa. Students taking 8842 in the summer register for 3 cr.

Advanced Standing students will take SW 8030 concurrently with SW 8842.

**SW 8020 - Field Practicum II (1.0 - 6.0 cr)**

**with SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 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.

SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
or SW 8351 - Advanced Practice I: Families and Children (3.0 cr)
or SW 8551 - Advanced Community Practice: Assessment, Organizing, and Advocacy (3.0 cr)

-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. In addition to the following requirements, students must complete 5 cr of electives.

**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**

Students must take two courses/6 cr of concentration electives.

SW 5562 - Global Social Work and Social Development (3.0 cr)
or SW 8561 - Human Resources Management in Human Services Agencies (3.0 cr)
or SW 8563 - Advanced Policy Advocacy (3.0 cr)

**Diversity**

SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

**Field Practicum and Advanced Evaluation**

SW 8020, Field Practicum II (6 cr) and SW 8842, Advanced Social Work Evaluation (3 cr) must be taken concurrently. SW 8842 must be taken for a total of 3 cr. The credits are split between fall and spring semesters. If a student registers for 2 cr in the fall, they must register for 1 cr in the spring and vice versa. Students taking 8842 in the summer register for 3 cr.

Advanced Standing students will take SW 8030 concurrently with SW 8842.

**SW 8020 - Field Practicum II (1.0 - 6.0 cr)**

**with SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 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**

SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
or SW 8351 - Advanced Practice I: Families and Children (3.0 cr)
or SW 8451 - Assessment and Engagement in Clinical Social Work Practice (3.0 cr)

-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. In addition to the following requirements, students must complete 5 cr of electives at a minimum of 5-000 level.

**Anchor and Boost**

SW 8351 - Advanced Practice I: Families and Children (3.0 cr)

**SW 8352 - Advanced Practice II: Families and Children (3.0 cr)**

**Concentration Electives**

Students must take two courses/6 cr of concentration electives.
SW 8361 - Identification and Assessment of Family Violence (3.0 cr)
or SW 8363 - Social Work in Child Welfare (3.0 cr)
or SW 8462 - Advanced Clinical Practice With Children and Adolescents (3.0 cr)

Diversity
SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

Field Practicum and Advanced Evaluation
SW 8020, Field Practicum II (6 cr) and SW 8842, Advanced Social Work Evaluation (3 cr) must be taken concurrently. SW 8842 must be taken for a total of 3 cr. The credits are split between fall and spring semesters. If a student registers for 2 cr in the fall, they must register for 1 cr in the spring and vice versa. Students taking 8842 in the summer register for 3 cr.

Advanced Standing students will take SW 8030 concurrently with SW 8842.
SW 8020 - Field Practicum II (1.0 - 6.0 cr)
with SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 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
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)

-OR-

Health, Disability and Aging Concentration
Prepares students to work with people affected by distince 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. In addition to the following requirements, students must complete 5 cr of electives at a minimum of 5-000 level.

Anchor and Boost
SW 8251 - Social Work Practice in Health, Disabilities, and Aging (3.0 cr)
SW 8252 - Advanced Interventions and Issues in Health, Disabilities, and Aging (HDA) (3.0 cr)

Concentration Electives
Students must take two courses/6 cr of concentration electives.
SW 8261 - Advanced Social Work Practice in Health Care (3.0 cr)
or SW 8262 - Empowerment Practice With Persons With Disabilities (3.0 cr)
or SW 8263 - Advanced Direct Practice and Community-Based Interventions in Gerontology (3.0 cr)

Diversity
SW 8821 - Social Work and Difference, Diversity and Privilege (2.0 cr)

Field Practicum and Advanced Evaluation
SW 8020, Field Practicum II (6 cr) and SW 8842, Advanced Social Work Evaluation (3 cr) must be taken concurrently. SW 8842 must be taken for a total of 3 cr. The credits are split between fall and spring semesters. If a student registers for 2 cr in the fall, they must register for 1 cr in the spring and vice versa. Students taking 8842 in the summer register for 3 cr.

Advanced Standing students will take SW 8030 concurrently with SW 8842.
SW 8020 - Field Practicum II (1.0 - 6.0 cr)
with SW 8842 - Advanced Social Work Evaluation (1.0 - 3.0 cr)

Advanced Policy
SW 8805 - Aging and Disability Policy (3.0 cr)
or SW 8806 - Health and Mental Health Policy (3.0 cr)

2nd Focus Anchor
SW 8351 - Advanced Practice I: 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)

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.

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

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 2014
- 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 Ph.D. 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 Ph.D. 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 Friday, January 2, 2015. Final deadline is Friday, March 6, 2015. 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 1 semesters must be completed before filing a Degree Program Form.

The Ph.D. 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 M.S.W. 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); statistics courses (most students take EPSY 8261 and EPSY 8262 but other sequences may be approved by the PhD Committee). 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)
EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)
EPSY 8262 - Statistical Methods II: Regression and the General Linear Model (3.0 cr)

Other sequence of statistics courses may be approved by the PHD Committee.

Supporting Program Coursework
Students must take 12 credits of supporting course work in consultation with their adviser. Eight credits must be taken outside of social work while four 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, 330 Wulling Hall, 86 Pleasant Street 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 2014  
- 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 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 of Minnesota master's or doctoral degree-granting program. Interested students should consult with a SCSE faculty member to develop a proposed course of study, complete the SCSE application form, and submit it to the SCSE DGS. The SCSE DGS reviews applications in consultation with SCSE faculty and notifies applicants of their admission. Students who are admitted into the minor program are required to enlist a member of the SCSE faculty on their master's or doctoral committee. Students may apply to this minor year round.

**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.

**Master's or Doctoral**

**Masters Degree Students**
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 cr 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 cr from the list below
Take 1 - 2 course(s) from the following:
- 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)
- EPSY 5157 - Social Psychology of Education (3.0 cr)
- CPSY 5251 - Social and Philosophical Foundations of Early Childhood Education (2.0 cr)
- KIN 5371 - Sport and Society (3.0 cr)
- SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)
- SW 5802 - Social Welfare History (1.0 cr)
- AFRO 5103 - World History and Africa (3.0 cr)
- AFRO 5120 - Social and Intellectual Movements in the African Diaspora (3.0 cr)
- AFRO 5551 - Methods: Use of Oral Traditions as Resources for History (3.0 cr)
- AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
- AMIN 5890 - Problems in American Indian History (3.0 cr)
- AMDP 8288 - Working in the Global Economy: Readings (3.0 cr)
- ANTH 5033 - Feminist Anthropology (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)
- COMM 5404 - Language and Culture (3.0 cr)
- COMM 5451W - Intercultural Communication Processes [WI] (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 8920 - Advanced Topics in Comparative Studies in Discourse and Society (3.0 cr)
- CL 8362 - Modernity and Its Others (4.0 cr)
- CSCL 5555 - Introduction to Semiotics (3.0 cr)
- CSCL 5833 - Marx, Freud, Nietzsche: Intellectual Foundations (3.0 cr)
- DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (2.0 cr)
- DSSC 8310 - Topics in Development Studies and Social Change (1.0 cr)
- GWSS 5102 - Feminist Approaches to History (3.0 cr)
- GWSS 5103 - Feminist Pedagogies (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 8109 - Feminist Knowledge Production (3.0 cr)
- GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)
- GLOS 5403 - Human Rights Advocacy (3.0 cr)
- GLOS 5602 - Other Worlds: Globality and Culture (3.0 cr)
- HIST 5632 - Reading: Modern European History (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)
• PHIL 5323 - Education and Social Change [WI] (4.0 cr)
• PHIL 5601 - History of the Philosophy of Science (3.0 cr)
• PHIL 5622 - Philosophy and Feminist Theory (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 5253 {Inactive}(4.0 cr)
• POL 5275 {Inactive}(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)
• SOC 8211 - Race Relations Theory (3.0 cr)
• SOC 8731 - Sociology of Knowledge (3.0 cr)
• SOC 8735 - Sociology of Culture (3.0 cr)
• PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
• PA 5414 - Child Human Rights: Work and Education (3.0 cr)

-OR-

Doctoral Students
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 cr from 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 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 cr from list below
Take 1 - 2 course(s) from the following:
• 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)
• EPSY 5157 - Social Psychology of Education (3.0 cr)
• CPSY 5251 - Social and Philosophical Foundations of Early Childhood Education (2.0 cr)
• KIN 5371 - Sport and Society (3.0 cr)
• SW 5101 - Historical Origins and Contemporary Policies and Programs in Social Welfare (3.0 - 4.0 cr)
• SW 5802 - Social Welfare History (1.0 cr)
• AFRO 5103 - World History and Africa (3.0 cr)
• AFRO 5120 - Social and Intellectual Movements in the African Diaspora (3.0 cr)
• AFRO 5551 - Methods: Use of Oral Traditions as Resources for History (3.0 cr)
• AFRO 8554 - Seminar: Gender, Race, Nation, and Policy--Perspectives from Within the African Diaspora (3.0 cr)
• AMIN 5890 - Problems in American Indian History (3.0 cr)
• AMST 8288 - Working in the Global Economy: Readings (3.0 cr)
• ANTH 5033 - Feminist Anthropology (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)
• COMM 5404 - Language and Culture (3.0 cr)
• COMM 5451W - Intercultural Communication Processes [WI] (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 8010 - 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)
• CL 8362 - Modernity and Its Others (4.0 cr)
• CSCL 5555 - Introduction to Semiotics (3.0 cr)
• CSCL 5833 - Marx, Freud, Nietzsche: Intellectual Foundations (3.0 cr)
• DSSC 8111 - Approaches to Knowledge and Truth: Ways of Knowing in Development Studies and Social Change (2.0 cr)
• DSSC 8310 - Topics in Development Studies and Social Change (1.0 cr)
• GWSS 5102 - Feminist Approaches to History (3.0 cr)
• GWSS 5103 - Feminist Pedagogies (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 8109 - Feminist Knowledge Production (3.0 cr)
• GWSS 8201 - Feminist Theory and Methods in the Social Sciences (3.0 cr)
• GLOS 5403 - Human Rights Advocacy (3.0 cr)
• GLOS 5602 - Other Worlds: Globality and Culture (3.0 cr)
• HIST 5632 [Inactive] (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)
• PHIL 5323 - Education and Social Change [WI] (4.0 cr)
• PHIL 5601 - History of the Philosophy of Science (3.0 cr)
• PHIL 5622 - Philosophy and Feminist Theory (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 5253 [Inactive] (4.0 cr)
• POL 5275 [Inactive] (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)
• SOC 8211 - Race Relations Theory (3.0 cr)
• SOC 8731 - Sociology of Knowledge (3.0 cr)
• SOC 8735 - Sociology of Culture (3.0 cr)
• PA 5001 - Intellectual Foundations of Public Action (1.5 cr)
• PA 5414 - Child Human Rights: Work and Education (3.0 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

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 51
- 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.

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

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Information current as of September 19, 2014
- 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 adviser 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.

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 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:
- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
Autism Spectrum Disorder

Professional development in special education offers a program in Autism Spectrum Disorders (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 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:

- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
- EPSY 5604 - Transition From School to Work and Community Living for Persons With Special Needs (3.0 cr)
- EPSY 5611W - Research-based Practices in Academic and Behavior Disabilities [WI] (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5632 - Module 2: Evidence-based Methods for AAC Assessment and Intervention (2.0 cr)
- EPSY 5633 - Module 3: Speech-generating Devices and High-Tech AAC (1.0 cr)
- EPSY 5661 - Introduction to Autism Spectrum Disorder (3.0 cr)
- EPSY 5663 - Assessment and Intervention for Individuals with Autism Spectrum Disorders (3.0 cr)
- EPSY 5681 - Education of Preschool Children With Disabilities: Methods and Materials (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in Special Education (2.0 cr)
- EPSY 5704 - Practicum in Middle/Secondary Settings (1.0 cr)
- EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 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 professional development program in special education specializing in deaf/hard of hearing leads to Birth-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 are deaf or hard of hearing. Graduates are prepared to assess, analyze, and problem solve the challenges of learning for deaf or hard of hearing students and their families, focusing on the objective of providing effective teaching practices and instructional strategies.

Students complete 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:
- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 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 5611W - Research-based Practices in Academic and Behavior Disabilities [WI] (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (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 5631 - Module 1: Introduction to Augmentative and Alternative Communication (1.0 cr)
- EPSY 5690 - Experimental Teaching Seminar: MEd Culminating Project (2.0 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 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:
- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 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 5611W - Research-based Practices in Academic and Behavior Disabilities [WI] (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate 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 5633 - Module 3: Speech-generating Devices and High-Tech AAC (1.0 cr)
- EPSY 5636 - Sensory Impairments of Students With Developmental Disabilities (2.0 cr)
- EPSY 5701 - Practicum: Field Experience in Special Education (2.0 cr)
- EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 cr)
• EPSY 5706 - Practicum in Moderate to Severe Developmental Disabilities (2.0 cr)
• EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 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)

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 30-31 credits: 18 credits required courses and 12-13 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 (3.0 cr)
EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 - 13 credit(s) from the following:
• CPSY 5252W - Facilitating Social and Emotional Learning in Early Childhood Education [WI] (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)
• EDHD 5005 - School and Society (2.0 cr)
• EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
• EDHD 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 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (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 Special Education (2.0 cr)
• EPSY 5704 - Practicum in Middle/Secondary Settings (1.0 cr)
• EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 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)

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 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:
- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 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 5611W - Research-based Practices in Academic and Behavior Disabilities [WI] (3.0 cr)
- EPSY 5612 - Understanding of Academic Disabilities (3.0 cr)
- EPSY 5615 - Advanced Academic Interventions (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (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 Special Education (2.0 cr)
- EPSY 5704 - Practicum in Middle/Secondary Settings (1.0 cr)
- EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 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)

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 30-31 credits: 19 credits required courses and 11-12 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 (3.0 cr)
- EPSY 5614 - Assessment and Due Process in Special Education (4.0 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 11 - 12 credit(s) from the following:
- EDHD 5005 - School and Society (2.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 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 5611W - Research-based Practices in Academic and Behavior Disabilities [WI] (3.0 cr)
- EPSY 5612 - Understanding of Academic Disabilities (3.0 cr)
- EPSY 5615 - Advanced Academic Interventions (3.0 cr)
- EPSY 5617 - Academic and Social Interventions for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (3.0 cr)
- EPSY 5627 - Seminar: Advanced issues in Learning Disabilities (3.0 cr)

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- 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 5656 - Advanced Issues in Emotional Behavior Disorders (3.0 cr)
- EPSY 5657 - Interventions for Behavioral Problems in School Settings (3.0 cr)
- EPSY 5701 - Practicum: Field Experience in Special Education (2.0 cr)
- EPSY 5704 - Practicum in Middle/Secondary Settings (1.0 cr)
- EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 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)

Teacher Licensure Exempt
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

Students in the M.Ed. program in special education who do not hold a valid Minnesota elementary, secondary, or K-12 classroom teaching license must complete additional foundational education coursework to be eligible for a license to teach in their specialization area. This is called the classroom teaching license exemption (TLE), and the coursework is in compliance with the exemption requirements of the Minnesota Board of Teaching.

Students take 21.5 - 30.5 credits depending on which M.Ed. subplan they are concurrently enrolled in. Students will take 30-31 credits for the concurrent subplan with 10.5 required credits also satisfying TLE required coursework.

Required Courses
Students must take these courses. Students must take CPSY 2301 if they have no previous child psychology or individual differences coursework.
- EDHD 5005 - School and Society (2.0 cr)
- EDH 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 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)
- EPSY 5114 - Psychology of Student Learning (3.0 cr)
  or EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
- EPSY 5619 - Specialized Interventions in Mathematics for Students with Mild to Moderate Disabilities (3.0 cr)
  or MTHE 5355 - Mathematics for Diverse Learners (3.0 cr)

General Ed Practicum
- CPSY 5281 must be taken for 3 credits. Consult with adviser.
- EPSY 5701 - Practicum: Field Experience in Special Education (2.0 cr)
  or EPSY 5705 - Practicum in ECSE/Elementary Settings (1.0 cr)
  or CPSY 5281 - Student Teaching in Early Childhood Education (1.0 - 6.0 cr)

Student Teaching
Students take 3-6 credits; course(s) depend on M.Ed. subplan (consult with adviser).
- EPSY 5741 - Student Teaching: Academic and Behavioral Strategist (6.0 cr)
  or EPSY 5742 - Student Teaching: Autism Spectrum Disorders (6.0 cr)
  or EPSY 5751 - Student Teaching: Deaf and Hard of Hearing (1.0 - 6.0 cr)
  or EPSY 5752 - Student Teaching: Learning Disabilities (1.0 - 6.0 cr)
  or EPSY 5754 - Student Teaching: Social and Emotional Disabilities (1.0 - 6.0 cr)
  or EPSY 5755 - Student Teaching: Developmental Disabilities, Mild/Moderate (1.0 - 6.0 cr)
  or EPSY 5756 - Student Teaching: Developmental Disabilities, Moderate/Severe (1.0 - 6.0 cr)
  or EPSY 5761 - Student Teaching in Early Childhood Special Education Settings for Children Aged Three to Five Years (3.0 cr)
  or EPSY 5762 - Student Teaching in Early Childhood Special Education for Children Aged Birth to Three Years (3.0 cr)

K-12 Requirements
Students in all M.Ed. subplans (except ECSE) must take these courses.
- 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)

ECSE Requirements
Students in the ECSE subplan must take these courses.
- EPSY 5609 - Family-centered Services (2.0 cr)
- CPSY 5262W - Facilitating Social and Emotional Learning in Early Childhood Education [WI] (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)
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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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.

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 M.A. and Ph.D. 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

Specialist in Education and Special 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, 330 Wulling Hall, 86 Pleasant Street 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 2014
- 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.

This program is not accepting new students.

The Department of Organizational Leadership, Policy, and Development prepares administrators, scholars, and analysts for leadership roles in education. The department is committed to the preparation of leaders who can act effectively and ethically within the structures, processes, and cultural contexts of organized education.

The department also offers various certificate programs (including program evaluation, staff development, disability policy and services, and preK-12 administration), an individualized concentration in youth leadership development, and minors in international education, social and philosophic studies of education, and program evaluation. See the department website for details on minors and certificate programs.

These graduate programs incorporate relevant knowledge from the behavioral and social sciences and the humanities, with primary reliance on sociology, management science, political science, psychology, public affairs, economics, philosophy, history, and anthropology.

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:
This program is not accepting new 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: 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**

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 certificate is not accepting new students.

The specialist certificate required a minimum of 60 credits of which at least 30 credits had to be in educational administration, 3 credits in leadership, 3 credits in policy; at least 6 credits in curriculum and instruction; at least 9 credits taken outside of educational administration (collateral field) and/or in additional certificate or licensure areas in educational policy and leadership; and a course in human relations.
**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 S.E., Minneapolis, MN 55455 (612-625-5300; fax: 612-626-7700)
Email: kin@umn.edu
Website: [http://cehd.umn.edu/kin](http://cehd.umn.edu/kin)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 15 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 - Listening Score: 14
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 23
  - 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, 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 16 major credits, 10 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 20 major credits and 16 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 adviser 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 adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

The M.A. is offered under Plan A and Plan B. Plan A requires 36 credits, including 16 core course credits, 6 research core course credits, 4 elective credits, and 10 thesis credits (8777). The program must include 6 course credits in a minor or related field. Plan B also requires 36 credits, including 16 core course credits, 6 research core course credits, 10 elective credits, and 4 credits of a research project (8995). The program must include 6 course credits in a minor or related field (non-KIN courses). A GPA of at least 3.00 is required to maintain good standing and to graduate. A maximum of 9 credits of 4xxx-level courses are allowed at the discretion of the adviser.

Required core courses in sport management

KIN 5801 - Legal Aspects of Sport and Recreation (4.0 cr)  
KIN 5631 - Programming and Promotion in Sport (3.0 cr)  
KIN 5421 - Sport Finance (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)

Required research core courses

KIN 5981 - Research Methodology in Kinesiology, Recreation, and Sport (3.0 cr)  
One additional research analysis course can be taken from the following list (or consult with adviser):
  Take 3 or more credit(s) from the following:
  • EPSY 5261 - Introductory Statistical Methods (3.0 cr)  
  • EPSY 8261 - Statistical Methods I: Probability and Inference (3.0 cr)  
  • FSOS 8013 - Qualitative Family Research Methods (3.0 cr)

Electives

For Plan A, a minimum of 4 credits are required and may from chosen from the following list. For Plan B, a minimum of 10 credits are required and may be chosen from the following list. Students must consult with the adviser on selection of courses. Registration for KIN 5992, KIN 5995, and KIN 5720 is limited to 3 credits.

KIN 5111 - Sports Facilities (3.0 cr)  
or KIN 5115 - Event Management in Sport (3.0 cr)  
or KIN 5461 - Issues in the Sport Industry (3.0 cr)  
or KIN 5371 - Sport and Society (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 5992 - Readings in Kinesiology (1.0 - 9.0 cr)  
or KIN 5995 - Research Problems in Applied Kinesiology (1.0 - 6.0 cr)  
or REC 5701 [Inactive] (3.0 cr)  
or ABUS 4104 - Management and Human Resource Practices (3.0 cr)
Minor or related field
For Plan A and Plan B, a minimum of 6 semester credits in one or more related fields (not KIN prefix) is required. The KIN sport management courses are cross-listed with REC. Courses in the minor or supporting program may be chosen from any field selected by the student and the adviser according to the student’s prior academic background and career goals, and are subject to the adviser’s approval.

Thesis Credits: Master’s

Plan A
Take 10 or more credit(s) from the following:

• KIN 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

-OR-

Plan B
Take 4 or more credit(s) from the following:

• KIN 8995 - Research Problems in Kinesiology (1.0 - 12.0 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 2014
- 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.

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.

A sport management master's minor requires at least 6 credits of graduate-level sport management courses 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
A sport management master's minor requires at least 6 credits of graduate-level sport management courses chosen in consultation with the student's major adviser and the School of Kinesiology's director of graduate studies.

Minor Requirements
A sport management master's minor requires at least 6 credits of graduate-level sport management courses chosen in consultation with the student's major adviser and the School of Kinesiology's director of graduate studies.
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

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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:
- 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)
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 S.E., 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 2014
- Length of program in credits: 33 to 52
- 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 (M.Ed.)/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 M.Ed. adviser. 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.
- Classroom experience with appropriate grade levels (100 paid or unpaid hours) - reported in the online application
- Additional related hours and experience - reported in the online application
- Upload personal statements
- Two letters of recommendation
- 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 33 to 52 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.

Language Requirement: For language specific 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.

**Arabic**

This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Arabic sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.

EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Art
This sub-plan is limited to students completing the program under Plan C.

The art 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 art. The program seeks to develop thoughtful practitioners who are enthusiastic about and prepared for leadership roles in the schools.

Master of education (M.Ed./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 M.Ed. - Art 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.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5008 should be taken for 2 credits. CI 5049 and CI 5075 should each be taken for 3
credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5008 - Theory and Practice of Teaching Art in Elementary Schools (1.0 - 2.0 cr)
CI 5049 - Art Media Techniques (1.0 - 4.0 cr)
CI 5065 - Improving Art Programs in the Schools (3.0 cr)
CI 5069 - Curriculum Innovations in Art Education (3.0 cr)
CI 5075 - The Social and Historical Foundations of Art Education (1.0 - 3.0 cr)
CI 5078 - Application of Aesthetic Theory in Education (2.0 cr)

Electives
A minimum of three credits taken in consultation with your faculty adviser.

Chemistry
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.

M.Ed./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 M.Ed. - Chemistry 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.

M.Ed. Required Coursework

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Information current as of September 19, 2014
EDHD 5008 and EPSY 5720 should each be taken for 2 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
CI 5530 - Secondary Science Teaching: Laboratory-based Instruction (3.0 cr)
CI 5531 - Teaching Middle School Science (3.0 cr)
CI 5532 - Teaching Secondary School Science (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)

Electives
A minimum of nine credits is required. If student chooses to complete CI 5540, it should be taken for 3 credits one time only.
CI 5535 - Foundations of Science Education (3.0 cr)
CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)
CI 5539 - Improving Secondary Science Instruction: Surviving the First Two Years (3.0 cr)
CI 5540 - Special Topics: Science Education (1.0 - 8.0 cr)

Chinese
This sub-plan is limited to students completing the program under Plan C.

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.

The Teaching M.Ed. - Chinese sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Classrooms (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
CI 5641 - Language, Culture, and Education (3.0 cr)
CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Earth 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, by 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.

M.Ed./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 M.Ed. - Earth 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.

**M.Ed. Required Coursework**

- EDHD 5008 and EPSY 5720 should each be taken for 2 credits.
- EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- EDHD 5017 - Academic Language and English Learners (1.0 cr)
- EDHD 5018 - Academic Language and English Learners (1.0 cr)
- EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- CI 5530 - Secondary Science Teaching: Laboratory-based Instruction (3.0 cr)
- CI 5531 - Teaching Middle School Science (3.0 cr)
- CI 5532 - Teaching Secondary School Science (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)

**Electives**

- A minimum of nine credits is required. If student chooses to complete CI 5540, it should be taken for 3 credits one time only.
- CI 5535 - Foundations of Science Education (3.0 cr)
- or CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)
- or CI 5539 - Improving Secondary Science Instruction: Surviving the First Two Years (3.0 cr)
- or CI 5540 - Special Topics: Science Education (1.0 - 8.0 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 M.Ed./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 M.Ed. - Elementary sub-plan requires a minimum of 51.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

The Teaching M.Ed. - Elementary sub-plan for transitioners from the U of MN B.S. 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: 51.5 credits

**M.Ed. Required Coursework**

- EPSY 5720 should be taken for 2 credits
- EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
EDHD 5005 - School and Society (2.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5009 - Human Relations: Applied Skills for School and Society (1.0 cr)
EPSY 5270 - Special Topics: Special Education (1.0 - 4.0 cr)
CI 5111 - Introduction to Elementary School Teaching (3.0 cr)
CI 5283 - Practicum: Applying Instructional Methods in the Elementary Classroom (3.0 cr)
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)
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)

-OR-

Elementary Education - U of MN B.S. Degree Transitioners

Total: 39 credits

M.Ed. Required Coursework

CI 5283 - Practicum: Applying Instructional Methods in the Elementary Classroom (3.0 cr)
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)
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)

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 M.Ed./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 M.Ed. - English sub-plan 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.

M.Ed. Required Coursework

EDHD 5008 should be taken for 1 credit. CI 5441 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 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 5461 - Teaching Composition in the Secondary School (2.0 cr)
CI 5481 - Developments in Teaching English and Speech (3.0 cr)

Electives

A minimum of 12 credits is required. If student chooses CI 5410, the course should be taken for 3 credits.
CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)  
or CI 5422 - Teaching Writing in Schools (3.0 cr)  
or CI 5442 - Literature for Adolescents (3.0 cr)  
or CI 5462 - Evaluating and Assessing Writing (3.0 cr)  
or CI 5472 - Teaching Film, Television, and Media Studies (3.0 cr)  
or CI 5475 - Teaching Digital Writing: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing (3.0 cr)  
or CI 5641 - Language, Culture, and Education (3.0 cr)  
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)

English as a Second Language  
This sub-plan is limited to students completing the program under Plan C.

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.

The Teaching M.Ed. - ESL sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Context-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

French
This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - French sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.

EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

**Electives**

A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.

CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
CI 5641 - Language, Culture, and Education (3.0 cr)
CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

**General 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, 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.

M.Ed./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 M.Ed. - General 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.

**M.Ed. Required Coursework**

EDHD 5008 and EPSY 5720 should each be taken for 2 credits.

EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
CI 5530 - Secondary Science Teaching: Laboratory-based Instruction (3.0 cr)
CI 5531 - Teaching Middle School Science (3.0 cr)
CI 5532 - Teaching Secondary School Science (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)
Electives

A minimum of nine credits is required. If student chooses to complete CI 5540, it should be taken for 3 credits one time only.

CI 5535 - Foundations of Science Education (3.0 cr)
or CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)
or CI 5539 - Improving Secondary Science Instruction: Surviving the First Two Years (3.0 cr)
or CI 5540 - Special Topics: Science Education (1.0 - 8.0 cr)

German

This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - German sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives

A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
CI 5643 - Language, Culture, and Education (3.0 cr)
CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Hebrew

This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Hebrew sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.

- **EDHD 5000** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **EDHD 5007** - Technology for Teaching and Learning (1.5 cr)
- **EDHD 5008** - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- **EDHD 5010** - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- **EDHD 5013** - Child and Adolescent Development for Teaching and Learning (1.0 cr)
- **EDHD 5014** - Child and Adolescent Development for Teaching and Learning (2.0 cr)
- **EDHD 5015** - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- **EDHD 5016** - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- **EDHD 5017** - Academic Language and English Learners (1.0 cr)
- **EDHD 5018** - Academic Language and English Learners (1.0 cr)
- **EDHD 5020** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)

CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)

CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)

CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)

CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)

CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)

CI 5646 - English Grammar for ESL Teachers (3.0 cr)

CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)

LING 5001 - Introduction to Linguistics (4.0 cr)

**Electives**

A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.

- **CI 5619** - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)

  or **CI 5641** - Language, Culture, and Education (3.0 cr)

  or **CI 5647** - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)

  or **CI 5657** - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)

  or **CI 5658** - Foreign Language Testing and Assessment (3.0 cr)

  or **CI 5660** - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

**Japanese**

This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Japanese sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.

- **EDHD 5000** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **EDHD 5007** - Technology for Teaching and Learning (1.5 cr)
- **EDHD 5008** - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- **EDHD 5010** - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- **EDHD 5013** - Child and Adolescent Development for Teaching and Learning (1.0 cr)
- **EDHD 5014** - Child and Adolescent Development for Teaching and Learning (2.0 cr)
- **EDHD 5015** - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- **EDHD 5016** - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- **EDHD 5017** - Academic Language and English Learners (1.0 cr)
- **EDHD 5018** - Academic Language and English Learners (1.0 cr)
- **EDHD 5020** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
- CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
- CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
- CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
- CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
- CI 5646 - English Grammar for ESL Teachers (3.0 cr)
- CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
- LING 5001 - Introduction to Linguistics (4.0 cr)
- **Electives**
  - A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
    - **CI 5619** - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
    - or **CI 5641** - Language, Culture, and Education (3.0 cr)
    - or **CI 5647** - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
    - or **CI 5657** - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
    - or **CI 5658** - Foreign Language Testing and Assessment (3.0 cr)
    - or **CI 5660** - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.

CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Italian
This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Italian sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Latin
This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Latin sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Life 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, 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.

M.Ed./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 M.Ed. - Life 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.

**M.Ed. Required Coursework**

EDHD 5008 and EPSY 5720 should each be taken for 2 credits.

- **EDHD 5000** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **EDHD 5001** - Learning, Cognition, and Assessment (3.0 cr)
- **EDHD 5007** - Technology for Teaching and Learning (1.5 cr)
- **EDHD 5008** - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- **EDHD 5010** - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- **EDHD 5017** - Academic Language and English Learners (1.0 cr)
- **EDHD 5018** - Academic Language and English Learners (1.0 cr)
- **EDHD 5020** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **EPSY 5720** - Special Topics: Special Education (1.0 - 4.0 cr)
- **CI 5530** - Secondary Science Teaching: Laboratory-based Instruction (3.0 cr)
- **CI 5531** - Teaching Middle School Science (3.0 cr)
- **CI 5532** - Teaching Secondary School Science (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)

**Electives**

A minimum of nine credits is required. If student chooses to complete CI 5540, it should be taken for 3 credits one time only.

- **CI 5535** - Foundations of Science Education (3.0 cr)
- **or CI 5536** - Equity, Policy, and Assessment in Science Education (3.0 cr)
- **or CI 5539** - Improving Secondary Science Instruction: Surviving the First Two Years (3.0 cr)
- **or CI 5540** - Special Topics: Science Education (1.0 - 8.0 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.

M.Ed./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 M.Ed. - 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.

**M.Ed. Required Coursework**

EDHD 5008 and EPSY 5720 should each be taken for 2 credits.

- **EDHD 5000** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **EDHD 5001** - Learning, Cognition, and Assessment (3.0 cr)
- **EDHD 5007** - Technology for Teaching and Learning (1.5 cr)
- **EDHD 5008** - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- **EDHD 5010** - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- **EDHD 5017** - Academic Language and English Learners (1.0 cr)
- **EDHD 5018** - Academic Language and English Learners (1.0 cr)
- **EDHD 5020** - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- **MTHE 5011** - Arithmetic Structures in School Mathematics (3.0 cr)
- **MTHE 5021** - Algebraic Structures in School Mathematics (3.0 cr)
- **MTHE 5031** - Geometric Structures in School Mathematics (3.0 cr)
- **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)

**Electives**

A minimum of three credits is required. If student chooses to complete MTHE 5100, it should be taken for 3 credits.

- **MTHE 5100** - Topics in Mathematics Education (1.0 - 6.0 cr)
- **or MTHE 5155** - Rational Number Concepts and Proportionality (3.0 cr)
- **or MTHE 5171** - Teaching Problem Solving (3.0 cr)

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Information current as of September 19, 2014
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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Norwegian sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**

- EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
- EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
- EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
- EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EDHD 5017 - Academic Language and English Learners (1.0 cr)
- EDHD 5018 - Academic Language and English Learners (1.0 cr)
- EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
- CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
- CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
- CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
- CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
- CI 5646 - English Grammar for ESL Teachers (3.0 cr)
- CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
- LING 5001 - Introduction to Linguistics (4.0 cr)

**Electives**

A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.

- CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
- CI 5641 - Language, Culture, and Education (3.0 cr)
- CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
- CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
- CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
- CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

**Ojibwe**

This sub-plan is limited to students completing the program under Plan C.
obtain a score of at least "advanced low" on the Oral Proficiency Interview (OPI).

The Teaching M.Ed. - Ojibwe sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**
- EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
- EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
- EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
- EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
- EDHD 5017 - Academic Language and English Learners (1.0 cr)
- EDHD 5018 - Academic Language and English Learners (1.0 cr)
- EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
- CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
- CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
- CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
- CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
- CI 5646 - English Grammar for ESL Teachers (3.0 cr)
- CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
- LING 5001 - Introduction to Linguistics (4.0 cr)

**Electives**
- A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
- CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
- or CI 5641 - Language, Culture, and Education (3.0 cr)
- or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
- or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
- or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
- or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

**Physics**
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, 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.

The M.Ed./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 M.Ed. - Physics 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.

**M.Ed. Required Coursework**
- EDHD 5008 and EPSY 5720 should each be taken for 2 credits.
- EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EDHD 5001 - Learning, Cognition, and Assessment (3.0 cr)
- EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
- EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
- EDHD 5017 - Academic Language and English Learners (1.0 cr)
- EDHD 5018 - Academic Language and English Learners (1.0 cr)
- EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
- EPSY 5720 - Special Topics: Special Education (1.0 - 4.0 cr)
- CI 5530 - Secondary Science Teaching: Laboratory-based Instruction (3.0 cr)
- CI 5531 - Teaching Middle School Science (3.0 cr)
- CI 5532 - Teaching Secondary School Science (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)

Electives
A minimum of nine credits is required. If student chooses to complete CI 5540, it should be taken for 3 credits one time only.

CI 5535 - Foundations of Science Education (3.0 cr)
CI 5536 - Equity, Policy, and Assessment in Science Education (3.0 cr)
CI 5539 - Improving Secondary Science Instruction: Surviving the First Two Years (3.0 cr)
CI 5540 - Special Topics: Science Education (1.0 - 8.0 cr)

Polish
This sub-plan is limited to students completing the program under Plan C.

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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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Polish sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5666 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
CI 5641 - Language, Culture, and Education (3.0 cr)
CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Russian
This sub-plan is limited to students completing the program under Plan C.

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.
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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Russian sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework

EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Teaching, Speaking and Listening in Second Language Classrooms (2.0 cr)
EDH 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives

A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5650 - English Language Testing and Assessment (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

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 M.Ed./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 M.Ed. - 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.

M.Ed. Required Coursework

EDHD 5008 should be taken for 2 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5741 - Introduction to Social Studies Education (3.0 cr)
CI 5742 - Advanced Methods of Teaching the Social Studies (3.0 cr)
CI 5743 - The Social Sciences and the Social Studies (3.0 cr)
CI 5744 - Seminar: Reflecting on Professional Development in Social Studies Education (3.0 cr)
CI 5745 - Engaging Youth With Social Studies Texts (3.0 cr)

Electives
A minimum of three credits is required, chosen from the list below.
CI 5746 - Global and Multicultural Education in the Secondary Classroom (3.0 cr)
or CI 5762 - Developing Civic Discourse in the Social Studies (3.0 cr)

Spanish
This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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. Non-native speakers of Arabic, Mandarin Chinese, French, German, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Spanish sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

M.Ed. Required Coursework
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)
EDHD 5017 - Academic Language and English Learners (1.0 cr)
EDHD 5018 - Academic Language and English Learners (1.0 cr)
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)
CI 5646 - English Grammar for ESL Teachers (3.0 cr)
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)
LING 5001 - Introduction to Linguistics (4.0 cr)

Electives
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)
or CI 5641 - Language, Culture, and Education (3.0 cr)
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 cr)

Swedish
This sub-plan is limited to students completing the program under Plan C.

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.

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, Hebrew, Italian, Japanese, Latin, Norwegian, Ojibwe, Polish, 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, Hebrew, Italian, Japanese, Norwegian, Polish, 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 M.Ed. - Swedish sub-plan requires a minimum of 41.5 credits. Additional requirements and credits will be required to earn the initial licensure, which is awarded through the Minnesota Department of Education.

**M.Ed. Required Coursework**
EDHD 5008 should be taken for 1 credit. CI 5696 should be taken for 3 credits.  
EDHD 5000 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)  
EDHD 5007 - Technology for Teaching and Learning (1.5 cr)  
EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)  
EDHD 5010 - Cultures, Schools, and Communities (Human Relations) (2.0 cr)  
EDHD 5013 - Child and Adolescent Development for Teaching and Learning (1.0 cr)  
EDHD 5014 - Child and Adolescent Development for Teaching and Learning (2.0 cr)  
EDHD 5015 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)  
EDHD 5016 - Teaching Students with Special Needs in Inclusive Settings (1.0 cr)  
EDHD 5017 - Academic Language and English Learners (1.0 cr)  
EDHD 5018 - Academic Language and English Learners (1.0 cr)  
EDHD 5020 - Cultures, Schools, and Communities (Human Relations) (1.0 cr)  
CI 5620 - Introduction to Second Language Acquisition for Language Teachers (3.0 cr)  
CI 5631 - Second Language Curriculum Development and Assessment (3.0 cr)  
CI 5632 - Literacy and Language Development in Second Language Classrooms (3.0 cr)  
CI 5634 - Content-Based Instruction in Second Language Settings (3.0 cr)  
CI 5635 - Culture and Diversity in Second Language Classrooms (3.0 cr)  
CI 5641 - Language, Culture, and Education (3.0 cr)  
CI 5646 - English Grammar for ESL Teachers (3.0 cr)  
CI 5696 - Practicum: Teaching World Languages and Cultures in Elementary Schools (2.0 - 6.0 cr)  
LING 5001 - Introduction to Linguistics (4.0 cr)  

**Electives**
A minimum of three credits is required. If student chooses to complete CI 5660, it should be taken for 3 credits.  
CI 5619 - Teaching World Languages and Cultures in Elementary Settings (3.0 cr)  
or CI 5641 - Language, Culture, and Education (3.0 cr)  
or CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (3.0 cr)  
or CI 5657 - Teaching Speaking and Listening in Second Language Classrooms (3.0 cr)  
or CI 5658 - Foreign Language Testing and Assessment (3.0 cr)  
or CI 5660 - Special Topics in the Teaching of Second Languages and Cultures (1.0 - 4.0 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 M.Ed./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 M.Ed 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 Elementary Education track, and 6 elective credits selected in consultation with faculty adviser.

**Common Content Coursework**
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 M.Ed./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 M.Ed 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 adviser.

**Common Content Coursework**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI 5980</td>
<td>Clinical Experiences for K-12 Teaching (1.0 - 4.0 cr)</td>
</tr>
<tr>
<td>CI 5981</td>
<td>Introduction to Equity-Based Pedagogy (1.0 cr)</td>
</tr>
<tr>
<td>CI 5982</td>
<td>Enacting Equity-Based Pedagogy (2.0 cr)</td>
</tr>
<tr>
<td>CI 5983</td>
<td>Equity-Based Pedagogy/Advocacy (1.0 cr)</td>
</tr>
<tr>
<td>CI 5984</td>
<td>Planning Design and Management (1.0 cr)</td>
</tr>
<tr>
<td>CI 5985</td>
<td>Academic Language and English Learners in the Content Areas (1.0 cr)</td>
</tr>
<tr>
<td>CI 5986</td>
<td>Foundations of Special Education (1.0 cr)</td>
</tr>
<tr>
<td>CI 5987</td>
<td>Child and Adolescent Development for Teaching, Learning, and Assessment (1.0 cr)</td>
</tr>
<tr>
<td>CI 5988</td>
<td>Clinical Experience: Improvement of Teaching (2.0 cr)</td>
</tr>
<tr>
<td>EDHD 5008</td>
<td>Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)</td>
</tr>
</tbody>
</table>

**Secondary Mathematics Coursework**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI 5811</td>
<td>Introduction to Teaching Secondary Mathematics (4.0 cr)</td>
</tr>
<tr>
<td>CI 5812</td>
<td>Teaching Algebra (3.0 cr)</td>
</tr>
<tr>
<td>CI 5813</td>
<td>Teaching Geometry (3.0 cr)</td>
</tr>
<tr>
<td>CI 5814</td>
<td>Teaching and Learning Mathematics (3.0 cr)</td>
</tr>
<tr>
<td>CI 5815</td>
<td>Leadership in Mathematics Education (2.0 cr)</td>
</tr>
</tbody>
</table>

**Elective Coursework**

A minimum of six credits is required, selected in consultation with faculty adviser.

**Alternative Pathway: Secondary 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, 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 M.Ed./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 M.Ed 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 adviser.

**Common Content Coursework**
- CI 5980 will be taken a total of four semesters; 1 credit each semester. EDHD 5008 should be taken for 1 credit.
- 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)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)

**Secondary Science Coursework**
- CI 5511 - Introduction to Secondary Science: Laboratory-based Instruction (4.0 cr)
- CI 5512 - Secondary Science Methods: Understanding the Nature of Science (3.0 cr)
- CI 5513 - Secondary Science Methods: Equity in Science Teaching (3.0 cr)
- CI 5514 - Secondary Science Methods: The Science Learning Environment (2.0 cr)
- CI 5515 - Secondary Science Methods: Developing Adaptive Expertise (3.0 cr)

**Elective Coursework**
- A minimum of six credits is required, selected in consultation with faculty adviser.

**Alternative Pathway: English as a Second Language**
This sub-plan is limited to students completing the program under Plan C.

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 M.Ed./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 M.Ed 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 adviser.

**Common Content Coursework**
- CI 5980 will be taken a total of four semesters; 1 credit each semester. EDHD 5008 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)
- EDHD 5008 - Reading in the Content Areas for Initial Licensure Candidates (1.0 - 2.0 cr)

**English as a Second Language Coursework**
- CI 5622 - Second Language Acquisition Basics for Teachers (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 adviser.
Twin Cities Campus
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 S.E., 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 2014
- 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, three-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

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 5469 should be taken for 3 credits
- CI 5463 - Minnesota Writing Project Annual Invitational Summer Institute (3.0 cr)
- CI 5469 - Minnesota Writing Project Directed Studies (1.0 - 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)
- or CI 5451 - Teaching Reading in Middle and Secondary Grades (3.0 cr)
- or CI 5462 - Evaluating and Assessing Writing (3.0 cr)

#### 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 (3.0 cr)
- CI 5404 - Culturally Diverse Books for Children and Adolescents (3.0 cr)
- CI 5410 - Special Topics in the Teaching of Literacy (1.0 - 3.0 cr)
- CI 5411 - Teaching Reading in the Elementary School (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: Blogs, Wikis, Online Talk, Podcasting, and E-Portfolios to Teach Writing (3.0 cr)
- CI 5641 - Language, Culture, and Education (3.0 cr)
- CI 5647 - Teaching Middle and Secondary Immigrant and Refugee Students With Limited Formal Schooling (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)
- LGTT 5101 - Applications of Technology in Language Teaching (3.0 cr)
- ENGL 5630 [Inactive] (3.0 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 5900 - Topics in Linguistics (1.0 - 4.0 cr)
- WRIT 5531 - Introduction to Writing Theory and Pedagogy (3.0 cr)
- EPSY 5612 - Understanding of Academic Disabilities (3.0 cr)
- EPSY 5615 - Advanced Academic Interventions (3.0 cr)
- EPSY 5618 - Specialized Interventions for Students With Mild/Moderate Disabilities in Reading & Written Language (3.0 cr)
- EPSY 5644 - Language Development and Programming for Deaf/Hard of Hearing Children (3.0 cr)
- EPSY 5646 - Reading and Writing Practices with Deaf/Hard of Hearing Children (2.0 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)
• SLS 5101 (Inactive) (1.0 cr)
• SLS 5401 (Inactive) (4.0 cr)
• SLS 5721 (Inactive) (3.0 cr)
• OLPD 5814 (Inactive) (3.0 cr)
Twin Cities Campus

Undergraduate Multicultural Teaching and Learning Postbaccalaureate Certificate

Postsecondary Teaching and Learning

College of Education and Human Development

Link to a list of faculty for this program.

Contact Information:
Department of Postsecondary Teaching and Learning, 206 Burton Hall, 178 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-626-8705; fax: 612-625-0709)
Email: pstlinfo@umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Ugrd Multicultural Tchng & Lrng 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)
- 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

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 postsecondary teaching and learning. Visit http://www.cehd.umn.edu/PsTL/Certificate/apply.asp for more information about 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
  - 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 DGS for information regarding the 3-credit elective requirement.

Core Courses
- PSTL 5105 - Increasing Access and Success in Undergraduate Classrooms (3.0 cr)
- PSTL 5106 - Multicultural Teaching and Learning in Diverse College Contexts (3.0 cr)
- PSTL 5212 - 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, 330 Wulling Hall, 86 Pleasant Street 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: Master's
- Requirements for this program are current for Fall 2014
- 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 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 M.A. and Ph.D. 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:
When applying online, applicants should complete Statements #1 & 2. 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 Work and Human Resource Education 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 semester 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).
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 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 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 & 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 adviser 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 adviser approved methods of instruction course

Electives

Up to 13 credits with adviser approval, a minimum of 6 credits must come from outside the OLPD department

Integrating Project

Students work with their faculty adviser 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 not 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.

All subplans in this major use same curriculum

Rochester

This sub-plan is limited to students completing the program under Plan C.

Requirements for this sub-plan are the same as those listed in general description. Students may take courses on the Twin Cities or Rochester campuses.
Youth Development Leadership M.Ed.

College of Education and Human Development

Youth Development Leadership (YDL) is a graduate degree offered for people who work with youth in traditional and nontraditional settings, and who are committed to the healthy development of young people. Effectiveness depends upon keeping up with the challenges facing today’s youth, which requires continual learning and professional growth. This degree is an excellent career opportunity for anyone working with youth, regardless of his or her previous academic background.

The M.Ed. in youth development leadership 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 (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:** 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 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 Coursework**

Students must take a total four credits of YOST 5960, in one credit increments, during their time in the program.

- **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 - 4.0 cr)
- **YOST 5962** - Leadership Field Experience: Youth Development (4.0 cr)

**Elective Credits**

10 or more elective credits must be selected with approval of faculty adviser.
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.anisci.umn.edu/GraduateProgram/index.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 subdisciplines: genetics, growth biology, nutrition, physiology, or production systems. Students have the option of tailoring their individual programs to include study in more than one subdiscipline 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.

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 adviser.
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 adviser. 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 adviser 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 adviser.
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 2014
- 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 a minor in animal sciences concentrate on one of the animal sciences subdisciplines: genetics, growth biology, nutrition, physiology, or production systems. Students have the option of tailoring their program to include study in more than one subdiscipline 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
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.
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: http://www.ansci.umn.edu/GraduateProgram/index.htm

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

Students in the Ph.D. program concentrate on one of the animal sciences subdisciplines: genetics, growth biology, nutrition, physiology, or production systems. Students have the option of tailoring their program to include study in more than one subdiscipline 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
40 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.

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 Ph.D. degree is granted chiefly in recognition of the candidate's achievements and knowledge in a specific field. Students must register for a minimum of 24 thesis credits. Appropriate graduate level courses taken at another university may be approved for transfer. Coursework completed under an M.S. program can be counted towards the Ph.D. degree. The student is expected to maintain a B average or better in all coursework.
Twin Cities Campus

Applied Economics M.S.

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

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.S. degree in applied economics prepares students for employment opportunities in the public and private sector 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 M.S. 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 M.S. 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. 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.
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, 0 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 14 major credits and 0 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.

M.S. students are required to complete graduate-level courses in microeconomic theory, macroeconomic theory, and econometrics or statistics. Students are also required to participate in two 1-credit M.S. seminars. Both Plan A and Plan B require at least 30 credits, of which at least 14 credits must be in the major field. The major field must include a minimum of 9 credits in applied economics (excluding thesis and special topics, independent study, and the M.S. seminar). Plan A requires 10 thesis credits. Plan B requires a 4- to 6-credit project.

For more information about program requirements, refer to the department's Graduate Program Student Handbook: http://www.apecgrad.umn.edu/ prod/groups/ cfans/@pub/@ cfans/@ apec/documents/ asset/ cfans_asset_352638.pdf.
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

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 and 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

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.

M.S. students must complete at least 9 credits of 5xxx or 8xxx courses in applied economics. Ph.D. students must complete at least 15 credits of 5xxx or 8xxx courses in applied economics. Courses for the minor must be approved by the director of graduate studies. 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: apecdgs@umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g004.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Ph.D. 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 Ph.D. degree should have completed an M.S. 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 M.S. 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
- 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 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 40 credits of coursework and must take 24 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. The student must pass a written preliminary exam in microeconomic theory and at least one field examination in one of the seven Ph.D. 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.

After passing the written preliminary examinations, the student must take a preliminary oral exam. This exam can be on coursework, a thesis prospectus, or some combination. It is administered by a committee of four persons, to include three from the Applied Economics Graduate Program and one other graduate faculty from outside the program. At the conclusion of the thesis research, students complete a final oral examination, which consists of a public seminar (in which the candidate presents the thesis) and a closed meeting between the candidate and the appointed examining committee.

For more details, please see the Graduate Program Handbook weblink:
http://www.apecgrad.umn.edu/ServicesandResources/index.htm
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 2014
- 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 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; Landscape Architecture; and related departments. Students choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics.

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 B.S. or B.A. degree in agriculture, biology, or other related life science. Students with a B.S. or B.A. 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.

The M.S. is offered under Plan A (with thesis) and Plan B (with project). Plan A requires a minimum of 20 course credits and 10 thesis credits; Plan B requires a minimum of 30 course credits. Students are required to complete the courses in the common curriculum and the requirements for their specialization, and to present one graduate seminar. Additional course requirements are flexible and are determined in consultation with the student's adviser(s) and advisory committee. Required core courses are counted toward the required credits.

Required courses

All APS graduate students are required to take a group of core courses
- AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
- AGRO 8270 - Graduate Seminar (1.0 cr)
- APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- STAT 5021 - Statistical Analysis (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.

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.

M.S. Plan A degree: In addition to the 6.5 credits in program-wide required courses, students must complete two agroecology/agronomy courses:
- AGRO 4005 - Applied Crop Physiology and Development (4 cr)
- AGRO 4505 - Integrated Weed Management (3 cr)
- AGRO 4401 - Plant Genetics and Breeding (4 cr)
- SAGR 8010 - Sustainable Agriculture Colloquium (2 cr)
- AGRO 5321 - Ecology of Agricultural Systems (3 cr)
- AGRO 5999 - Special Topics: Agro-ecosystems Analysis Summer Field Course (3 cr);

A course in plant biology such as:
- PBIO 5516 - Plant Cell Biology (3 cr)
- PBIO 5412 - Plant Physiology (3 cr)
At least one other course from the following suggested courses:

BIOL 5407 - Ecology (3 cr)
EEB 4068 - Plant Physiological Ecology (3 cr)
EEB 4609 - Ecosystem Ecology (3 cr)
EEB 5053 - Ecology: Theory and Concepts (4 cr)
HORT 5071 - Restoration and Reclamation Ecology (3 cr)
ESPM 5108 - Ecology of Managed Systems (4 cr)
ESPM 5345 - Sustainable Land Use Planning and Policy (3 cr)

Courses listed within the agroecology/agronomy, plant biology, and ecology groups are provided as a guide for students and faculty. Other courses can be substituted with agreement of the adviser, advisory committee, and DGS.

**Required courses**

AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
AGRO 8270 - Graduate Seminar (1.0 cr)
APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
STAT 5021 - Statistical Analysis (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 6.5 credits in program-wide required courses, students must complete at least 14 course credits from the following courses:

**Area 1 - Cross Commodity Horticulture**

HORT 4071W - Applications of Biotechnology to Plant Improvement (4 cr)
AGRO 4505 - Integrated Weed Management (4 cr)
HORT 4461 - Horticultural Marketing
HORT 5007 - Advanced Plant Propagation (3 cr) (Sp even yrs)
HORT 5023 - Public Garden Management (2 cr)
STAT 5302 - Applied Regression Analysis (4 cr)
AGRO 5221 - Ecology of Agricultural Systems (3 cr)
MKTG 6051 - Marketing Research (4 cr)
MKTG 6055 - Buyer Behavior (4 cr)
MBA 6210 - Marketing Management (3 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2 cr)
HORT 8044 - Manipulation of Plant Growth and Reproduction (2 cr), Spring (even yrs)

**Area 2 - Commodity-based Horticulture**

HORT 4061 - Turfgrass Management (4 cr)
HORT 4062 - Turfgrass Weed and Disease Science (3 cr), Fall (odd yrs)
HORT 4063 - Turfgrass Science (3 cr)
HORT 4141W - Plant Production I (4 cr)
HORT 5031 - Organic Viticulture and Fruit Production (3 cr), Fall (odd yrs)
HORT 5032 - Organic Vegetable Production (3 cr), Spring (odd yrs)
HORT 5051 - Plant Production II (4 cr)
HORT 5071 - Restoration and Reclamation Ecology (3 cr)

**Required Courses**

AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
AGRO 8270 - Graduate Seminar (1.0 cr)
APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
STAT 5021 - Statistical Analysis (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.
In addition to the 6.5 credits in program-wide required courses, students must complete at least 14 course credits from the following courses:

- AGRO/HORT 8280 - Current Topics in Applied Plant Sciences (1 cr)
- or AGRO 8010 - Colloquium in Sustainable Agriculture (2 cr)
- Molecular Genetics Area (3 cr)
- Genetics Area (3 cr)
- Plant Breeding Area (3 cr)
- Additional courses determined by student/committee (6 cr).

**Required courses**

- AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
- AGRO 8270 - Graduate Seminar (1.0 cr)
- APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
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 2014
- 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.

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 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; Landscape Architecture; and related departments. Students choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/plant molecular genetics.

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 B.S. or B.A. degree in agriculture, biology, or other related life science. Students with a B.S. or B.A. 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 upon consultation with the Director of Graduate Studies.
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 2014
- 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 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 Ecology, Evolution, and Behavior; Plant Biology; Plant Pathology; Soil, Water, and Climate; and related departments. Students choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/molecular genetics. Student choose from among four specialization tracks: agronomy/agroecology, applied plant sciences, horticulture, or plant breeding/molecular genetics.

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 B.S. or B.A. degree in agriculture, biology, or other related life science. Students with a B.S. or B.A. 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
- 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 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 semester must be completed before filing a Degree Program Form.

Ph.D. students are required to complete the courses in the common curriculum, the requirements for their respective specialization, and present one graduate seminar; 24 thesis credits are also required. Additional course requirements are flexible and are determined in consultation with the student's adviser(s) and advisory committee.

Required core courses are counted toward the required 30 credits.

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.

Two agroecology/agronomy courses:
AGRO 4005 - Applied Crop Physiology and Development (4 cr)
AGRO 4401 - Plant Genetics and Breeding (4 cr)
AGRO 4505 - Integrated Weed Management (3 cr)
SAGR 8010 - Sustainable Agriculture Colloquium (2 cr)
AGRO 5521 - Ecology of Agricultural Systems (3 cr)
AGRO 5999 - Special Topics: Agro-ecosystem Analysis Summer Field Course (3 cr)

A course in plant biology such as:
PBIO 5412 - Plant Physiology (3 cr)
PBIO 5416 - Plant Morphology, Development, and Evolution (4 cr)

Ecology courses such as the following:
BIOL 5407 - Ecology (3 cr)
EEB 4068 - Plant Physiological Ecology (3 cr)
EEB 4609 - Ecosystem Ecology (3 cr)
EEB 5053 - Ecology: Theory and Concepts (4 cr)
HORT 5071 - Restoration and Reclamation Ecology (3 cr)
ESPM 5108 - Ecology of Managed Systems (4 cr)
ESPM 5245 - Sustainable Land Use Planning and Policy (3 cr)

Required courses
AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
AGRO 8270 - Graduate Seminar (1.0 cr)
APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
GRAD 8101 - Teaching in Higher Education (3.0 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
STAT 5021 - Statistical Analysis (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.

Specialization courses:
Area 1 - Cross Commodity Horticulture
HORT 4071W - Applications of Biotechnology to Plant Improvement (4 cr)
AGRO 4505 - Integrated Weed Management (4 cr)
HORT 4461 - Horticultural Marketing
HORT 5007 - Advanced Plant Propagation (3 cr), Spring (even yrs)
AGRO 5021 - Introduction to Plant Breeding (3 cr)
HORT 5023 - Public Garden Management (2 cr)
STAT 5302 - Applied Regression Analysis (4 cr)
AGRO 5321 - Ecology of Agricultural Systems (3 cr)
MKTG 6051 - Marketing Research (4 cr)
MKTG 6055 - Buyer Behavior (4 cr)
MBA 6210 - Marketing Management (3 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2 cr)
HORT 8023 - Evolution of Crop Plants (3 cr)
HORT 8044 - Manipulation of Plant Growth and Reproduction (2 cr), Spring (even yrs)
AGRO 8305 - Physiological Ecology of Plants in Natural and Managed Ecosystems (4 cr)
AGRO 8605 - Advanced Management of Agroecosystems (3 cr)

Area 2 - Commodity-based Horticulture
HORT 4061 - Turfgrass Management (4 cr)
HORT 4062 - Turfgrass Weed and Disease Science (3 cr), Fall (odd yrs)
HORT 4063 - Turfgrass Science (3 cr)
HORT 4141W - Plant Production I (4 cr)
HORT 5031 - Organic Viticulture and Fruit Production (3 cr), Fall (odd yrs)
HORT 5032 - Organic Vegetable Production (3 cr) Spring (odd yrs)
HORT 5051 - Plant Production II (4 cr)
HORT 5071 - Restoration and Reclamation Ecology (3 cr)

Required 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)
GRAD 8101 - Teaching in Higher Education (3.0 cr)
HORT 8270 - Graduate Seminar (1.0 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
STAT 5021 - Statistical Analysis (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.

Molecular Genetics Area (3 cr)
Genetics Area (3 cr)
Plant Breeding Area (3 cr)
Additional courses determined by student/advisory committee (12 credits) from these suggested areas and course:

Genetics area:
EEB 5042 - Quantitative Genetics (3 cr), Fall
GCD 8131 - Advanced Genetics and Genomics (3 cr), Spring
Molecular Genetics area:
GCD 4034 - Molecular Genetics, (3 cr), Spring
AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3 cr), Spring (odd years)

Plant Breeding area:
AGRO/HORT 8201 - Advanced Plant Breeding (3 cr), Fall (odd years)
AGRO 8202 - Breeding for Quantitative Traits in Plants (3 cr), Spring (even years)

Required courses
AGRO 5311 - Research Methods in Crop Improvement and Production (1.0 cr)
AGRO 8270 - Graduate Seminar (1.0 cr)
APSC 8123 - Research Ethics in the Plant and Environmental Sciences (0.5 cr)
GRAD 8101 - Teaching in Higher Education (3.0 cr)
SAGR 8010 - Colloquium in Sustainable Agriculture (2.0 cr)
STAT 5021 - Statistical Analysis (4.0 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

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 on previous academic work required for a degree of at least a 3.0 GPA (on a 4.0 grading scale).

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 20 major credits and 10 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Students complete a smaller project or projects that involve 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 8001 - Seminar I (1 cr) and BBE 8002 - Seminar II (1 cr). 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 have justified the selection of a suitable alternative.

Degree programs are expected to include mostly 5xxx and 8xxx courses. The graduate degree program may contain no more than 9 credits of 4xxx level coursework. If a master's degree program includes more than 4 credits of special problems or advanced problems courses, students and their advisers are asked to include a letter of explanation when the degree program is submitted for approval.
Twin Cities Campus
Bioproducts and Biosystems Science, Engineering and Management Minor
Bioproducts and Biosystems Engineering
College of Food, Agricultural and Natural Resource Sciences

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 2014
- 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.

For master's students, a minor consists of at least 6 credits of BBE courses numbered 4xxx or higher. For doctoral students, a minor consists of at least 12 credits of BBE courses numbered 4xxx or higher.
Twin Cities Campus

Bioproducts and Biosystems Science, Engineering and Management Ph.D.

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

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Ph.D. degree 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.

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.20.

Students seeking the Ph.D. 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.

Students seeking the Ph.D. should 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.

Special Application Requirements:
Students seeking the Ph.D. 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 Ph.D. normally complete a master of science Plan A degree before starting their Ph.D. programs. Exceptional students who want to go straight to the Ph.D. from the bachelor's level may be admitted subject to conditions agreed upon by the adviser, 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**

33 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.

All Ph.D. degree programs must include BBE 8001 - Seminar I (1 cr), BBE 8002 - Seminar II (1 cr). Any of these courses taken at the master’s level count toward the Ph.D. and do not have to be retaken.

The Ph.D. 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 Ph.D. 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). A minimum of 12 course credits must be in a minor field or in a supporting program. Ph.D. degree programs should contain a minimum of 9 course credits in a concentrated area of scientific or mathematical theoretical development that is related to the student’s research, and may contain up to 3 credits of enrichment courses.
Twin Cities Campus

Conservation Biology 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: consbio@umn.edu
Website: http://www.consbio.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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 Biology (CB) 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.

A B.S./B.A. 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

Key to test abbreviations (GRE, TOEFL, IELTS, MELAB).

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Information current as of September 19, 2014
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:** 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 DGS. 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.

Students must complete a minimum of 30 credits in the biological and social aspects of conservation biology. For Plan A students, 10 of these credits are thesis credits; for Plan B students, 10 of these credits are for electives.

**Joint- or Dual-degree Coursework:** Joint Degree in Conservation Biology and Law

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.

**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 M.S., Ph.D., and joint degree students wishing to emphasize this concentration within a CB major. The track name can be indicated on the student's transcript (this is optional) 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 the CB graduate program. Students in the track must meet all requirements for the M.S. in CB.

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 DGS for approval.

In addition to course requirements for the conservation biology major, students in the FAB track will take at least two 3 cr courses from the following list:

- EEB 5601 - Limnology (3 cr)
- ENT 5361 - Aquatic Insects (3 cr)
- FW 4136 - Ichthyology (4 cr)
- FW 4401 - Fish Physiology and Behavior (4 cr)
- FW 5003 - Human Dimensions of Biological Conservation (3 cr)
- FW 5601 - Fisheries Population Analysis (3 cr)
- OR FW 5051 Analysis of Populations - (4 cr)
- FW 5604 - Fisheries Ecology and Management (3 cr)
- FW 8448 - Fishery Science (3 cr)
- FW 8459 - Stream and River Ecology (3 cr)
FW 8465 - Fish Habitats and Restoration (3 cr)
ESPM 5061 - Water Quality and Natural Resource (3 cr)
ESPM 5575 - Wetlands Conservation (3 cr)
EPSP 5111 Hydrology and Water Quality Field Methods (3 cr)
EEB 5605 Limnology Laboratory (2 cr)
EEB 8601 Introduction to Stream Restoration (3 cr)
EEB 8602 Stream Restoration Practice (2 cr)
FR 5114 Hydrology and Watershed Management (3 cr)
FR 5153 Forest and Wetland Hydrology (3 cr)

Other advanced courses or colloquia on fisheries or aquatic biology that are not listed here may also satisfy needs of students in the track. In addition, master’s students are required to enroll for at least one semester of FW 8200 - Seminar for 1 credit.
Twin Cities Campus
Conservation Biology Minor
Fisheries, Wildlife, and Conservation Biology
College of Food, Agricultural and Natural Resource Sciences

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 2014
- 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 Biology (CB) 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
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 may be earned by completing the two required courses for a major, plus participating in one semester of the conservation biology seminar. A doctoral minor may be earned by completing the two required courses for a major, participating in one semester of the conservation biology seminar, and completing 6 elective credits. Electives are determined in consultation with the director of graduate studies and the student's advisory committee.
Twin Cities Campus
Conservation Biology 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: consbio@umn.edu
Website: http://www.consbio.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Biology (CB) 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 3.50.

Other requirements to be completed before admission:
A B.S./B.A. 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, Ph.D. 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. Letters of recommendation should be sent directly to the Conservation Biology Program Office. 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
Program Requirements
12 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.

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.

Ph.D. 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 biology. Dissertation research may require proficiency in supporting areas (e.g., statistics, computing, communications).

Program Sub-plans
A sub-plan is not required for this program.
Students may not complete the program with more than one sub-plan.

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 M.S., Ph.D., and joint degree students wishing to emphasize this concentration within a CB major. The track name can be indicated on the student's transcript (this is optional) 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 CB graduate program. Students in the track must meet all requirements for the Ph.D. in CB.

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 DGS for approval.

In addition to course requirements for the conservation biology major, students in the FAB track must take at least three courses from the following list:
EEB 5601 - Limnology (3 cr)
ENT 5361 - Aquatic Insects (3 cr)
FW 4136 - Ichthyology (4 cr)
FW 4401 - Fish Physiology and Behavior (4 cr)
FW 5003 - Human Dimensions of Biological Conservation (3 cr)
FW 5601 - Fisheries Population Analysis (3 cr)
OR FW 5051 Analysis of Populations - (4 cr)
FW 5604 - Fisheries Ecology and Management (3 cr)
FW 8448 - Fishery Science (3 cr)
FW 8459 - Stream and River Ecology (3 cr)
FW 8465 - Fish Habitats and Restoration (3 cr)
ESPM 5061 - Water Quality and Natural Resource (3 cr)
ESPM 5575 - Wetlands Conservation (3 cr)
EPMS 5111 Hydrology and Water Quality Field Methods (3 cr)
EEB 5605 Limnology Laboratory (2 cr)
EEB 8601 Introduction to Stream Restoration (3 cr)
EEB 8602 Stream Restoration Practice (2 cr)
FR 5114 Hydrology and Watershed Management (3 cr)
FR 5153 Forest and Wetland Hydrology (3 cr)

Other advanced courses or colloquia on fisheries or aquatic biology that are not listed here may also satisfy needs of students in the track. In addition, doctoral students are required to enroll for at least two semesters of FW 8200 - Seminar for 1 credit per semester.
Twin Cities Campus
Entomology M.S.
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: Master's
- Requirements for this program are current for Fall 2014
- 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.

Special Application Requirements:
Applicants must submit a complete set of official transcripts and a clearly written statement of career interests, goals, and objectives. 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

**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 present one graduate seminar (ENT 8300) and must take Scientific Communication and Ethics (ENT 8061). Students must also pass two written examination questions. The core curriculum courses are: ENT 5021 - Insect Taxonomy and Phylogeny, ENT 5011 - Insect Structure and Function, and either ENT 5042 - Insect Ecology or ENT 5045 - Insect Population Dynamics.

Plan B students must take 6 credits of ENT 5910 - Special Problems in Entomology as part of the 20 credits of required entomology courses. For both plans: All courses are flexible and are determined in consultation with the adviser and other members of the student's advisory committee. Plan A is recommended for students contemplating a career in entomological research.

Requirements for the M.S., supplemental to general Graduate Education requirements, include a minimum of 14 course credits in entomology including a core curriculum of fundamental entomology courses and 1 credit of graduate seminar. Additional requirements include 6 credits from other programs to make a total of at least 20 course credits for Plan A or at least 30 course credits for Plan B students (must take 6 credits of ENT 5910). These courses are flexible and are determined in consultation with the adviser and other members of the student's advisory committee. Plan A is recommended for students contemplating a career in entomological research.

**Course Group 0**

All students must take: Seminar (ENT 8300, 1 cr.)
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

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

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
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 4xxx, 5xxx, or 8xxx entomology courses. The doctoral minor requires a minimum of 12 credits in 4xxx, 5xxx, or 8xxx entomology courses.
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 2014
• Length of program in credits: 51
• 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 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.

Special Application Requirements:
Applicants must submit a complete set of official transcripts and a clearly written statement of career interests, goals, and objectives. 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
15 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.

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.

Students must present two graduate seminars (ENT 8300) and must take Scientific Communication and Ethics (ENT 8061). Students also must pass three written examination questions (or a total of four if the student has received an M.S. degree in entomology from the U of MN). The core curriculum courses are: ENT 5021 - Insect Taxonomy and Phylogeny, ENT 5011 - Insect Structure and Function, and either ENT 5042 - Insect Ecology or ENT 5045 - Insect Population Dynamics.

Ph.D. requirements include a minimum of 15 course credits in entomology, including a core curriculum of fundamental entomology courses and 2 credits of graduate seminar. Additional requirements include 12 credits from other programs, and are determined in consultation with the adviser and other members of the student's advisory committee.
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 2014
- 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 adviser. 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.

The M.S. offers both Plan A (with thesis) and Plan B (without thesis) options. Both options require at least 20 course credits in the major. Plan A also requires at least 10 thesis credits. Plan B also requires at least an additional 10 graduate credits in approved courses and a Plan B paper. The minor may be chosen from fields such as biochemistry, chemistry, chemical engineering, microbiology, nutrition, and statistics. All students also are expected to participate as teaching assistants during their graduate careers.
Twin Cities Campus

Food Science 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/education/foodsciencegraduate/index.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

For a master's minor, the following courses must be taken: FSCN 4111 and 4121, and BAE 4744. The minor must be approved by the food science director of graduate studies.

For a Ph.D. minor, students must take FSCN 4111 and 4121, BAE 4744, and one additional food science graduate-level course totaling 12 credits. The minor must be approved by the Food Science Director of Graduate Studies.
Twin Cities Campus
Food Science Ph.D.
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/foodsciencegraduate/index.htm

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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.
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.

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 number of credits required varies depending on preparation (such a M.S. in food science) and the research undertaken. Of these, at least 12 credits must be in the minor or related fields and 24 credits must be doctoral thesis credits. The student and the adviser, with the approval of the graduate studies committee, determine coursework in the major. All students also must participate as teaching assistants during their graduate career.
Twin Cities Campus
Land and Atmospheric Science M.S.
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: laas@umn.edu
Website: http://www.laas.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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.

B.S. 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)
  or 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)
  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 - The Atmosphere [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)
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 adviser.

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.

All M.S. students must complete a minimum of 30 credits: 14 credits in the major area (which includes one seminar - 1 cr, and teaching experience), and a minimum of 6 credits in a minor or related field.

Plan A students: all must take a minimum of 10 thesis credits. Plan A students in the soil science concentration must take three out of the four core courses in soil science. Plan A students in the climatology concentration must take two or more courses in climatology or atmospheric sciences (approved by the student's advisory committee) and two of the four core courses in soil science.

Plan B students: all must complete 20 major and 10 outside coursework credits. Students must complete a Plan B paper and fulfill the 30-credit minimum by taking 10 credits of coursework or a special project to replace the 10 thesis credits. Plan B students in the soil science concentration must take all four core courses in soil science. Plan B students in the climatology concentration must take three or more courses in climatology or atmospheric sciences (approved by the student's advisory committee) and two of the four core courses in soil science.

Core Courses
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)
Major credits
Choose at least 9 additional credits within the LAAS major. (You will need 15 for Plan B).

Outside the major
Choose at least 6 credits from outside the major. These can be courses for a minor or from a related field. (You will need 10 credits for Plan B).

Thesis credits
Register for at least 10 credits of LAAS 8777 for Plan A.
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: laas@umn.edu
Website: http://www.laas.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

Special Application Requirements:
All courses for use in the minor must be taken using the A-F grading system, unless approved by the Graduate Advisory Committee, or if they are offered on an 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 adviser and approved by 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 towards program requirements is not permitted.

The minor in LAAS for doctoral students requires a minimum of 12 graduate-level credits of regular coursework (not special problems) in land and atmospheric science. The minor in LAAS for master’s students requires a minimum of 9 graduate-level credits in LAAS.

All students seeking a minor in LAAS must take LAAS 5050 - Integrated Topics in Land and Atmospheric Science (3 cr). The remaining 9 or 6 credits for the doctoral or master’s minor, respectively, must come from other graduate-level LAAS courses.

Integrated Topics
All students are required to take the following course.
Take 1 or more 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 M.S. minor or 9 credits for Ph.D. minor from the following options, or others approved by the DGS and the LAAS graduate faculty member serving as the minor adviser.
- LAAS 5426 - Atmospheric Processes II: Radiation, Composition, and Climate (3.0 cr)
- or LAAS 5515 - Soil Formation: Earth Surface Processes and Biogeochemistry (3.0 cr)
- or LAAS 8128 - Land and Atmospheric Science Seminar (1.5 cr)
- or LAAS 5051 - Thesis Proposal Writing for Land & Atmospheric Science (2.0 cr)
- or LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)
Twin Cities Campus
Land and Atmospheric Science Ph.D.
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, 1911 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 2014
• 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.

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 interdisciplinary 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 Ph.D. program are expected to have an M.S. 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)
or MATH 1142 - Short Calculus [MATH] (4.0 cr)
or MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)
PHYS 1101W - Introductory College Physics I [PHYS, WI] (4.0 cr)
or 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 - The Atmosphere [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] (3.0 cr)
  or MICB 3301 - Biology of Microorganisms (5.0 cr)
- BIOL 3407 - Ecology (3.0 cr)

Other requirements to be completed before admission:
Students with a B.S. degree and outstanding scholarship can request direct admission to the LAAS Ph.D. 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 Ph.D. Fellowship, high GPA/GRE scores, or strong previous research experience. Current M.S. candidates who exhibit outstanding scholarship may request transfer to a Ph.D. 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
26 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 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must take two seminars (1 credit each), 2 credits of teaching experience, a minimum of 12 credits in a minor or supporting program, and 24 thesis credits. Students in the soil science concentration must take all four core area courses in soil science. Students in the climatology concentration must take a minimum of two courses in climatology or atmospheric sciences (approved by the student's advisory committee) and two of the four core area course in soil science.

Core Courses
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 adviser.
Take 4 or more course(s) totaling 16 or more credit(s) from the following:
- LAAS 5311 - Soil Chemistry and Mineralogy (3.0 cr)
  or LAAS 5425 - Atmospheric Processes I: Thermodynamics and Dynamics of the Atmosphere (3.0 cr)
  or AGRO 5121 - Applied Experimental Design (4.0 cr)
  or AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
Outside the major
Choose 12 credits of minor or related field coursework.

Thesis credits
10 completions allowed; no grade associated; maximum 18 credits per semester or summer; 24 credits required.
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 2014
- 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.


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 adviser.

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
- 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 adviser 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 M.S. 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.

**Joint- or Dual-degree Coursework:** Law, Health and the Life Sciences

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.

**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.

**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 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.

**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.

**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.

**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.

**Wildlife Ecology and Management**
For students interested in working with leaders in ecology, physiology, evolution, genetics, statistics, computer science, forestry, natural resource policy, and the social sciences as they relate to wildlife; ecology and management; and conservation biology.
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: nrsrsm@umn.edu
Website: http://www.nrsrsm.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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. Master's students must complete a minimum of eight credits of NRSM-related coursework. Doctoral students must complete a minimum of twelve credits of NRSM-related coursework.

Because the NRSM program is multidisciplinary, we do not require specific courses for completion of the minor. Rather, the student should work in consultation with his or her 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. (It is a University of MN requirement that students declaring a minor have a representative of the minor program on the committee.) The proposed coursework will then be reviewed by NRSM's director of graduate studies, and must be approved before the student can submit the degree program for approval. It is expected that courses students take to fulfill the NRSM minor are taught by NRSM faculty members. The minor proposal form is available on the NRSM website.
Twin Cities Campus

Natural Resources Science and Management Ph.D.
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: Doctorate
- Requirements for this program are current for Fall 2014
- 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.


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 adviser.

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
- 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.

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Information current as of September 19, 2014
Program Requirements
35 to 48 credits are required in the major.
0 credits are required outside the major.
24 thesis credits are required.

Plan A: Plan A requires up to null major credits, up to null credits outside the major, and up to null thesis credits. The final exam is oral.

Plan B: Plan B requires up to null major credits and up to null 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 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. 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 adviser 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.

Joint- or Dual-degree Coursework: Law, Health and the Life Sciences
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.

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.

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 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.
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.

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.

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.

Wildlife Ecology and Management
For students interested in working with leaders in ecology, physiology, evolution, genetics, statistics, computer science, forestry, natural resource policy, and the social sciences as they relate to wildlife, ecology and management, and conservation biology.
Twin Cities Campus
Nutrition 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/nutritiongraduate/index.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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. 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, Minn.); and V.A. Medical Center and Park Nicollet Institute (Minneapolis, Minn.).

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 adviser and DGS, specify both the nature and extent of the course and project work necessary to satisfy this requirement.

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 M.S. is offered under both Plan A (thesis) and Plan B (non-thesis). Plan A requires a minimum of 20 course credits and 10 thesis credits; Plan B requires a minimum of 30 course credits, including a Plan B project.

General requirements include the graduate nutrition core series (four courses), an orientation and presentation skills class, graduate courses statistics, an advanced topics course, and presentation of the thesis or project work. All students also are expected to obtain teaching experience, subject to the policies of the adviser's department or division.

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
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/education/nutritiongraduate/index.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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. 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, 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.

A master's minor requires a minimum of 6 course credits in nutrition, including NUTR 5625 and NUTR 5626. A doctoral minor may be completed by taking NUTR5624, 5625, 5626, 5622, and 8620.
Twin Cities Campus
Nutrition Ph.D.
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/nutritiongraduate/index.htm

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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, Minn.); V.A. Medical Center and Park Nicollet Institute (Minneapolis, Minn.).

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 M.S. 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 Ph.D. 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
- 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
16 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.

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 Ph.D. offers three areas of specialization: human nutrition, nutritional biochemistry, and public health nutrition. Thesis work may be conducted in the laboratory, clinic, or field, either locally or internationally.

The Ph.D. requires the graduate nutrition core series (four courses), an orientation and presentation skills class, graduate level courses statistics and two advanced topics courses. All students also are expected to obtain teaching experience, subject to the policies of the adviser's department or division.
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: pipathgp@umn.edu
Website: http://plpa.cfans.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 B.S. degree are admitted into the M.S. program. After a minimum of two semesters, students who qualify may elect to change their degree status to the Ph.D. program. Criteria for the change include scholastic standing, potential for success in completing a Ph.D., 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
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

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.

**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 option also requires one to three projects totaling ca. 120 hours. The content and procedures for completing the project(s) are to be determined and approved by the student's major adviser and the 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 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Regular attendance at weekly plant pathology seminars is expected. Internships are encouraged as part of the graduate experience and financial support is available on a competitive basis for international or domestic internships.

**Required Coursework**

- **PLPA 5480:** Principles of Plant Disease (3 cr) must be completed if student lacks an introductory Plant Pathology course.
- **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)
- **PLPA 8200:** Seminar (1.0 cr)

Students must enroll for 1 credit in PLPA 8090 Advanced Procedures and Research in Plant Pathology, Topic: Teaching Experience. Students must enroll in a seminar or workshop on teaching methods.

All students are required to enroll in a minimum of four of the following courses, chosen in consultation with the director of graduate studies, adviser, and graduate advisory committee.

Take 4 or more course(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 - 2.0 cr)
- **PLPA 5301:** Plant Genomics (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)

**M.S. in Plant Pathology, Molecular Option (Plan A only)**

**Molecular Option Requirements**

M.S. students wishing to emphasize molecular plant pathology must complete the following course requirements in addition to the Plan A master’s program requirements:

- **BIOC 4125:** Laboratory in Molecular Biology and Biotechnology, or equivalent.
PLPA 8103 - Plant-Microbe Interactions (3.0 cr)

Suggested courses for the 6 supporting field credits

Note: Students who wish to complete a designated minor (which is certified on the transcript, unlike the related-fields option, which is not) must complete 6 or more credits in a single field. A designated minor must be approved by the director of graduate studies in the minor field.

Take 6 or more credit(s) from 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)
Twin Cities Campus

Plant Pathology Minor

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: pipathgp@umn.edu
Website: http://plpa.cfans.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 (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
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.
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.

Ph.D. 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 B.S. degree are admitted into the M.S. degree program. After a minimum of two semesters, students who qualify may elect to change their degree status to the Ph.D. program. Criteria for the change include scholastic standing, potential for success in completing a Ph.D., 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.

**Program Requirements**

17 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.

Course requirements include enrollment in a supervised teaching or extension teaching experience. Degree programs are determined by the student and the student's 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 and financial support is available on a competitive basis for international or domestic internships.

A detailed overview of course offerings and requirements, including additional details on the molecular plant pathology emphasis, is available on the plant pathology program website.

**Required Coursework**

All Ph.D. students must take the following courses (if not taken previously):

- PLPA 5444 - Ecology, Epidemiology, and Evolutionary Biology of Plant-Microbe Interactions (3.0 cr)
- 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)
- two semesters of PLPA 8200 - Plant Pathology Seminar (2 credits total, including credits taken during a PLPA M.S. program at the University of Minnesota)
- one full semester in-classroom teaching experience
  - PLPA 8005 - Supervised Classroom or Extension Teaching Experience (2.0 cr)
  - or GRAD 8101 - Teaching in Higher Education (3.0 cr)
- PLPA 8104 - Plant Virology (2.0 cr)
- or PLPA 8105 - Plant Bacteriology (2.0 cr)

**Ph.D. in Plant Pathology, Molecular Option**

**Molecular Option Requirements**

Ph.D. students wishing to emphasize molecular plant pathology must complete the following course requirements in addition to the standard Ph.D. program requirements.

- BIOC 4125 - Laboratory in Molecular Biology and Biotechnology or equivalent
- PLPA 5301 - Plant Genomics (3.0 cr)
- PLPA 5300 - Current Topics in Molecular Plant Pathology (two semesters required) 2 credits total
Suggested courses for the 12 supporting field credits:
Take 12 or more credit(s) from the following:

• AGRO 8241 - Chromosomal and Molecular Genetics of Plant Improvement (3.0 cr)
• ANSC 5200 - Statistical Genetics and Genomics (4.0 cr)
• BIOM 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
• CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
• EEB 5221 - Molecular Evolution (3.0 cr)
• GCD 5036 - Molecular Cell Biology (3.0 cr)
• GCD 8131 - Advanced Genetics and Genomics (3.0 cr)
• MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 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 Fisheries, Wildlife, and Conservation Biology, 115 Northern Forest Station, 1992 Folwell Avenue, St. Paul, MN 55108-1034 (612-625-0890; fax: 612-626-7080)
Email: isgigert@umn.edu
Website: http://isg-igert.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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
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 from the core curriculum; the doctoral minor requires 13 graduate credits. Master's students must take ISG 5010 (3 credits), ISG 5020 (1 credit), and ISG 8001 (1 credit; taken twice for credit).

The doctoral minor requires at least 13 credits, including the master's courses, plus ISG 8021 (3 credits), ISG 8031 (1 credit), and a 3-credit course in quantitative modeling or a decision analysis course offered by another program.
**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](http://www.misa.umn.edu/StudentPrograms/GraduateMinor/index.htm)

- Program Type: Graduate free-standing minor  
- Requirements for this program are current for Fall 2014  
- 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 (M.A. and M.S.) 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. 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**  
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.

The master's minor requires 6 graduate credits from the core curriculum; the doctoral minor requires 12 graduate credits. All students must take SAGR 8010 and 8020. The other core course is AGRO 5321 - Ecology of Agricultural Systems (cross listed with ENT 5321). A unique component of the minor is an on-site internship with growers, grassroots organizations, or public agencies working in sustainable agriculture.
Twin Cities Campus
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 S.E., 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 2014
- 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 master's degree in American studies is not designed as a terminal degree; therefore, students are not admitted directly to the M.A. program. Students may apply for graduate study at the Ph.D. level only. A Ph.D. student may elect to pursue the M.A. All Ph.D. coursework is applicable. Current graduate students seeking to obtain the M.A. 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 Ph.D. level only. Ph.D. students may obtain a M.A. during the course of their studies; however no students are admitted for a terminal M.A. Students entering the Ph.D. 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 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 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 M.A. program. A Ph.D. student may elect to pursue the M.A. All Ph.D. coursework is applicable. Current graduate students seeking to obtain the M.A. should review the information in the current Graduate Handbook on the program website at http://americanstudies.umn.edu/grad/handbook.html.
American Studies Minor

American Studies

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: amstdv@umn.edu
Website: http://americanstudies.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 a master's minor, students are expected to choose courses consistent with or complementary to their major. For an Master's minor, students should take either AMST 8201 (3 cr.) OR AMST 8202 (3 cr.) and two more courses in AMST (3 cr. each) for a total of 9 credits.

For a doctoral minor, students must complete at least 12 credits of courses consistent with or complementary to their major, including four 5xxx or 8xxx courses in American studies, one of which must be AMST 8201 or AMST 8202.
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 S.E., Minneapolis, MN 55455 (612-624-4190; fax: 612-624-3858).
Email: amstdy@umn.edu
Website: http://americanstudies.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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 Ph.D. level only. (Ph.D. students may obtain a M.A. during the course of their studies, but students are not admitted for a terminal M.A.) Students entering the Ph.D. 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
36 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: Reading knowledge of one foreign language.

A minimum GPA of 3.50 is required for students to remain in good standing.

Ph.D. students must complete the following course distributions: four core American studies courses (Introductory Seminars AMST 8201 and AMST 8202; AMST 8401 - Practicum in American Studies; and AMST 8801 - Dissertation Seminar); a minimum of three seminars, one of which must require original research; one comparative culture course covering international or non-U.S. topics; and seven adviser-approved courses, at least one of which must focus on American cultural diversity. With adviser approval, any or all of the above listed seminars (except the required core courses) may count toward these seven courses. Twenty-four thesis credits are also required. Ph.D. students may register for 0999 no more than two semesters total without approval from their adviser and the director of graduate studies.
Twin Cities Campus
Anthropology M.A.
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: Master's
- Requirements for this program are current for Fall 2014
- 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 Anthropology MA degree is offered with a focus on Cultural Heritage Management (CHM). It is a two-year program, which can be completed with or without a thesis, designed for students who wish to pursue a career in heritage management archaeology in non-academic settings. Our aim is to train students in anthropological perspectives on the issues of heritage management, broadly defining heritage as materials and practices remaining from the past. This perspective ranges from the abstract understanding of how heritage is construed, valued and used, to the more concrete methods for archaeological analysis, site protection (especially in the legal framework), outreach and education in concert with stakeholder communities and the wider public.

This program draws additional strength from a wide variety of heritage-related departments and programs that students may work with, including Architecture, Public History, Museum Studies, Landscape Architecture, Geography, the Tourism Center, the River Life program, and many more. Both on-campus and in the greater Twin Cities area, there are a tremendous number of museums, archives, history centers and sites, heritage preservation non-profits and agencies where students may gain practical experiences and contacts in the professional worlds.

Note: The Department of Anthropology admits students for the master's degree only in cultural heritage management, although in some cases students admitted to the Ph.D. program complete a master's degree as they work toward the Ph.D.

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:
For the Cultural Heritage Management focus of the Anthropology MA program, students with a background in anthropology or archaeology are preferred because of the two-year nature of the program and the demanding final oral examination. Likewise, students with field and/or laboratory experience are preferred because of the nature of the competencies that structure the program. Nonetheless, all applicants to the cultural heritage management program are considered and students with little or no background in anthropology or archaeology are accepted depending on interest and training. These students may be required to make up specified deficiencies during their program.

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. Students are admitted for fall semester only; the deadline for all materials is February 15.

Applicants must submit their test score(s) from the following:
- GRE

International applicants must submit score(s) from one of the following tests:
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 advisers 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 advisers, 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.

Students should consult the Graduate Student Handbook for special requirements for sociocultural anthropology, linguistic anthropology, archaeology, and biological anthropology.
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 2014
- 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 adviser.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
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 adviser.

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 minor programs are both individually designed by the student and a faculty advisor. For the master's minor, students must complete a minimum of 6 credits in anthropology. For the doctoral minor, students must complete a minimum of 12 credits in anthropology, with at least one 8xxx course. Course choices are subject to the approval of the director of graduate studies.
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 Avenue South, Minneapolis, MN 55455 (612-625-3400; fax: 612-625-3095)
Email: anthgrad@umn.edu
Website: http://anthropology.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Department of Anthropology offers graduate education in sociocultural and linguistic anthropology, archaeology, and biological anthropology. With the exception of the master’s degree with an emphasis on cultural heritage management, the program admits students only for the Ph.D., although some students do earn a master’s degree as part of their Ph.D. program. Major areas of faculty research and graduate student training in sociocultural and linguistic anthropology include colonial and post-colonial studies, cultures of capitalism, cultural studies of science, the anthropology of death and dying, analysis of discourse and social interaction, economic anthropology, ethnographies of the state, gender/sexuality, globalization, human/nonhuman relations, language politics, medical anthropology, philosophical anthropology, semiotic anthropology, temporality and futurity, and urban anthropology, among other specialties. Regional specializations include Europe, the Pacific, the Middle East, North America, Russia, Southern Africa, East Asia, and South Asia. The program in biological anthropology offers training and research opportunities in two main areas: paleoanthropology and behavioral biology. The paleoanthropology specialty combines biological anthropology and Paleolithic archaeology in the reconstruction of the evolution and behavior of primates, including hominins, through the application of evolutionary theory to the analysis of skeletal morphology, faunal remains, site taphonomy, and lithic technology. The behavioral ecology specialty involves the study of the behavior and ecology of living primate species, including humans, through field studies and the analysis of long-term data. Regional specializations include Africa, Southwest Asia, Central Asia, and Europe. 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 B.A. degree or equivalent is required for admission.

Other requirements to be completed before admission:
Graduate students who enter the Ph.D. program with a M.A. 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, in most cases the student will 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
  - 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

24 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.

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 Ph.D. 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.
Twin Cities Campus

Art History M.A.

Art History

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 Avenue South, 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 2014
- 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.

Areas of specialization in the art history master's degree 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 the M.A. program, a bachelor's degree is required, preferably in art history or a closely related field. Ability and scholarly promise must be demonstrated by a past record of academic excellence.

Special Application Requirements:
For the M.A. program, results from the GRE General Test, at least one substantial research paper preferably in art history, and three letters of recommendation from persons well acquainted with the applicant's research and writing skills are required. In addition, M.A. applicants must provide a detailed statement describing previous experience and academic training as related to the projected course of study and academic goals.

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 21 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 a suitable length for an adequate treatment of the chosen topic. The projects will be 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 in a second language.

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.

A minimum of 36 course credits (about 12 courses) is required, including at least two 8xxx seminars in art history (in addition to ARTH 8001, and excluding ARTH 8975). A minimum of 21 credits must be comprised of art history in content and be drawn from courses in at least three of the following areas: North American, ancient Mediterranean, ancient western Asia, early modern, East Asian, Islamic, medieval, modern, contemporary, film/photography, Latin American, or South Asian. Of these, three courses must be in an area of primary concentration, two courses in an area of secondary concentration, and one course in a third area. Students concentrating in Western art or art of the Global North must take one course in Eastern art or art of the Global South. Students concentrating in Eastern art or art of the Global South must take one course in Western art or art of the Global North. In addition, students must take 6 credits in courses that do not focus on art history in content. The remaining 9 credits may be either in art history or outside the discipline; these are chosen in consultation with the adviser and the director of graduate studies.
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 2014
- 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.

A a minimum of 11 graduate credits in art history is required for a master's minor. For the Ph.D., a minimum of 12 art history credits of 5xxx or higher coursework is required.
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 Avenue South, 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 2014
- 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.

Note: The art history program does not admit students directly to the Ph.D. All art history graduate students begin in the M.A. program and are expected to continue on toward the Ph.D. Areas of specialization in the art history program include: American art and material culture; early modern and Baroque art; 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, South Asian art and architecture, East Asian art and archaeology.

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:
Note: The program does not admit students directly to the Ph.D. All graduate students in art history begin in the M.A. program and are expected to continue on toward the Ph.D. Graduate students who join the program already having completed a master's degree or graduate-level coursework at another institution may be allowed to transfer credits. See the department website for more information or contact the director of graduate studies.

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
18 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: Reading proficiency in two foreign languages.

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.

A minimum of 54 course credits (about 18 courses), inclusive of credits earned for the M.A. degree, is required. At least 18 credits (about 6 courses) must be in an area of primary concentration within art history, while a minimum of 9 credits (about 3 courses) must be in an area of secondary concentration in art history. In addition, at least 6 credits (about 2 courses) must be outside the field of art history in the minor or supporting program beyond work done at the M.A. level. These outside courses count towards the minimum of 12 credits required in a minor or supporting field.
Twin Cities Campus
Art M.F.A.
Art 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 South, 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 2014
- 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 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 M.F.A. 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 51 major credits and 9 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 and 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 M.F.A. program requires a total of 60 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 advisers with approval of the DGS. The program requires all course work be completed by the end of the second year of the program. Required courses include ARTS 8400 (fall semester of the first term), ARTS 8410 (taken in the first or second year), ARTS 8X00 (Area) Practice and Critique course taken each of the four semesters of years one and two, and 9 credits of Related Field courses including a minimum of one course in the history of art and two courses from other academic departments pertinent to the student's program. Students who will teach during their time in the MFA program will be required to register for the 1 credit MFA Teaching Colloquium prior to a graduate teaching appointment. In the third year of the MFA program candidates are required to register for 9 ARTS 8990 credits per semester and a one credit writing workshop 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.
Twin Cities Campus

Art Minor

Art

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 South, 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 2014
- 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.

A minor in art may be obtained by candidates in a master's program by completing 9 credits of graduate-level coursework chosen in consultation with the director of graduate studies in art. Candidates in a Ph.D. program must complete 12 credits. The minor must include ARTS 8400 - Theoretical Constructions in Contemporary Art.
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 Street S.E., 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 2014
- 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 does not admit students directly to the M.A. degree. It considers applications only from students seeking the Ph.D. degree. The M.A. 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 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 Ph.D. degree are considered, although applicants are not required to have taken graduate coursework before entering the program. The M.A. is offered as an exit degree or interim credential. 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**

**Plan B:** Plan B requires 14 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: Advanced knowledge in the chosen language.

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 M.A. is offered only under Plan B, which requires 30 credits. A Ph.D. qualifying exam, normally given at the end of the student's second year in the program, also serves as the M.A. exam. Students entering the program with an M.A. in a related field can take this qualifying exam after one year of study, with approval of the director of graduate studies.

The final exam consists of the following: 1) written language exam(s), typically an in-room reading/translation exam on materials directly related to study and research interests; 2) oral presentation and interview (conducted in the language of concentration) discussing the materials that were part of the written exam; 3) submission of two Plan B research papers for evaluation (normally papers from two different classes, revised for submission); and 4) oral exam (in English) by the above committee, based on the submitted papers.
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 S.E., Minneapolis, MN 55455 (612-625-6534; fax: 612-624-5513).
Email: all@umn.edu
Website: http://all.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 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
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 the doctoral minor, students are expected to take a minimum of 12 credits in graduate courses offered in the Department of Asian Languages and Literatures, 4 of which must be at the 8xxx level; the student must also pass the reading language exam that is part of the Ph.D. qualifying exam for ALCM (see above). The director of graduate studies acts as the student's adviser and approves a course of study.
Twin Cities Campus
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 Street S.E., 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 2014
- Length of program in credits: 77
- 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 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:
Note: Only applications from students seeking the Ph.D. degree are considered, although applicants are not required to have taken graduate coursework before entering the program. (The M.A. is offered as an exit degree or interim credential.) 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
53 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 3.00 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

The student must also pass the reading language exam that is part of the Ph.D. qualifying exam for ALCM.
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. S.E., 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 2014
- Length of program in credits: 94
- 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 Au.D. 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 Au.D. 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.

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 Au.D. 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 adviser 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.

Joint- or Dual-degree Coursework: Au.D. and Ph.D. in Speech-Language-Hearing Sciences Student may take a total of 9 credits in common among the academic programs.
Classical and Near Eastern Studies M.A.
Classical & Near Eastern Studies
College of Liberal Arts

Contact Information:
Department of Classical and Near Eastern Studies, 245 Nicholson Hall, 216 Pillsbury Dr. S.E., 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 2014
- 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.
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.

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.

Ancient and Medieval Art and Archaeology

Note: This sub-plan is inactive. CNES is currently not accepting applications for this program.

This sub-plan allows concentrations ranging broadly over the ancient and medieval periods, with an emphasis on art historical and archaeological approaches. Work in an appropriate ancient language is encouraged.

Language Requirements: Reading knowledge of one modern foreign language appropriate to the student's program is required (normally German, French, or Italian).

Final Exam: The final exams are written and oral.

Classics

This sub-plan 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. The program requires nearly equal emphasis on courses and seminars in Greek and in Latin, as well as supporting work in a related field or area of interest. The minimum requirement for Plan A is 44 credits (including 10 thesis credits), and for Plan B, 34 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 a department exam based on a set reading list is required. Final Exam: The final exams are written (Greek and Latin reading proficiency) and oral (general).

Greek

A core of advanced work in Greek is supplemented by a minor or supporting program in a related field or area of interest. The minimum requirement for Plan A is 47 credits (including 10 thesis credits), and for Plan B, 37 credits.

Language Requirements: One modern research language as appropriate, preferably French, German, or Italian, and reading proficiency in Greek as demonstrated by a department exam based on a set reading list is required.

Final Exam: The final exams are written (Greek reading proficiency) and oral (general).

Latin

A core of advanced work in Latin is supplemented by a minor or supporting program in a related field or area of interest. The minimum requirement for Plan A is 47 credits (including 10 thesis credits), and for Plan B, 37 credits.

Language Requirements: One modern research language as appropriate, preferably German, French, or Italian, and reading proficiency in Latin as demonstrated by a department exam based on a set reading list is required.
Final Exam: The final exams are written (Latin reading proficiency) and oral (general).

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. Plan A requires 47 credits, including 31 graduate course credits, plus 6 credits in a related field, plus 10 thesis credits. Plan B requires 37 credits, including 31 graduate course credits, plus 6 credits in a related field.

Language Requirements: Proficiency in one modern language (normally German) and master's-level proficiency in classical Hebrew, Greek, or Latin as demonstrated by a department exam based on a set reading list is required.

Final Exam: The final exams are written (ancient language reading proficiency) and oral (general).
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 Dr. S.E., 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 2014
- Length of program in credits (Masters): 10 to 13
- Length of program in credits (Doctorate): 15 to 17
- 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 M.A. 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.

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 toward program requirements is permitted under certain conditions with adviser approval.

Language Requirement: Reading proficiency in either Greek or Latin.

M.A. Classics Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794, as well as 6 credits in graduate-level Latin courses (excluding LAT 8120) and 6 credits in graduate-level Greek courses (excluding GRK 8120).

M.A. Greek Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794, as well as 9 graduate credits of Greek (excluding GRK 8120).

M.A. Latin Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794, as well as 9 graduate credits of Latin (excluding LAT 8120).

Ph.D. Classics Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794, as well as 9 graduate credits of Greek or Latin (excluding GRK/LAT 8120) and 6 graduate credits in the other language (excluding GRK/LAT 8120).

Ph.D. Greek Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794, as well as 15
graduate credits in Greek (excluding GRK 8120).

Ph.D. Latin Minor: Minor Requirements for Students Majoring in Other Fields: Students must complete CNES 5794 and 15 graduate credits of Latin (excluding LAT 8120).
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. S.E., 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 2014
- 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 Ph.D. 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.
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.

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.

Ancient and Medieval Art and Archaeology
Note: This sub-plan is currently inactive. CNES is currently not accepting applications for this program.

This sub-plan allows concentrations ranging broadly over the ancient and medieval periods, with an emphasis on art historical and archaeological approaches. Graduate-level ability in an appropriate ancient language is required for graduation.

Students who continue from the M.A. program may apply those credits toward the Ph.D., with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is at least 60 credits, including at least 21 credits in the major, 12 in a supporting program, and 24 thesis credits.

Language Requirements: Reading proficiency in German and in a second modern research language as appropriate (usually French), and research knowledge of an ancient language are required.

Classics
This sup-plan 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. Students must take at least three seminars in the major, a graduate level course in archaeology, and a two-semester sequence in ancient history, in addition to fulfilling all course requirements specified for the M.A. Students who continue from the M.A. program may apply those credits toward the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is at least 71 credits, including at least 35 credits in the major, 12 in the supporting program, and 24 thesis credits.

Language Requirements: German, plus another modern language, preferably French or Italian, and reading proficiency in Greek and Latin as demonstrated by a department exam based on a set reading list is required.

Greek
A core of advanced work in Greek is supplemented by a minor or a supporting program in a related field or area of interest. Students must take at least three seminars in the major, a graduate level course in archaeology, and a two-semester sequence of ancient history in addition to completing all courses required for the M.A. Students who continue from the M.A. program may apply those credits toward the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is at least 70 credits, including at least 15 credits in Greek, 15 credits in the supporting program, and 24 thesis credits.

Language Requirements: German and a second modern language, preferably French or Italian, and reading proficiency in ancient Greek as demonstrated by a department exam based on a set reading list is required.
Latin
A core of advanced work in Latin is supplemented by a minor or supporting program in a related field or area of interest. Students must take at least three seminars in the major, a graduate-level course in archaeology, and a two-semester sequence in ancient history, in addition to completing all M.A. course requirements. Students who continue from the M.A. program may apply those credits towards the degree, with the exception of Plan A thesis credits or Plan B paper credits. A typical Ph.D. program is at least 70 credits, including at least 15 credits in Latin, 15 credits in the supporting program, and 24 thesis credits.

Language Requirements: German and a second modern research language, normally French or Italian, and reading proficiency in Latin as demonstrated by a department exam based on a set reading list is required.
Twin Cities Campus

Cognitive Science Minor
College of Liberal Arts - Adm
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 2014
- Length of program in credits (Masters): 11
- Length of program in credits (Doctorate): 23
- 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.

Minor Requirements for Students Majoring in Other Fields: The minor in cognitive science is available to master's (M.A. and M.S.) and doctoral students. Both master's and doctoral minors require the following courses outside the student's major department: CGSC 8001 Proseminar in Cognitive Science and a broad introduction to cognitive sciences, such as one of the following: IDSC 8711 - Cognitive Science; CGSC 8000 - Philosophy of Cognitive Science; PSY 5015 - Cognition, Computation, and Brain; CGSC 8040 - Cognitive Neuroscience.

The master's minor requires a minimum of 8 graduate credits (including the required courses listed above) and 3 credits of additional relevant elective courses.

The doctoral minor requires a minimum of 14 graduate credits (including the required courses listed above) and 9 credits of additional relevant elective courses. 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.
Twin Cities Campus
Cognitive Science Ph.D.
College of Liberal Arts - Adm
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 2014
- 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.

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 Ph.D. 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 coadvisers 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 Graduate School's Apply Now interface. They must submit a completed Graduate School Application, scores from the GRE, and three letters of recommendation. Applicants wishing to be considered for financial support should apply no later than January 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

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.

The Ph.D. program requires a minimum of 46 credits, in addition to 24 thesis credits. Students are required to take two core courses with a CGSC designator, as well as 9 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 Ph.D. written preliminary projects are expected to be of near publishable quality. As entry into the Ph.D. program assumes no previous graduate work, students who enter the program with an M.A. or other graduate coursework in a cognitive science-related discipline may apply credits from their previous graduate work towards the required 46 credits.
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 2014
- 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 oral.

**Plan B:** Plan B requires 21 major credits and 6 credits outside the major. The final exam is 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.

Inclusion of 4xxx courses on Graduate Degree Plan Forms is subject to adviser and director of graduate studies approval. Such courses must be taught by graduate faculty and usually no more than one 4xxx course is allowed on a Degree Program Form. The degree is offered under Plan A (thesis) and Plan B (without thesis). Plan A requires a minimum of 15 course credits in communication studies, including 3 course credits from a 5xxx or 8xxx course in one of the concentrations other than the student's own, a minimum of 6 course credits in a minor or related fields, and 10 thesis credits. Plan B requires a minimum of 21 course credits in communication studies, including 3 course credits from a 5xxx or 8xxx course in one of the concentrations other than the student's own, a minimum of 6 course credits in a minor or related field, an additional 6 credits in the field of student's choice, and a paper.
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 2014
- 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.

The master's minor requires 6 credits. The doctoral minor requires 12 credits.
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 S.E., Minneapolis, MN 55455 (612-624-5800; fax: 612-624-6544).
Website: http://www.comm.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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.

Applicants must submit scores from the GRE General Test, transcripts of all postsecondary 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**

30 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.

A minimum GPA of 3.50 is required for students to remain in good standing.

Students must submit programs consisting of at least 42 course credits (which may include 12 credits from the M.A. and an additional 30 credits of doctoral coursework; at least 12 credits must be obtained from a supporting program or official graduate minor; 6 course credits from a 5xxx or 8xxx course from each of the other concentrations other than the student’s own); 24 thesis credits are required. The program should include 12 credits in research methods relevant for completing the degree and continuing a scholarly career. Under certain circumstances, foreign language courses may be used to satisfy this requirement.
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 S.E., 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 2014
- 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 M.A. degree. In the event that a Ph.D. student decides not to finish the Ph.D. and is in good standing, that student may apply for a terminal M.A. 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.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for 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
  - 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 20 major credits and 6 credits outside the major. The final exam is written. 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.

M.A. Plan B Degree Requirements: Students are not admitted to work toward the M.A. degree. In the event that a Ph.D. student decides not to finish the Ph.D. and is in good standing, that student may apply for a terminal M.A. Thirty credits of coursework, including 6 credits of the Basic Research Seminar (CL 8001-8002), 3 credits of CL 8901 - Pedagogy of Cultural Studies and Comparative Literature, 2 credits of CL 8902 - Methodologies Colloquium, 9 additional CL credits, 6 credits in courses in related fields outside Comparative Literature or in a formal minor in another program (excluding Comparative Studies in Discourse and Society), and 4 credits either in CL courses or in the related minor field are required. One Plan B paper of approximately 40 pages is required. Students are advised to check the program website indicated above for updated information.
Twin Cities Campus
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 S.E., 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 2014
- 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 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.

Minor Requirements for Students Majoring in Other Fields: A minimum of 9 credits is required for a master's minor, which must include CL 8001 and 8002. A minimum of 12 credits is required for the Ph.D. minor, which must include CL 8001 and 8002. Students are advised to check the program website indicated above for updated information.
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 Drive S.E., 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 2014
- 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 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 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
The B.A. and/or M.A. degree in a humanities or a social science discipline, or other relevant field, is required for admission to the Ph.D.

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 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 two languages (other than English)

A minimum GPA of 3.50 is required for students to remain in good standing.

The Ph.D. requires 47 graduate credits of coursework as follows: 6 credits of the Basic Research Seminar (CL 8001-8002); 3 credits of CL 8901 - Pedagogy of Cultural Studies and Comparative Literature; 2 credits of CL 8902 - Methodologies Colloquium; 24 credits in CL courses, inclusive of the 11 credits taken in CL 8001-8002, 8901, and 8902 (with approval of the adviser and the Director of Graduate Studies, up to 3 credits of the 24-credit requirement may be taken in the field of the minor or supporting program); 11 additional credits either in CL courses or in courses in a related field; and 12 credits (or more, as necessary) to complete a formal graduate minor, excluding Comparative Studies in Discourse and Society. If a minor is not pursued in another program, the student must complete 12 credits in coursework outside of CL, CSDS, or CSCL courses in a coherent and complementary program (i.e., a “supporting program”) to be approved by the adviser and the Director of Graduate Studies. Overall, the degree should include 12 credits of 8xxx courses (exclusive of CL 8001-8002). 24 doctoral thesis credits are also required. Students are advised to check the program website indicated above for updated information.
Twin Cities Campus
Comparative Studies in Discourse and Society 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, 216 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: cssclgrad@umn.edu
Website: http://csds.cla.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 normally are not admitted to work toward the M.A. degree. In the event that a Ph.D. student decides not to finish the Ph.D. and is in good standing, that student may apply for a terminal M.A. 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
Students are not admitted to work toward the M.A. degree. In the event that a Ph.D. student decides not to finish the Ph.D. and is in good standing, that student may apply for a terminal M.A.

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 24 major credits and 6 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 not be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Reading knowledge of one foreign language.

A minimum GPA of 3.50 is required for students to remain in good standing.

M.A. Plan B Degree Requirements: Students are not admitted to work toward the M.A. degree. In the event that a Ph.D. student decides not to finish the Ph.D. and is in good standing, that student may apply for a terminal M.A. Thirty credits of coursework are required, including 6 credits of the Basic Research Seminar (CSDS 8001-8002), 3 credits of CSDS 8901 - Pedagogy of Cultural Studies and Comparative Literature, 2 credits of CSDS 8902 - Methodologies Colloquium, 9 additional CSDS credits, 6 credits in courses in related fields outside Comparative Studies in Discourse and Society or in a formal minor in another program (excluding Comparative Literature), and 4 credits either in CSDS courses or in the related minor field are required. One Plan B paper of approximately 40 pages is required. Students are advised to check the program website indicated above for updated information.
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 S.E., 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 2014
- 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 toward program requirements is permitted under certain conditions with adviser approval.

Minor Requirements for Students Majoring in Other Fields: A minimum of 9 credits is required for a master’s minor, which must include CSDS 8001 and 8002. A minimum of 12 credits is required for a Ph.D. minor, which must include CSDS 8001 and 8002. Students are advised to check the program website indicated above for updated information.
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 Drive S.E., Minneapolis, MN 55455 (612-624-8099; fax: 612-625-4170)
Email: csclgrad@umn.edu
Website: http://cbsd.cla.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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
The B.A. and/or M.A. degree in a humanities or a social science discipline, or other relevant field, is required for admission to the Ph.D.

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.

A minimum GPA of 3.50 is required for students to remain in good standing.

The Ph.D. requires 47 graduate credits of coursework as follows: 6 credits of the Basic Research Seminar (CSDS 8001-8002); 3 credits of CSDS 8901 - Pedagogy of Cultural Studies and Comparative Literature; 2 credits of CSDS 8902 - Methodologies Colloquium; 24 credits in CSDS courses, inclusive of the 11 credits taken in CSDS 8001-8002, 8901, and 8902 (with approval of the adviser and the Director of Graduate Studies, up to 3 credits of the 24-credit requirement may be taken in the field of the minor or supporting program); 11 additional credits either in CSDS courses or in courses in related fields; and 12 credits (or more, as necessary) to complete a formal minor in another University graduate program, excluding Comparative Literature. If a minor is not pursued in another program, the student must complete 12 credits in coursework outside of CSDS, CL, or CSCL courses in a coherent and complementary program (i.e., a "supporting program") to be approved by the adviser and the Director of Graduate Studies. Overall, the degree should include 12 credits of 8xxx courses (exclusive of CSDS 8001-8002). 24 doctoral thesis credits are also required. Students are advised to check the program website indicated above for updated information.
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 S.E., Minneapolis, MN 55455 (612-625-6366; fax: 612-624-8228)
Email: creawrit@umn.edu
Website: http://creativewriting.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 "Dislocate", 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 M.F.A. 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 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.
Program Requirements

Plan C: Plan C requires 42 major credits and 3 credits outside the major. There is no final exam. A capstone project is required.

Capstone Project: The capstone project is a publishable thesis manuscript of poetry, fiction, or creative 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 M.F.A. requires 45 credits distributed over a three-year period, culminating in a book-length manuscript, M.F.A. literary essay, and an M.F.A. defense. Required coursework includes ENGW 8101 (4 cr), ENGW 8180 (4 cr); three writing workshops (12 cr), one of which must be outside the student's primary genre; one 8xxx seminar (4 cr); language and literature courses (10 cr); coursework in a related field (3 cr); an additional creative writing class of the student's choosing (4 cr); thesis credits (4 cr); and a creative project in the form of a book-length manuscript suitable for publication.
Twin Cities Campus
Developmental Studies and Social Change Minor
College of Liberal Arts - Adm
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 Avenue South, 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 2014
- 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.

The doctoral minor requires a sequence of four core seminars (DSSC 8111, 8112, 8211-8212 and 8310) for 9 credits total (8310 is taken twice). Students also take one or two courses (minimum 3 credits total) chosen from an approved list of courses from across the graduate education curriculum that are relevant to the field of development studies and social change.

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Information current as of September 19, 2014
Twin Cities Campus

Early Modern Studies Minor

History

College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Email: emsdgs@umn.edu
Website: http://www.cemh.umn.edu/minor

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 EMS: 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.

The master's minor requires 7 graduate credits: EMS 8520 - Seminar in EMS: Current Research and Methodologies (3 cr), EMS 8100 - Workshop in EMS: Workshop in Early Modern Studies (1 cr), and one graduate-level elective course (3 cr) outside of the student's major department.

The doctoral minor requires 12 graduate credits: Including EMS 8520 - Seminar in EMS: Current Research and Methodologies (3 cr), EMS 8100 - Workshop in EMS: Workshop in Early Modern Studies (1 cr), and eight (8)graduate-level elective credits outside of the student's major department.
Twin Cities Campus
Economics M.A.
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: econdgs@umn.edu
Website: http://www.econ.umn.edu/graduate/index.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 Ph.D. in economics; the M.A. is an optional part of the Ph.D. 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 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 written. A capstone project is required.

Capstone Project: Two Plan B projects consisting of research papers or literature reviews are required; the Ph.D. 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 M.A. are less rigorous than those for the Ph.D., students may qualify for the master's Plan B without having satisfied all requirements for the Ph.D. 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 3.20 is required for students to remain in good standing.
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: econogs@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 2014
- Length of program in credits (Masters): 6
- 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 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 Ph.D.; the M.A. is an optional part of the Ph.D. 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.

A master's minor consists of 6 credits in 4xxx, 5xxx, or 8xxx economics courses, all taken A-F and completed with grades of B or better (one 8xxx course may carry a grade of C). The 6 credits must include two courses in either the 4161-4164 sequence or the 4165-4168 sequence, or more advanced courses in economic theory.

The economic theory requirement may be waived if, in the judgment of the director of graduate studies, the student's previous work in economics has included courses equivalent to 4xxx economic theory courses, though the requirement to complete 6 credits would still stand.

Requirements for a doctoral minor include five or more from among the following courses: ECON 8001-8004 or 8101-8104, and 8105-8108; plus completion of at least two 8xxx courses in economics other than those listed above. All courses must be taken A-F, with no grade lower than C and no more than two course grades of C.

In addition, students must pass the microeconomics preliminary exam for minors or majors and either the macroeconomics preliminary exam for minors or majors, or a preliminary exam for majors in one of the fields listed under the program description above.
**Twin Cities Campus**

**Economics Ph.D.**

**Economics**

**College of Liberal Arts**

Link to a [list of faculty](http://www.econ.umn.edu/graduate/index.html) 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: econdag@umn.edu

Website: [http://www.econ.umn.edu/graduate/index.html](http://www.econ.umn.edu/graduate/index.html)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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](http://www.econ.umn.edu/graduate/index.html) 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 Ph.D.; the M.A. is an optional part of the Ph.D. 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: 158

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](http://www.econ.umn.edu/graduate/index.html) 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 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 3.20 is required for students to remain in good standing.

At least 2 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 adviser, although at least 12 credits in the major are required. In addition, students must complete 12 credits outside the major for a supporting program, which may include economics courses not included in the major.
Twin Cities Campus

English as a Second Language M.A.

Writing Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Department of Writing Studies, 214 NCCE 0093A, 315 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-626-4802; fax: 612-624-4579)
Email: slsinfo@umn.edu
Website: http://www.sls.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 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.

Note: Admission to the M.A. program in English as a Second Language (ESL) has been suspended and the program is in the process of being discontinued.

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.

International applicants must submit score(s) from one of the following tests:
- TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Speaking Score: 25

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 23 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 23 major credits and 9 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: The Plan B project is a paper of publishable quality based on ESL master's coursework, coursework in another program, or personal interest. Two Plan B papers are required; one may be a Teaching Portfolio, prepared according to specific program guidelines.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

Language Requirement: Proficiency in one language not native to student.

A minimum GPA of 3.20 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.
The M.A. program in ESL typically takes two years to complete. Plan A requires a thesis demonstrating original work in areas related to the field, familiarity with research methodology, and knowledge of the effective presentation of investigative study results. Plan B requires two qualifying papers, usually consisting of course papers that have been revised under the supervision of a faculty member.

Plan A and Plan B students must complete 23 credits in required coursework (SLS 5401, 5402, 5721, 5722, 5724, 5805) and 6 credits of elective coursework in related fields. Plan A students must complete an additional 10 thesis credits for a total of 39 credits and Plan B students must complete an additional 3 credits in elective coursework for a total of 32 credits. Elective and related field courses must be chosen with the help of an adviser to ensure the relevance of courses to students’ goals.
**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](http://english.cla.umn.edu)

- **Program Type:** Master's
- **Requirements for this program are current for Fall 2014**
- **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 M.A. offers training in the areas of literary history, literary theory and interpretation, language, linguistics, rhetoric, and composition. Students in the M.A. can develop specific concentrations through consultation with the director of graduate studies.

Course requirements for the M.A. 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 15th.

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
  - 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 21 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.

The minimum requirement for the M.A. is 30 credits. Coursework must include at least 21 credits in English and 6 credits in related fields outside of English or in a minor field. All M.A. students must complete the introductory course ENGL 5001, introduction to literary theory and literary study, and three Plan B papers.
**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](http://english.cla.umn.edu)

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 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 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.

The master's minor consists of 9 credits in English. Course selection is determined in consultation with the director of graduate studies.

The Ph.D. minor consists of 12 credits in English. Course selection is determined in consultation with the director of graduate studies.
Twin Cities Campus

English Ph.D.

English Language & Literature

College of Liberal Arts

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 2014
• 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 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.

Course requirements for the Ph.D. 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 on route to the Ph.D. degree. 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 15th.

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
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
27 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: 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.

A minimum of 39 course credits and 24 thesis credits is required. Course requirements for the Ph.D. program are broadly defined, allowing students to shape a personal program of study. The following courses are required: ENGL 5001 and 5800, preferably during the first year of doctoral study (6 cr); three English courses distributed among broad areas (minimum of 9 cr); four additional English courses in a focused area of emphasis (minimum of 12 cr); 12 credits in a supporting program, with a minimum of two courses outside the department. Students are encouraged to enroll in additional courses as appropriate.
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 S.E., Minneapolis, MN 55455 (612-624-6006; fax: 612-624-3573)
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 2014
- 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 feminist studies director of graduate studies.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
In a letter of interest to the director of graduate studies, applicants must demonstrate a clear relationship between the focus and objectives of their doctoral research and the goals, curriculum, and scholarly resources of the feminist and critical sexuality graduate minor program. 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.

To complete a Ph.D. minor, students must complete GWSS 8108 and 8109 and three graduate-level electives (9 cr), including at least one 5xxx or 8xxx course in feminist studies (GWSS 8xxx or GWSS 5xxx) and, at most, one feminist studies-approved graduate course from their home department. Students must apply for admission into the graduate minor program.
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 S.E., 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 2014
- 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 M.A. is available only to students admitted to the feminist studies Ph.D. program who wish to secure a Plan B M.A. along the way to obtaining a Ph.D. This credential is helpful for ABD employment purposes or for students who must exit the program. It is similar to the Ph.D. milestones but does not require a dissertation.

The Ph.D. 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. A capstone project is required.

Capstone Project: The Plan B project is made available to students who file a separate Program of Study form in addition to a Ph.D. Program of Study form. The program of study is the same for both degrees. A Plan B M.A. is conferred upon successful completion of the written and oral 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 3.50 is required for students to remain in good standing.

At least 4 semesters must be completed before filing a Degree Program Form.
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 S.E., 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 2014
- 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 Ph.D. 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 M.A. 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

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
28 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 Ph.D. fall into roughly two categories: interdisciplinary courses satisfying core requirements, and courses constituting or enhancing a concentration. Students take 28 credits in required courses, including two elective courses that satisfy core requirements in cultural diversity and two courses that satisfy core requirements in research tools and methods. The remaining coursework includes 12 credits in an area of concentration and 12 credits in the minor field or supporting program (related to the concentration). Students are also expected to register for 1 credit of GWSS 8996 for each of 4 semesters and to participate in the department colloquium series of faculty, student, and guest lecturer presentations. In addition, students are expected to register for 24 thesis credits while writing the dissertation.

Because some courses may fall into more than one category (e.g., courses in the concentration may also satisfy core course requirements), students are permitted to double count credits in the major program in consultation with the director of graduate studies. This means that a student can graduate with fewer than 52 credits when double counting is approved. Students entering the Ph.D. program with a master's degree may transfer credits from that degree and apply them to the Ph.D. requirements in consultation with the director of graduate studies. All students, however, must take GWSS 8108 and 8109.
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 S.E., Minneapolis, MN 55455 (612-626-0418, fax: 612-624-6021).
Email: dgsfren@umn.edu
Website: http://www.frit.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.A. and Ph.D. 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 M.A. level. Submission of all application materials by January 10 ensures consideration for 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.
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 21 major credits and 9 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 one foreign language.
**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: dgsfren@umn.edu  
Website: http://www.frit.umn.edu

- Program Type: Graduate minor related to major  
- Requirements for this program are current for Fall 2014  
- 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 M.A. and Ph.D. 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.

The master's minor requires 9 credits. The doctoral minor requires 12 credits.
**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 S.E., Minneapolis, MN 55455 (612-626-0418; fax: 612-624-6021).
Email: dgsfren@umn.edu
Website: [http://www.frit.umn.edu](http://www.frit.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 81
- 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 M.A. and Ph.D. 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 Ph.D. program, an M.A. in French (or equivalent) is required.

Other requirements to be completed before admission:
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.

**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**

45 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 one foreign language.

The Ph.D. requires at least 57 course credits and 24 thesis credits. Coursework involves at least 45 credits in the major and at least 12 credits (usually four courses) in related fields or, in a minor, the number of credits required by the major program (usually 12 cr). Detailed information is available through program office.
Twin Cities Campus
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 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: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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 B.A. in French or equivalent (B.A./B.S. 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.

The certificate consists of five courses (15 cr) selected according to the following formula: one course (3 cr) in French linguistics, one course (3 cr) in French or francophone literature or culture, and three elective courses (9 cr) in French/francophone language, linguistics, literature, or culture. One of the three electives may be taken in a related area outside French studies, subject to approval by the student's adviser. At least 60 percent of credits must from 5xxx and 8xxx courses; no more than two courses (6 cr) may be 4xxx courses. No courses taken as part of an undergraduate program may be applied, but up to 40 percent of the work on the certificate program can be transfer credits, consistent with the Graduate School's transfer policy. Program must be completed within four years of the date of admission.
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://www.mgis.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.G.I.S.), 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
  - Paper Based - Total Score: 600
- 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.

The degree is offered under Plan C (coursework only) and requires 35 credits of coursework. All students must have at least 35 credits, with a minimum of 18 credits in core and technology courses (12 credits of core courses and 6 credits of technology courses). All students are required to take GEOG 5561 or FR 5131, an approved 5000-level course with an advanced GIS focus, GIS 5571, GIS 5572, an approved 8000-level course with an advanced GIS focus, and GIS 8501. At least 6 credits of the 35 required must be taken outside of the geography department (GEOG and GIS designators) but may include core GIS courses (e.g. FR and ESPM designators). Students must also complete a professional portfolio, and a set of concluding experiences including a public presentation, an exit survey, and a final meeting with an adviser.
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://www.mgis.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 (M.G.I.S.), 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
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 graduate minor is developed in consultation with the M.G.I.S. director of graduate studies. The master's minor requires at least 9 credits (three courses) while the doctoral minor requires at least 12 credits (four courses).
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: braun217@umn.edu
Website: http://www.geog.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 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: 600
  - General Test - Quantitative Reasoning: 600
  - 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 25 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.

Each student is required to take GEOG 8001 and 8405, plus two additional GEOG 81xx and/or GEOG 82xx courses and one methods course. GEOG 8970 and 8980 may be used for GEOG 81xx or 82xx coursework with permission of the adviser.
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: braun217@umn.edu
Website: http://www.geog.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 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
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 adviser. Consult the director of graduate studies about selecting an adviser.
**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: braun217@umn.edu
Website: [http://www.geoq.umn.edu](http://www.geoq.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 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**
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: 600
  - General Test - Quantitative Reasoning: 600
  - 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 receive certification of expertise in the language(s) or techniques(s) or both as necessary for the proposed program. The advising committee sets the requirements, and certifies that they are met before the final Ph.D. examination is scheduled.

Each student is required to take GEOG 8001 and 8405, preferably within the first year. Students must also complete two additional GEOG 81xx and/or GEOG 82xx courses, with at least one of the three a GEOG 82xx course. In addition, students must take one methods course and one proposal-writing course. The choice of courses should be made in consultation with the student's adviser. GEOG 8970 and GEOG 8980 courses may be used for GEOG 81xx or GEOG 82xx coursework with permission of the adviser. Students must prepare a Research dossier and pass preliminary exams. These usually focus on areas closest to a student's current research interests. They also may cover broader knowledge of the discipline and of minor or supporting fields, as the Examining Committee chooses. They must also complete dissertation proposal then complete their PhD dissertation and pass the final oral examination.
Twin Cities Campus
Germanic Studies M.A.
German, Scandinavian, & 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 S.E., Minneapolis, MN 55455 (612-625-2080; fax: 612-624-8297)
Email: gradgsd@umn.edu
Website: http://gsd.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 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 M.A. and Ph.D. 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 (M.A., Ph.D.), Germanic Medieval Studies (M.A., Ph.D.) or Scandinavian Studies (M.A.) 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:
B.A. or equivalent in German, Scandinavian, or related field. Students are usually admitted to the Ph.D. program, but the M.A. 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
- 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 27 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 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.

The Germanic Studies M.A. includes the following: one introductory course; six electives in German and/or Scandinavian literature/culture; one Germanic medieval studies course; a pedagogy seminar; two courses outside the major; and demonstration of oral and written proficiency in German or one Scandinavian language.

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
Students may choose an track in German which will be noted on their transcript.

Five of the six elective courses must be from those specified as applicable for the German track, and the Plan B paper must reflect the track.

Germanic Medieval Studies
Students may choose an track in Germanic Medieval Studies which will be noted on their transcript.

Five of the six elective courses must be from those specified as applicable for the German Medieval Studies track, and the Plan B paper must reflect the track.

Scandinavian Studies
Students may choose an track in Scandinavian Studies which will be noted on their transcript.

Five of the six elective courses must be from those specified as applicable for the Scandinavian Studies track, and the Plan B paper must reflect the track.
**Germanic Studies Minor**

**German, Scandinavian, & 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 S.E., 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 2014
- 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.

M.A. minors are required to take GSD 8001 - Approaches to Textual Analysis and two other courses, for at least 9 credits. Ph.D. minors who have not completed GSD 8001 at the M.A. level must fulfill this requirement at the Ph.D. level. In addition, Ph.D. minors must complete at least four other courses for a total of at least 15 credits (usually five courses).
Twin Cities Campus

Germanic Studies Ph.D.
German, Scandinavian, & 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 S.E., 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 2014
- 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 M.A. and Ph.D. 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 (M.A., Ph.D.), Germanic Medieval Studies (M.A., Ph.D.) or Scandinavian Studies (M.A.) 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.

M.A. or equivalent from another institution in German or a related field.

Other requirements to be completed before admission:
Students with a B.A. only are usually admitted to the Ph.D. program, but the M.A. must be completed first. Those applying with an M.A. 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 other requirements

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 the language of emphasis.

The Germanic Studies Ph.D. includes five elective courses in German and/or Scandinavian literature/culture; a dissertation seminar; and four courses (12 cr) outside the major. Students with an M.A. from another institution will also need to take one theory course and a pedagogy seminar.

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
Students may choose a track in German which will be noted on their transcript.

Four of the five elective courses must be from those specified as applicable for the German track, and the dissertation must reflect that track.

Germanic Medieval Studies
Students may choose a track in Germanic Medieval Studies which will be noted on their transcript.

Four of the five elective courses must be from those specified as applicable for the Germanic Medieval Studies track and the dissertation must reflect that track.
Twin Cities Campus
Hispanic and Lusophone Literatures, Cultures, and Linguistics M.A.
Spanish & Portuguese
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 S.E., Minneapolis, Minnesota, 55455 (612-625-5858; fax: 612-625-3549)
Email: spanportgrad@umn.edu
Website: http://spanport.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 33 to 37
- 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 Hispanic and Lusophone Literatures, Cultures, and Linguistics is a free-standing, two-year degree with three formal tracks: Hispanic Literatures and Cultures, Lusophone Literatures and Cultures, and Hispanic Linguistics. The M.A. is designed as a preparatory degree for students planning to obtain a Ph.D. in the field. The M.A. program is built around 11 core classes taught by graduate faculty and designed to give the student a solid intellectual and professional preparation upon which they can build further in a Ph.D. program in the field or in a related career. The M.A. program also features professional training in the field, including a methodology class that focuses on the teaching of foreign languages and cultures. Students are encouraged to pursue deeper knowledge of related fields through courses taken with graduate faculty outside of the department. In addition to the 11 core courses, 2 courses in a field outside of the major program are required.

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
Program Requirements

Plan A: Plan A requires 21 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 27 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.

Language Requirement: Reading knowledge of a foreign language.

A minimum GPA of 3.50 is required for students to remain in good standing.

For the master's degree, students must have a reading knowledge of a foreign language outside of their principal area of study. Competence in both Spanish and Portuguese satisfies this requirement. Students who wish to continue to the Ph.D. after the M.A. are strongly encouraged to begin their study of Portuguese immediately so as to be prepared for the Ph.D. requirement of two Portuguese 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.

Hispanic Linguistics
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.

Hispanic Literature and Cultures
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.

Lusophone Literatures and Cultures
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.
Twin Cities Campus
Hispanic and Lusophone Literatures, Cultures, and Linguistics Minor
Spanish & Portuguese
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 S.E., Minneapolis, Minnesota, 55455 (612-625-5858; fax: 612-625-3549)
Email: spportgrad@umn.edu
Website: http://spanport.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

The graduate minor requires at least 18 credits of 5xxx or 8xxx courses (six courses), to be determined in consultation with the director of graduate studies.
Twin Cities Campus
Hispanic and Lusophone Literatures, Cultures, and Linguistics Ph.D.
Spanish & Portuguese
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 S.E., 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 2014
- 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.

The Ph.D. program in Hispanic and Lusophone Literatures, Cultures, and Linguistics is a four-year program (post M.A.) that provides students with a focused and rigorous formation in the literatures, languages, and cultures of Spain and Latin America. Ph.D. 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 M.A. degree, Ph.D. students must complete additional coursework. For students in the literature and culture tracks, six additional 5xxx and 8xxx courses in related or major fields are required in order to strengthen and further define the student's area of concentration. The final make-up of the program is decided by the student with the consent of his/her academic adviser. Ph.D. students in Hispanic linguistics are required to take three courses outside the department relating to linguistics, and three 5xxx or 8xxx courses in order to strengthen and further define the student's area of concentration. 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 U.S. 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 Ph.D. 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**
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 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.

The Ph.D. requires a minimum of 54 course credits (18 courses) beyond the B.A., including a required teaching methodology course, 39 credits in the major field, and 12 credits in either a minor or related field, depending on the requirements of the minor program. The program also requires 24 thesis credits. Students entering the program with an M.A. from other institutions must take a minimum of seven courses in this department.
Twin Cities Campus

History M.A.

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 2014
- 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, Ph.D. students often earn their M.A. on the way to the doctoral degree.

Areas of concentration in the history degree include Africa; ancient history; East and South Asia; comparative women's history; 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, and Institute for Advanced Study.

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, Ph.D. students often earn their M.A. on the way to the doctoral degree.

Special Application Requirements:

We prefer GRE scores above the 90% percentile in verbal (usually over 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 (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: Reading knowledge in one foreign language

A minimum GPA of 3.00 is required for students to remain in good standing.

Students are only admitted to the Ph.D. program. They may complete an M.A. while studying for the Ph.D. The M.A. is offered under Plan A and Plan B.
Twin Cities Campus
History Minor
History
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 2014
- 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; comparative women’s history; 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, and Institute for Advanced 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.

The Master’s minor requires a minimum of two related courses in history (at least 6 credits) determined in consultation with the History DGS.

The Doctoral minor requires a minimum of 4 history courses (at least 12 credits) determined in consultation with the History DGS, and HIST 8015.

The Master’s minor in history typically involves a concentration in a single sub-area of history and the completion of a minimum of three graduate courses in history (6-credit minimum). The Doctoral minor in history typically involves four to five history courses (including HIST 8015). For additional information consult with the History graduate program.
**Twin Cities Campus**

**History Ph.D.**

**History**

**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](http://www.grad.hist.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

Areas of concentration in the history Ph.D. program include Africa; ancient history; East and South Asia; comparative women's history; 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, and Institute for Advanced Study.

**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.

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Information current as of September 19, 2014
Program Requirements
30 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: Reading proficiency in two non-English languages

A minimum GPA of 3.50 is required for students to remain in good standing.

Ph.D. candidates are required to complete 10 history courses (30 cr); HIST 8015 - Scope and Methods of Historical Studies; 9 additional courses in history, which must include 2 courses in a comparative area; 4 supporting program courses (12 cr); and 24 thesis credits. The language requirement of reading knowledge in 2 foreign languages is required before admission to the preliminary oral examination. Some concentration areas may require additional foreign languages. In some cases, competence in quantitative methods may replace one of the foreign languages.

Courses used to satisfy M.A. requirements can be counted in these totals. After completion of the preliminary oral examinations, the student focuses on writing the Ph.D. thesis. Upon completion of the thesis, a final oral defense is scheduled.
Twin Cities Campus

Human Rights Minor
Institute for Global Studies
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 Avenue South, 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 2014
- 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 three core courses, each of which is 3 credits (LAW 6886 - International Human Rights Law, SOC 8090 Topics in Sociology: Cross-Disciplinary Approaches to Human Rights, and GLOS 5403/LAW 6058: Human Rights Advocacy), and one 200-hour internship (no coursework associated with the internship). Masters students must complete one additional elective course (3 cr), while doctoral and law students select at least two additional electives (totaling 6 cr) 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.

A master's minor in human rights requires 9 credits: two core courses, at least one elective course taken from a designated course list, and one six-week internship approved by the program director.

A law/doctoral minor requires 12 credits: two core courses, at least two elective courses, and one six-week internship approved by the program director.
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 S.E., 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 2014
- 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 Graduate School 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 Graduate School. 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 master's or doctoral degree granting program within the Graduate School. 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.

M.A. students must complete at least 6 graduate credits in approved courses or directed readings. Ph.D. students must complete at least 12 graduate credits in approved courses or directed readings. One of these may be a 4xxx course with the approval of the director of graduate studies; 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.
Twin Cities Campus
Linguistics M.A.
Institute of Linguistics
College of Liberal Arts

Contact Information:
Institute of Linguistics, 205 Elliott Hall, 75 East River Road, Minneapolis, MN 55455 (612-624-3331; fax: 612-624-4579)
Email: linq@umn.edu
Website: http://www.linguistics.umn.edu/grad/index.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

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
There are no specific prerequisites for admission. Students admitted normally have a broad undergraduate background that includes some linguistics courses.

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 but may be permitted in other semesters in exceptional cases.

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 not be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Plan A: Plan A requires 20 major credits, 10 MA thesis credits and 6 credits outside the major. The total number of credits is 36. An Oral Final Exam and an MA thesis are also required. Students have to demonstrate competence (the equivalent of two or more years of study) in one language other than their native language. The major courses include five courses covering core areas of language structure (phonology, syntax, semantics) and one course in field methods.

Plan B: Plan B requires 26 major credits, 6 credits outside the major. The total number of credits is 32. An Oral Final Exam and a Plan B paper are also required. Students have to demonstrate competence (the equivalent of two or more years of study) in one language other than their native language. The major courses include five courses covering core areas of language structure (phonology, syntax, semantics); one course in field methods; one research paper course; and one elective.

Use of 4xxx courses toward program requirements is permitted under certain conditions with the approval of the Director of Graduate Studies.
Twin Cities Campus
Linguistics Minor
Institute of Linguistics
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 2014
• Length of program in credits (Masters): 9 to 11
• Length of program in credits (Doctorate): 15 to 20
• 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.

Master's students who took LING 5001, 4002, and 5201 or 5302 (or equivalents) as undergraduates will select at least 9 graduate-level Linguistics credits (3 courses) in consultation with the director of graduate studies to meet the University's 9-credit minimum. Master's students with no previous Linguistics coursework must take LING 5001, 4002, and 5201 or 5302 to meet the program's minimum requirement, for a total of 10 to 11 credits.

Doctoral students who previously took LING 5001, 4002, and 5201 or 5302 (or equivalents) will select at least 15 Linguistics credits (5 courses) in consultation with the director of graduate studies to meet the program's minimum requirements. Doctoral students with no previous Linguistics coursework must take at least 6 courses, including LING 5001, 4002, and 5201 or 5302 (for 10-11 credits), plus 3 additional Linguistics courses (9 additional credits) to meet the program's minimum requirement, for a total of 19 to 20 total credits.
**Twin Cities Campus**

**Linguistics Ph.D.**

**Institute of Linguistics**

**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/](http://www.linguistics.umn.edu/grad/)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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**
Other requirements to be completed before admission:
There are no specific prerequisites for admission. Students admitted normally have a broad undergraduate background that includes some linguistics courses.

**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 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

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
19 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: Knowledge of two languages not native to student.

A minimum GPA of 3.00 is required for students to remain in good standing.

The Ph.D program requires 19 major credits, 24 thesis credits, and 12 credits outside the major. The total number of credits is 55. All Ph.D. students are expected to have completed M.A. course requirements (23 credits or less, depending on prior coursework in linguistics). The Ph.D major courses include advanced level courses covering core areas of language structure (phonology, syntax) (6 credits), a second semester course in field methods (4 credits), three 8xxx level Topics or Seminar courses (9 credits). Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

Upon completion of required coursework, students must pass a preliminary written exam. To pass the preliminary written exam, a student must complete (i) a paper judged to be of near publishable quality by the student's committee in the student's primary area of specialization; (ii) 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.

Language Requirement: Students must demonstrate competence (the equivalent of two or more years of study) in two languages.
Twin Cities Campus

Literacy and Rhetorical Studies Minor
Writing Studies
College of Liberal Arts

Link to a list of faculty for this program.

Contact Information:
Center for Writing, 10 Nicholson Hall, 216 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-626-7583; fax: 612-626-7580)
Email: writing@umn.edu
Website: http://www.writing.umn.edu/lrs/index.htm

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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, 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

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 minor requirements are listed under each individual sub-plan.

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 three graduate courses or seminars (9 credits minimum), one from each of the following categories: 1) literacy theory or practice, including pedagogy; 2) research methods and practices in one of the areas of the minor; and 3) a historical topic (e.g., history of the book), of rhetoric or of literacy. Students must also write a substantial paper that emerges from one of the three courses. In order to make the minor interdisciplinary, no more than one of the three courses at the Master's level may be from the student's home department.

Doctoral
A doctoral minor requires four graduate courses or seminars (12 credits minimum). Three courses must be in each of the categories enumerated above. The fourth course must be a capstone writing seminar specifically offered for the minor or a seminar that involves a substantial term paper or a completed dissertation chapter on a topic related to the minor. In order to make the minor interdisciplinary, no more than two of the four courses at the doctoral level may be from the student's home department. To complete the doctoral minor, students submit a capstone writing project emerging from their studies in literacy and/or rhetoric, such as a seminar paper or a completed dissertation chapter.
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:
Department of School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street S.E., 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 2014  
- 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 Ph.D. 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 application deadline is December 15.

The mass communication M.A. and Ph.D. programs offer a joint degree with the Law School. Applicants to either joint degree--either the M.A./J.D. or the Ph.D./J.D.--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  
  - General Test - Verbal 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: 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: 550

• IELTS
  - Total Score: 7
  - Listening Score: 7
  - Reading Score: 7
  - Writing Score: 7
  - Speaking 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

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 2.80 is required for students to remain in good standing.

At least 1 semester must be completed before filing a Degree Program Form.

A minimum of 25 course credits and 10 thesis credits are required. Coursework must include 13 credits in required core courses and 12 other credits (6 credits in other journalism and mass communication seminars or courses, and 6 credits in other departments). All coursework must be taken A-F.

Joint- or Dual-degree Coursework: M.A. in Mass Communication and J.D. 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:
Department of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-625-9824; fax: 612-625-9525).
Email: simcgrad@umn.edu
Website: http://sjmc.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 Ph.D. minor program consists of a minimum of 14 credits in a coherent disciplinary area.
**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:**
Department of School of Journalism and Communication, 111 Murphy Hall, 206 Church Street S.E., Minneapolis, MN  55455 (612-625-9824; fax: 612-625-9525)
Email: sjmcgrad@umn.edu
Website: [http://sjmc.umn.edu/grad](http://sjmc.umn.edu/grad)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Ph.D. 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 December 15.

The mass communication M.A. and Ph.D. programs offer a joint degree with the Law School. Applicants to either joint degree--either the M.A./J.D. or the Ph.D./J.D.--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**
  - 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: 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: 550
• IELTS
  - Total Score: 7
  - Listening Score: 7
  - Reading Score: 7
  - Writing Score: 7
  - Speaking 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
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 3.0 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 Ph.D. Degree Program Form must be graduate level (5xxx or 8xxx, or 4xxx with the approval of both adviser and director of graduate studies) and taken A-F.

Joint- or Dual-degree Coursework: JD/ Mass Communications PhD
Twin Cities Campus
Medieval Studies Minor
Center for Medieval Studies
College of Liberal Arts

Link to a list of faculty for this program.

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 2014
- 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 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 towards program requirements is not permitted.

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 DGS, 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.
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 Drive S.E., 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 2014
- 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 DGS 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 Ph.D. minor (minimum 15 credits) requires three core courses (9 credits): MIMS 8001 - Theories of the Moving Image (3 credits), MIMS 8003 - Historiography of the Moving Image (3 credits), and MIMS/SCMC 5002 - Advanced Film Analysis (3 credits). The Ph.D. minor also requires two electives (minimum 6 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 one additional 5xxx or 8xxx course (3 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 three core courses (9 credits): MIMS 8001 - Theories of the Moving Image (3 credits), MIMS 8003 - Historiography of the Moving Image (3 credits), and MIMS/SCMC 5002 - Advanced Film Analysis (3 credits).

Students are advised to check the program website indicated above for updated information.
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 2014
• 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).

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Information current as of September 19, 2014
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 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](http://www.music.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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 (M.A.) 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, 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 M.A. 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 M.A. 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.

**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. Please refer to the School of Music's website at http://www.music.umn.edu for other options.
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: mnmusic@umn.edu
Website: http://www.music.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 Street South, 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 2014
• 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.

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 towards program requirements is not permitted.

The minor in music studies for students in the Graduate School will consist of 12 credits as follows: four, three-credit-minimum courses in musicology/ethnomusicology or theory at the 8000-level, with the possible substitution of one or more of these courses at the 5000-level only with the approval of the student’s advisor and the Director of Graduate Studies in the School of Music. In the case of 5000-level substitutions, we strongly encourage the professor(s) of the course(s) in question, the graduate student, the graduate student’s advisor, and the School of Music DGS to communicate in advance of course registration, so as to ensure that the course will in fact count towards the minor.

Graduate students seeking to enroll in a 5000- or 8000-level School of Music course requiring prior coursework or its equivalent in background knowledge will need to have completed all course prerequisites or secured instructor approval in order to register for that course.
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 2014
- 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**  
**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](http://www.philosophy.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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 Ph.D. program, while admission to the M.A. 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 adviser, 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 M.A. 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](http://www.philosophy.umn.edu). All application materials may be uploaded to Apply Yourself. 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 MacArthur Fellowships should include a statement expressing their interest. Students interested in the MacArthur Fellowship should also contact the MacArthur Program, through 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

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Information current as of September 19, 2014
- 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: M.A., 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 courses requires program approval.
Twin Cities Campus
Philosophy Minor

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 2014
- 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.

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. For graduate-level credit, use of 4xxx courses requires program approval.
Twin Cities Campus
Philosophy Ph.D.
Philosophy
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 2014
- 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 Ph.D. and M.A. degrees. Students are primarily admitted to the Ph.D. program, while admission to the M.A. is intended for those with professional goals in other fields and disciplines. The stand-alone M.A. program is not considered a laddering program into the Ph.D. program at the University of Minnesota or any other institution. Students admitted to the Ph.D. program usually choose to complete an M.A. Plan B en route to the Ph.D. 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 adviser, 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. Ph.D. students take courses in four main areas: history of philosophy, logic, ELMS (epistemology, philosophy of language, metaphysics, philosophy of science), and value theory. These areas provide a firm foundation for research and teaching beyond the Ph.D. 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 to Apply Yourself. Department materials required include a completed application form, personal statement, transcripts, scores from the GRE general test, three academic letters of recommendation, and a philosophical writing sample that does not exceed 25 pages. Students interested in DOVE or MacArthur Fellowships should include a statement expressing their interest. Students interested in the MacArthur Fellowship should also contact the MacArthur Program, through 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.

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. Use of 4xxx courses toward program requirements requires program permission.
Twin Cities Campus
Political Psychology Minor
School of Journalism & Mass Communication, Political Science, 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 2014
- Length of program in credits (Doctorate): 22
- 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.

Applicants to the minor must be enrolled in a University doctoral program and be in good academic standing. Admission is limited only by permission of the director of graduate studies (DGS) in political psychology. To receive a minor in political psychology, a student must satisfy the following five requirements:

1) Enrollment in and completion of a minimum of two semesters of the political psychology proseminar (POL 8307/8308 or PSY 8211/8212). Students are encouraged to participate in the seminar beyond this requirement.
2) Completion of the Political Science Department's graduate class on Political Psychology (POL 8311).
3) Completion of the Psychology Department's graduate class on Social Cognition (PSY 8201).
4) Completion of two or more methodology courses. Examples include EPSY 5621, 5262; POL 8106, 8123; PSY 8814, 8815; STAT 5021, 5302. Courses from political science or other departments may be acceptable; students should consult with the DGS prior to enrolling in a course to confirm it satisfied this requirement. (Note that it is acceptable to use these courses to fulfill other requirements in one's degree program, if allowed by the student's department.)
5) Completion of two or more elective courses (equal to 6 credits) in a department other than one's own. The classes may be from the same department (e.g. two electives from the mass communication department for a psychology student).

Course Group 0
Contact the DGS for a list of previously approved elective courses.
** Students with sufficient background and previous courses experience equivalent to one or more courses within the curriculum may apply for a waiver of the appropriate requirements and replace waived courses with additional electives to meet the 6-credit minimum.
Twin Cities Campus
Political Science M.A.
Political Science
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 2014
- 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 political science program only admits students into the Ph.D. program. However, students admitted to the Ph.D. 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 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.

The M.A. degree, Plan B (without thesis), requires 34 credits, distributed between major courses and minor or related field courses; three research papers, usually written in connection with coursework, are also required.
Twin Cities Campus
Political Science Ph.D.
Political Science
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: phelp@umn.edu
Website: [http://www.polisci.umn.edu](http://www.polisci.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 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 online application (Apply Yourself): The following should be sent directly to the department: unofficial transcripts; applicant statement department application form; GRE scores; a complete set of transcripts in addition to that required by the University; a brief statement expressing the applicant's indicating purpose and goals in pursuing graduate work and outlining research interests; GRE scores; TOEFL or IELTS scores for international students; three letters of recommendation from professors who know the applicant's academic work, particularly in political science; department form; writing sample(s) of the applicant's written work (preferably papers written for political science courses preferred); and a curriculum vitae. If you believe you qualify for the DOVE (Diversity of Views and Experiences) Fellowship or one of the ICGC (Interdisciplinary Center for Global Change) Fellowships and would like to be considered for nomination, submit a statement explaining your candidacy. Send photocopies of written work; the department cannot guarantee that materials will be returned. Graduate study in the Ph.D. program begins in fall semester; the application deadline is December 15.

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.

Language Requirement: Varies. See research methodologies requirement

A minimum GPA of 3.00 is required for students to remain in good standing.
Research methodology requirement - Students 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.
**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 Avenue South, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: popstudies@pop.umn.edu
Website: http://www.pop.umn.edu/training/population-minor

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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.

The minor in population studies is available to master's and doctoral students. Both a master's and doctoral minor require the core course, PA 5301 - Population Methods and Issues for the United States and Third World or SOC 5090 - World Population Issues. In addition to the core course, master's students take at least three credits and doctoral students take at least 9 credits from the list of approved courses at www.pop.umn.edu/training/population-minor/curriculum. All courses should be from the same subject area and may not be in the student's major field. A total of 6 credits at the master's level and 12 credits at the doctoral level is required for the minor. Students must register for all courses A-F; courses taken on a pass/fail basis may not count toward the minor (with the exception of PUBH 5628, which is currently offered only S-N).
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 2014
• 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 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.

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 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 written and oral. A capstone project is required.

Capstone Project: Plan B requires one to three review papers in lieu of a thesis, and a minimum of 30 course credits, of which 14 credits must be in psychology and 6 credits in one or more related fields.

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.

If the student and adviser elect to satisfy the requirements for the master's degree, each student's program is planned in consultation with an adviser. Plan A requires a minimum of 14 credits in psychology and 6 credits in a minor/related field, a minimum of 10 thesis credits, and a research thesis. Plan B requires one to three review papers in lieu of a thesis, and a minimum of 30 course credits, of which 14 credits must be in psychology and 6 credits in one or more related fields. For Plan A, the final exam is oral.

**Program Sub-plans**

A sub-plan is not required for this program.

Students may not complete the program with more than one sub-plan.

Counsel
Twin Cities Campus

Psychology Minor
Communication Studies, Political Science, 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 2014
- 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 have Psychology Director of Graduate Studies approval for a 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.

The doctoral minor requires 12 credits.
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 2014
- 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

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 2014
- 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/

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 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 section of the catalog website.

Program Requirements
Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

The minor requires 9 credits for a master's and a 12 credits for a doctoral minor. All students enrolled in the minor take RELS 5001 - Theory and Method in the Study of Religion, and the remaining courses in consultation with the director of graduate studies. For appropriate courses, see www.religiousstudies.umn.edu/courses.
Twin Cities Campus
Rhetoric, Scientific and Technical Communication M.A.
Writing Studies
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, S.E., Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 39
- 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 M.A. 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. Those are complemented with other courses so that you develop expertise in a specialty area as well as a related field of courses outside the department. 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 M.A. applicants must meet the admission requirements of the University. M.A. 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 September 19, 2014
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 33 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.

Plan B requires 33 major credits including 6 credits outside the major and a 3-credit Independent Study (WRIT 8794) to be taken to develop the Plan B research paper. The final exam is oral. Use of 4xxx level courses toward program requirements is permitted under certain conditions with adviser approval.
Twin Cities Campus
Rhetoric, Scientific and Technical Communication Minor
Writing Studies
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, S.E., Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 and 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 Ph.D. 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.
Twin Cities Campus

Rhetoric, Scientific and Technical Communication Ph.D.

Writing Studies
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, S.E., Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• 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.

Applicants for the Ph.D. must have a master's degree either completed, or in progress with plans to complete it before the start of the Ph.D. program. As part of their application, graduate students are asked to discuss their interests and explain their master's program and how the Ph.D. will build upon it.

The primary purpose of the Ph.D. program is to prepare graduate students to do research in areas related writing, broadly construed, and to publish the results of that research.

Working in collaboration with faculty mentors, other students, and material 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 of graduate students have entered college teaching, a few have preferred to work in industry in scientific and technical communication.

Graduate student faculty advisers help graduate students with all parts of the degree, by articulating a coherent plan of coursework, leading a preliminary examination committee, and guiding them in developing a dissertation project.

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.

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
  - 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.
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.

Ph.D. students in rhetoric and scientific and technical communication are required to earn a minimum of 42 credits in seminars and courses. The requirement includes a research core, five courses in three core areas, and at least three in a specialty area (a concentration). The first is two courses in research methods in writing studies and technical communication (WRIT 8011 and 8012, 6 cr). Students take one Writing Studies course or seminar in each of the core areas: rhetoric theory and history, writing studies and pedagogy, and technical communication and technology and culture, as well as two others from any of the three (15 cr).

Examples of specialty areas include digital literacies, internet studies, professional and technical communication, theories of writing, writing pedagogies, rhetorics of science, medicine, or law, and rhetorical theory (9 cr). Elective courses or a formal doctoral minor from another program are needed in order to fulfill the supporting field requirement. The written preliminary examination covers three areas: one in rhetoric, one of the other core areas, and the specialty. The first two are based partly on fixed reading lists and coursework in the areas. The preliminary oral examination is built around the written examinations. Twenty-four thesis credits are also required.
**Twin Cities Campus**

**Scientific and Technical Communication M.S.**

*Writing Studies*

*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 S.E., Minneapolis, MN 55455 (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.S. 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 30 major credits and up to null credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** WRIT 8505 - Design Project. Also known as a capstone course, this is the final course necessary to complete the degree requirements. It is usually offered in the summer. The course is primarily for students seeking the M.S. 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.
Scientific and Technical Communication Minor

Writing Studies

College of Liberal Arts

Contact Information:
Department of Writing Studies, 215 Nolte Center, 315 Pillsbury Drive S.E., Minneapolis, MN 55455; (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 graduate programs. By taking 6 credits (for a masters minor) students can benefit from Writing Studies courses and seminars in the areas of our primary focus: rhetorical theory and history, technical communication, technology and culture, digital and new media studies, and writing pedagogy.

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 master's degree students, the minor requires 6 credits in 5xxx and 8xxx WRIT courses.
Twin Cities Campus
Sociology M.A.
Sociology
College of Liberal Arts

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://www.soc.umn.edu/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 never admitted to the sociology graduate program solely to pursue the M.A.; the M.A. is only an optional degree for students already enrolled in the doctoral program. 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 nine areas of specialization:
- Crime, Punishment, and Social Control
- Demography and Population Studies
- Inequalities and Identities
- Law, Rights, and Change
- The Life Course: Family, Education, Work, and Well-being
- Global, Transnational, and Comparative Sociology
- Organizations, Networks, and Markets
- Politics, Knowledge, and Cultures
- Sociology of the Environment and Food Systems

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:
Note: Students are never admitted to the sociology graduate program solely to pursue the M.A.; the M.A. is only an optional degree for students already enrolled in the doctoral program. 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 nine areas of specialization:
- Crime, Punishment, and Social Control
- Demography and Population Studies
- Inequalities and Identities
- Law, Rights, and Change
- The Life Course: Family, Education, Work, and Well-being
- Global, Transnational, and Comparative Sociology
- Organizations, Networks, and Markets
- Politics, Knowledge, and Cultures
- Sociology of the Environment and Food Systems

Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research.

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 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 3.00 is required for students to remain in good standing.

Students are never admitted to the sociology graduate program solely to pursue the M.A.; the M.A. is only an optional degree for students already enrolled in the doctoral program. Plan A students must complete an approved program of coursework consisting of a minimum of 14 credits in the major and a minimum of 6 credits outside the major. Students must also register for 10 thesis credits.

Plan B students must complete an approved program of coursework consisting of 14 major field credits (including 10 sociology designated credits), six non-sociology credits and 10 credits to be determined by the student in consultation with their adviser for a total of 30 credits.
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 Avenue South, Minneapolis, MN 55455 (612-624-4300; fax: 612-624-7020)
Email: soc@umn.edu
Website: http://www.soc.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 in nine areas of specialization: Crime, Punishment, and Social Control; Demography and Population Studies; Inequalities and Identities; Law, Rights, and Change; The Life Course: Family, Education, Work, and Well-being; Global, Transnational, and Comparative Sociology; Organizations, Networks, and Markets; Politics, Knowledge, and Cultures; Sociology of the Environment and Food Systems; 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.

A doctoral minor requires four courses in sociology (12 credits) at the 8xxx level in Sociology. A master's minor consists of 6 credits in sociology. Course choices are subject to the approval of the director of graduate studies.
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://www.soc.umn.edu/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 nine areas of specialization: Crime and Punishment, and Social Control; Demography and Population Studies; Inequalities and Identities; Law, Rights, and Change; The Life Course: Family, Education, Work and Well-being; Global, Transnational, and Comparative Sociology; Organizations, Networks, and Markets; Politics, Knowledge, and Cultures; Sociology of the Environment and Food Systems. Methodological training is available in historical and comparative research, survey research, network analysis, advanced statistical analysis, and qualitative research. Training for students interested in either academic or applied employment is generally available. 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 3.00.

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 M.A. 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 for admittance 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: 95
  - Internet Based - Writing Score: 24
  - Internet Based - Reading Score: 22
Internet Based - Speaking Score: 27
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
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.

Students are required to take 14 credits of core courses, 12 additional credits of coursework in Sociology, 12 credits outside of Sociology as a minor or supporting program, 3 credits of training in advanced methods, and 24 thesis credits. A reading list is prepared which defines the scope of the Preliminary Written and Oral Examination. The preliminary exam also covers all coursework in the major field and may include any work fundamental to the field. After passing the Written and Oral exams, a Dissertation Prospectus hearing is then held with the committee in order for the student to explain and elaborate the dissertation problem, sources of data and methods to be used. Students who enter the program with an M.A. in sociology must earn a minimum of 18 credits in the department regardless of the number of courses the department approves eligible for transfer credit from other institutions.
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 S.E., 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 2014
- Length of program in credits: 54 to 64
- 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.

Emphasis in the master's program is speech-language pathology focusing on meeting the standards for certification as a speech-language pathologist by the American Speech-Language-Hearing Association. 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.

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 mathematics.

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 47 major credits, 3 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 48 major credits and 6 credits outside the major. The final exam is written and oral.

**Plan C:** Plan C requires 51 major credits and 3 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 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 may choose to complete the MA without a track (54 credits; Plan B option, a comprehensive written examination including an oral examination); with an Audiology track (54 credits; Plan B option, a comprehensive final written examination including final oral examination), or with a Speech-Language Pathology track (60 credits; Plan A, a thesis including a final oral examination; or 54 credits; Plan C option, a comprehensive final written examination).

**Program Sub-plans**

A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**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 54 credits, and a Plan B comprehensive written exam and a final oral examination.

**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.

Sub-plan includes an average of 54 credits. Credits include clinical education in speech-language-pathology. Students in this sub-plan may elect a Plan A thesis or a Plan C option.
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 S.E., 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 2014
- Length of program in credits (Masters): 12
- 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.

Emphasis in the graduate program is speech-language pathology and audiology.

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
Special Application Requirements:
All minor coursework must be approved by the director of graduate studies in Speech-Language-Hearing 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 toward program requirements is permitted under certain conditions with adviser approval.

A minimum of 12 credits, approved by the director of graduate studies, is required for a master's minor. A minimum of 15 credits, approved by the director of graduate studies, is required for a doctoral minor.
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 Drive S.E., 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 2014
- 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 Ph.D. 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 Ph.D. 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 adviser 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.
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 Ph.D. 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 adviser 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 adviser.
Twin Cities Campus
Statistics M.S.
Statistics, School of-ADM
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 S.E., 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 2014
- 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 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 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 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.

The program prepares students for jobs in industry and the public sector and also for study at the doctoral level.
During the first year, students take a two-semester theory sequence (STAT 8101-8102) and a two-semester methods sequence (STAT 8051-8052). In addition, they usually take two supporting field courses (at least 6 cr) from other departments.

During the second year, students take two courses (at least 6 cr) of approved 5xxx or 8xxx statistics courses; some of this requirement can be satisfied by taking approved courses with heavy statistical content from other departments. Students also take a 3 credit statistical consulting course (STAT 8801), a 3 credit statistical computing course (STAT 5701) and complete their Plan B project. A total of at least 34 course credits is required.
Twin Cities Campus
Statistics Minor
Statistics, School of ADM
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 S.E., 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 2014
• 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.

A master's minor requires at least 9 credits of 5xxx or 8xxx statistics courses. STAT 4101-4102 may be used to satisfy this requirement.
A doctoral minor requires a theory sequence (STAT 4101-4102 or STAT 5101-5102) and familiarity with various statistical methods. Typical programs include 14 to 18 credits of graduate-level statistical courses. Note: STAT 4101 and 4102 are available to graduate students from other programs, but not to statistics majors.
Twin Cities Campus
Statistics Ph.D.
Statistics, School of ADM
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 S.E., 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 2014
- Length of program in credits: 73
- 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
37 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.

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 Ph.D. program core courses cover statistical theory (STAT 8111, and 8112; 6 cr), statistical methods (STAT 8051, 8052, 8053, and 8054; 12 cr), and statistical consulting (STAT 8811; 3 cr). In addition to this core, students take 12 credits outside of statistics in a supporting program, 12 credits of 8xxx statistics electives, 4 credits of literature seminar, and 24 thesis credits. Courses with heavy statistical content from other departments and some 5xxx statistics courses may be used as electives, and students are strongly encouraged to include MATH 8651-8652 - Theory of Probability Including Measure Theory in the supporting program. Students entering with a master's degree or other advanced training are not required to duplicate previous coursework. The Ph.D. written examination is given at the end of the first year of study and covers theory and methods. For more complete information, consult the School of Statistics Graduate Student Handbook or https://www.stat.umn.edu/grad/phd.html.
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:
School of Journalism and Mass Communication, 111 Murphy Hall, 206 Church Street S.E., Minneapolis, MN 55455 (612-625-4054; fax: 612-626-8251)
Email: smcgrad@umn.edu
Website: http://sjmc.umn.edu/grad/

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.A. 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, 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 M.A. 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, market research, 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 M.A. in strategic communication requires 33 credits to be completed within 24 calendar months. All students must take the same 18 course credits in communication, and complete the 6-credit individual project. In addition, 9 credits of graduate-level elective studies (at least 6 outside the School of Journalism and Mass Communication) must be completed.

Students must maintain a GPA of at least 3.00 and achieve a grade of B or better on their final 6-credit project. 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 unexpectedly must temporarily leave the program 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.
Twin Cities Campus
Studies in Africa and African Diaspora Minor
Afr American/African Studies
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 Avenue South, 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 2014
- 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.

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Information current as of September 19, 2014
Twin Cities Campus
Studies of Science and Technology Minor
Philosophy
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 Avenue South, 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 2014
- 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, Studies of Science and Technology.

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 7 graduate credits; the doctoral minor requires 12 graduate credits. Both minors must include HSCI 8112 or HMED 8112; one of either PHIL 8601, 8602, or 8605; and SST 8000 - Colloquium (one semester for master's, two for doctoral students). Doctoral students must also take one of the SST seminars (SST 8100, 8200, 8300, 8400, or 8420) in an area primarily outside the student's major.
Twin Cities Campus

Technical Communication Postbaccalaureate Certificate

Writing Studies
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 S.E., Minneapolis, MN 55455; (612-624-3445; fax: 612-624-3617)
Email: WRIT@umn.edu
Website: http://www.writingstudies.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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.

In collaboration with your academic adviser, you will create a program that matches the knowledge and skills you value to the experience required by industry. Certificate students may choose five courses from these Writing Studies options, with a maximum of two at the 4xxx level:

WRIT 4431  Intersections of Scientific & Technical Communication and Law
WRIT 4501  Usability and Human Factors in Technical Communication
WRIT 4562  International Professional Communication
WRIT 4573W Writing Proposals and Grant Management
WRIT 4662W Writing with Digital Technologies
WRIT 4664W Science Writing for Popular Audiences
WRIT 5001  Introduction to Graduate Studies in Scientific & Technical Communication
WRIT 5112  Information Design: Theory & Practice
WRIT 5270  Writing for Publication
WRIT 5561  Editing and Style for Technical Communicators
WRIT 5671  Visual Rhetoric

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. Several courses require students to engage in projects for clients that in the past have included such organizations as ISEEK (Minnesota Internet System for Education and Employment Knowledge), the YWCA, Hennepin County Libraries, the American Community Gardening Association, and the U.S. Forest Service North Central Research Station.

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**

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 students may take up to 2 courses at the 4xxx level.
Twin Cities Campus
Theatre Arts M.A.
Theatre Arts & Dance
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 2014
- 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 M.A. degree emphasizes academic pursuits and is considered a prerequisite for the Ph.D. The areas of study for the M.A. are devised in collaboration with a faculty adviser, and demand original and challenging research in the fields of theatre historiography or performance criticism.
Twin Cities Campus
Theatre Arts M.F.A.
Theatre Arts & Dance
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 2014
- Length of program in credits: 66
- 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 M.F.A. 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 60 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 M.F.A. 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 M.F.A. degree is considered a terminal degree in these areas of theatre arts.

The M.F.A. requires 66 graduate credits. The degree requires 6 credits of dramatic literature or theatre history, which may be fulfilled by TH 4177 and 4178; and a minimum of 6 credits from outside the department (at least 3 credits of which must be a University course that contributes substantially to the degree program). Each program requires a final performance practicum and written record of it. For specific program requirements, contact the director of graduate studies.
Twin Cities Campus

Theatre Arts Minor
Theatre Arts & Dance
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: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

A master's minor requires a minimum of 9 credits as approved by the director of graduate studies. A doctoral minor requires a minimum of 12 credits as approved by the director of graduate studies.
Twin Cities Campus
Theatre Arts Ph.D.
Theatre Arts & Dance
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: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

The M.A./Ph.D. core curriculum includes three categories of 8xxx courses. Students are required to take a minimum of two courses each from category A and category B, and both courses in category C.

A: Signature Seminars
Each member of the M.A./Ph.D. 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.

B: Field Seminars
Each member of the M.A./Ph.D. 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.

C: Pedagogy and 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.).

Historiography Seminar
This seminar is taught every second year (3 cr). It focuses on the contested nature of historical (theatre/performance) knowledge, and introduces students to 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.
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 2014
- 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 M.S. and Ph.D. 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 B.S. degree in an engineering, basic science, or mathematics program is required. 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.

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.
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.

At least 2 semesters must be completed before filing a Degree Program Form.

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 M.S. in Aerospace Engineering and Mechanics requires 30 credits and is offered under three plans. Plan A (thesis) requires 14 major credits, 6 credits outside the major, and 10 thesis credits. Plan B (project) and Plan C (coursework) require a minimum of 14 major credits and a minimum of 6 credits outside the major. The Plan B option requires completion of the 3-credit project course, AEM 8880. The remaining course credits may be taken in the major field or any supporting field.

For all plans, at least 12 of the major field credits must be at the 5xxx or 8xxx level. Degree plans must include at least one sequence of 5xxx or 8xxx courses in aerospace engineering and mechanics, and no more than 8 credits of 4xxx courses. If seminar credits are used to meet the 30-credit requirement, they must be in 1-credit modules and AEM 8000 may only be used once.
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@aem.umn.edu
Website: http://www.aem.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 M.S. and Ph.D. 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 B.S. 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.

Minor Requirements for Ph.D. Degree Students Majoring in Other Fields: At least 12 credits in aerospace engineering and mechanics are required, including at least one sequence of two 5xxx or 8xxx courses.

Minor Requirements for Master's Degree Students Majoring in Other Fields: At least 6 credits in aerospace engineering and mechanics are required, including one sequence of two 5xxx or 8xxx courses.

The two-course sequence must be in one of the following research areas: 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.
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 2014
- 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 Ph.D. degree in aerospace engineering and mechanics. The Ph.D. 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 B.S. 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.

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.

At least 2 semesters must be completed before filing a Degree Program Form.

The Ph.D. 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 Ph.D. requires about two years of coursework, but the heart of the program is the student's thesis research. The program must include a minimum of 42 credits of approved courses and four semesters of colloquium attendance. Of the 42 credits, 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. The remaining 18 course credits may be taken in the major or in any supporting field. Degree plans must include at least one sequence of 5xxx or 8xxx level courses in aerospace engineering and mechanics. No more than 8 credits of 4xxx level courses and no more than 13 credits taken as S/N are allowed. If seminar credits are used to meet the 42-credit requirement, they must be in 1-credit modules and AEM 8000 may only be used once.

The first year of the Ph.D. program is similar to the master's program and most Ph.D. 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 Ph.D. within five years after the bachelor's degree.
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, 356 Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax: 612-626-2029)
Email: grad-rec@astro.umn.edu
Website: http://www.astro.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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
For major work, 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 for financial aid are due January 10. Students are admitted 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
    - 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 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, including one semester of classical physics (PHYS 5011-5012). Plan A (thesis) requires 14 credits in astrophysics, 6 credits outside the major, and 10 thesis credits. Plan B (project) requires a minimum of 14 credits in astrophysics, and a minimum of 6 credits outside the major. 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. Completion of the degree normally takes two years.
**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  
Main Office: 356 Physics (612-624-4811; fax: 612-626-2029)  
Email: grad-reg@astro.umn.edu  
Website: [http://www.astro.umn.edu](http://www.astro.umn.edu)

- Program Type: Graduate minor related to major  
- Requirements for this program are current for Fall 2014  
- 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**

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
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, 356 Physics, 116 Church Street S.E., Minneapolis, MN 55455 (612-624-4811; fax: 612-626-2029)
Email: grad-reg@astro.umn.edu
Website: http://www.astro.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• 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
For major work, 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 for financial aid are due January 10. Students are admitted 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
  - 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.

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Information current as of January 21, 2015
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 Ph.D. degree requires a minimum of 40 course credits, including a year of classical physics (PHYS 5011-5012) and 12 credits in a minor or supporting program; 24 thesis credits are also required. The graduate written examination, held during spring term, 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. Ordinarily these two oral exams are combined.
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: bmengp@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

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)
- 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.

Other requirements to be completed before admission:
A baccalaureate degree in engineering or in a physical or biological science is required. Successful applicants without an engineering degree are required to complete appropriate coursework (including linear algebra and differential equations) before being admitted as a candidate for the degree. In most cases, this coursework is not considered part of the degree program.

All application materials must be submitted online through the ApplyYourself application system. See http://bme.umn.edu/grad/appinfo.html for detailed instructions.

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 - Speaking Score: 23
  - 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 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 31 major credits and 0 to 21 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 adviser. Students must submit a written report of approximately 10 double-spaced pages per credit to the adviser, who will assign a letter grade for BMEn 8820 based on the report. The report must then be defended before the student's 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 2.80 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. program requires courses in mathematics, biology, biomedical engineering, and relevant areas of science and engineering.

Plan A (with thesis) requires a minimum of 8 credits of BME courses, including 6 in BME core courses and 2 seminar credits, plus 10 thesis credits. The remaining 12 credits are taken from the list of approved electives, either in the major field or any supporting field.

The Plan B (with project) requires a minimum of 10 credits of BME courses, including 6 in BME core courses, 2 seminar credits, and at least 2 Plan B project credits. The remaining 21 credits are taken from the list of approved electives, either in the major field or any supporting field.

BMEn Core
Take at least 6 credits of BMEn Core courses at the 5xxx-level (http://bme.umn.edu/grad/courses/core-5000.html) and/or 8xxx-level (http://bme.umn.edu/grad/courses/core-8000.html). BMEn courses not listed on those pages do NOT satisfy the Core requirement.

BME Seminar
Take at least 2 credits of the BME Graduate Seminar. Other department/program seminars CANNOT be substituted for this requirement.

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
Take at least 6 credits of Biology Electives. Approved courses for this requirement are listed at http://bme.umn.edu/grad/courses/bio.html. Additional courses may be approved by the Director of Graduate Studies.

Technical Electives
Plan A students must take at least 6 credits of Technical Electives, including at least 3 credits that are Math- or Statistics-Intensive. Plan B students must take at least 9 credits of Technical Electives, including at least 3 credits that are Math- or Statistics-Intensive. Approved courses for these requirements are listed at http://bme.umn.edu/grad/courses/tech.html and http://bme.umn.edu/grad/courses/math.html. Additional courses may be approved by the Director of Graduate Studies.

Free Electives (Plan B only)
Plan B students must take at least 6 credits. Free Electives are graduate-level courses in a field of science or engineering. See http://bme.umn.edu/grad/courses/free.html. Plan A students are not required to take any Free Elective credits.
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: bmengp@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

The master's minor requires at least 6 course credits, including one BME core course and one additional BME course.

The doctoral minor requires at least 12 credits, including two BME core courses, one course with a biological sciences emphasis, and one course with an engineering emphasis.

All courses for the graduate minor must be at 5xxx level or higher.

A list of core courses and approved electives is available at http://bme.umn.edu/grad/courses/index.html
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: bmengp@umn.edu
Website: http://bme.umn.edu/grad

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 54
- 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.

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.

Other requirements to be completed before admission:
A baccalaureate degree in engineering or in a physical or biological science is required. Successful applicants without an engineering degree are required to complete appropriate coursework (including linear algebra and differential equations) before being admitted as a candidate for the degree. In most cases, this coursework is not considered part of the degree program.

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 - Speaking Score: 23
  - 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
9 to 30 credits are required in the major.
0 to 21 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 Ph.D. program requires coursework in mathematics, biology, biomedical engineering, and relevant areas of science and engineering, a written preliminary exam, an oral preliminary exam, a dissertation, and a final oral exam.

A minimum of 9 credits of BME courses are required, including 6 in BME core courses and 3 seminar credits. The remaining 21 credits are taken from the list of approved electives, either in the major or in any supporting field.

**BME 8xxx Core**
Take at least 6 credits of BME Core courses at the 8xxx-level (http://bme.umn.edu/grad/courses/core-8000.html). BME courses not listed on that page do NOT satisfy the 8xxx Core requirement.

**BME Seminar**
Take at least 3 credits of the BME Graduate Seminar. 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:
- **BME 8601** - Biomedical Engineering Seminar (1.0 cr)
- **BME 8602** - Biomedical Engineering Seminar (1.0 cr)

**Biology Electives**
Take at least 6 credits of Biology Electives. Approved courses for this requirement are listed at http://bme.umn.edu/grad/courses/bio.html. Additional courses may be approved by the Director of Graduate Studies.

**Technical Electives**
Take at least 9 credits of Technical Electives, including at least 6 credits that are Math- or Statistics-Intensive. Approved courses for these requirements are listed at http://bme.umn.edu/grad/courses/tech.html and http://bme.umn.edu/grad/courses/math.html. Additional courses may be approved by the Director of Graduate Studies.

**Free Electives**
Take at least 6 credits of Free Electives. Free Electives are graduate-level courses in a field of science or engineering. See http://bme.umn.edu/grad/courses/free.html. Up to three credits of coursework relevant to science and technology (e.g., public policy, ethical/historical aspects, etc.) may be counted toward this requirement with prior approval from the Director of Graduate Studies.
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 Amundson Hall, 421 Washington Avenue S.E., 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 2014
- 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 Ph.D. 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 Ph.D.

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 (M.Ch.E.) 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.

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
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.

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.

All master's students must complete at least four core courses chosen from CHEN 8101, 8201, 8301, 8401, 8402, and 8501. In addition, master's students must complete a total of 30 credits, including 14 from the major program (this includes the four required courses), 6 from the minor or related program, and 10 thesis credits (for the M.Ch.E., thesis credits are used for the design project). Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 2.80.

In addition to the coursework, M.Ch.E. students are required to complete a design project. The work-related M.Ch.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.
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 Avenue S.E., Minneapolis, MN 55455 (612-625-0382; fax: 612-626-7246)
Email: cemsgrad@umn.edu
Website: http://www.cems.umn.edu

- Program Type: Master's
- 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 M.S.Ch.E. (Plan A or C) and the M.Ch.E. degree, also known as the professional master's. The M.S.Ch.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 Ph.D. Working professionals who are interested in obtaining a master's degree part time should follow the requirements for the M.Ch.E. degree, which requires a design project, or the M.S.Ch.E. 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.

Special Application Requirements:
Note: With the exception of the professional master's degree (the M.Ch.E.) and the M.S.Ch.E. Plan C, the CEMS Department focuses on the Ph.D. and does not generally admit students directly to the M.S.Ch.E. Plan 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: 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 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan C**: Plan C requires 18 major credits and 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 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 M.S.Ch.E. is offered under Plan A (with thesis) or Plan C (coursework only); both require 30 credits.

All master's students must complete four core courses, chosen from CHEN 8101, 8201, 8301, 8401, 8402, and 8501. Plan A master's students complete 14 credits from the major program (this includes the 4 required courses), 6 from the minor or related program and 10 thesis credits. Plan C master's students complete 18 credits from the major program (this includes the 4 required courses) and 12 credits in one or more related fields.

Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 2.80.
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 Avenue S.E., 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 2014
- 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, contact and fracture properties of materials, electron microscopy, thin films and interfaces, composites, electron microscopes, chemical 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.

For a minor in chemical engineering, students must successfully complete at least two (for a master’s) or four (for a Ph.D.) of the core graduate courses in the minor program and obtain approval by the director of graduate studies. Core courses in chemical engineering are: CHEN 8101, 8201, 8301, 8401, 8402, and 8501.

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Information current as of January 21, 2015
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 and Engineering, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue S.E., 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 2014
- 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. Submission of all application materials by January 1 is strongly encouraged to ensure priority consideration for fellowships and assistantships; late applications are considered if space is available.

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.

At least 3 semesters must be completed before filing a Degree Program Form.

All Ph.D. students must complete at least four core courses chosen from CHEN 8101, 8201, 8301, 8401, 8402, and 8501. In addition, Ph.D. students must complete a total of 57 credits, including 21 from the major program (this includes the four required courses), 12 from the minor or related program, and 24 thesis credits. Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 3.00.
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, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: [http://www.chem.umn.edu/chemphys](http://www.chem.umn.edu/chemphys)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 areas where the techniques of chemistry and physics are brought together 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
The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in chemistry, physics or a related field is required for admission.

Other requirements to be completed before admission:
Prospective graduate students should have adequate undergraduate preparation in chemistry, physics, and mathematics.

All applicants must submit scores from the General GRE and Subject GRE (any science or engineering subject).

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: 20
  - Internet Based - Speaking Score: 25
  - 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 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 2.8 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The M.S. degree offered under Plan A (with thesis) requires at least 20 course credits and 10 thesis credits. The M.S. Plan B degree requires 30 course credits, which would include 8 credits for the two Plan B project courses. The course credits must include at least 6 credits each in chemistry and physics or at least 3 credits each in quantum mechanics, thermodynamics, and statistical mechanics.
Contact Information:
Chemical Physics Program, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://www.chem.umn.edu/chemphys

Program Type: Graduate minor related to major
Requirements for this program are current for Fall 2014
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 areas where the techniques of chemistry and physics are brought together 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
Other requirements to be completed before admission:
Good standing in related major graduate program and completion of at least 6 credits suitable for 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.

Minor Requirements for Students Majoring in Other Fields: Minor requirements are determined by the director of graduate studies, the student, and the adviser.
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, Department of Chemistry, University of Minnesota, 137 Smith Hall, 207 Pleasant Street S.E., Minneapolis, MN 55455 (612-626-7444; fax: 612-626-7541)
Email: chmapply@umn.edu
Website: http://www.chem.umn.edu/chemphys

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 areas where the techniques of chemistry and physics are brought together 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
The preferred undergraduate GPA for admittance to the program is 3.00.

An undergraduate degree in chemistry, physics, or a related field is required for admission.

Other requirements to be completed before admission:
Prospective graduate students should have adequate undergraduate preparation in chemistry, physics and mathematics.

All applicants must submit scores from the General GRE and Subject GRE (any science or engineering subject).

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: 20
  - Internet Based - Speaking Score: 25
  - 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
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.

Each first-year chemical physics student will choose a program of study in consultation with his or her TMC (three-member committee). Ordinarily, course programs for Ph.D. students will include at least 24 graduate credits (5xxx or 8xxx), which 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.
Twin Cities Campus  
Chemistry M.S.  
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 Street S.E., 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 2014  
- 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

The preferred undergraduate GPA for admittance to the program is 3.20.

An undergraduate degree in chemistry or a related field is required for admission.

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 are required for all applications. Scores from General (Aptitude) and Subject (Advanced) Tests of the GRE are required for all applicants. International applicants are expected to provide scores of at least 550 (paper), 213 (computer), or 85 (Internet) on the TOEFL, as well as GRE scores.

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: 21  
  - Internet Based - Reading Score: 19  
  - Internet Based - Speaking Score: 23  
  - 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 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 DGS. 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 2.80 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

M.S. students are expected to pass a proficiency exam during their first academic year in residence. Plan A requires 20 course credits and 10 thesis credits; Plan B requires 30 course credits, which include 8 credits for the two Plan B project courses.
Twin Cities Campus
Chemistry Minor
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 Street S.E., 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 2014
- 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.

Six course credits from graduate-level chemistry courses are required for a master's minor. Twelve course credits from graduate-level chemistry courses are required for a Ph.D. minor.
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 Street S.E., 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 2014
• 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
The preferred undergraduate GPA for admittance to the program is 3.20.

An undergraduate degree in chemistry or a related field is required for admission.

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.

Special Application Requirements:
Three letters of recommendation are required for all applications. Scores from General (Aptitude) and Subject (Advanced) Tests of the GRE are required for all applicants. International applicants are expected to provide scores of at least 550 (paper), 213 (computer), or 85 (Internet) on the TOEFL, as well as GRE scores.

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: 21
  - Internet Based - Reading Score: 19
  - Internet Based - Speaking Score: 23
  - 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
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.

The Ph.D. program requires 24 course credits and 24 thesis credits. The course credits must include 1 credit of seminar (CHEM 8601) and 1 credit for the ethics course (CHEM 8066).

Students in the Ph.D. 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.
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: civesgs@umn.edu
Website: http://www.ce.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.C.E.) 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:
Applicants are required to submit results of the GRE in support of their applications. The TOEFL is required of foreign applicants from non-English-speaking countries, with a score of at least 550 (paper), 213 (computer), or 79 (Internet). Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student's research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are encouraged to begin fall semester and to submit their applications by December 3 before the year their studies are expected to begin.

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 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.C.E. degree requires 30 credits and is offered under two plans. Plan A requires a minimum of 20 course credits and preparation of a thesis/design project (10 cr). 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 and requires 30 course credits.


Twin Cities Campus
Civil Engineering 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: civesgs@umn.edu
Website: http://www.ce.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

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:
Applicants are required to submit results of the GRE in support of their applications. A preferred TOEFL score of 550 (paper), 213 (computer), or 79 (Internet) is required of foreign applicants from non-English-speaking countries. Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student's research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are strongly encouraged to submit their applications by December 3 in order to begin the following fall semester.

Special Application Requirements:
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.

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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Information current as of January 21, 2015
- 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.

**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.S. 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 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. Plan A requires at least 20 course credits and 10 thesis credits. Plan B requires a minimum of 30 credits, which includes at least 27 course credits, and may include a maximum of 3 credits of CE 8094 for the Plan B project. Plan C requires 30 course credits and must include at least 2 courses at the 8xxx-level. A program typically takes 18 to 24 months to complete.

**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.
Twin Cities Campus
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: civesgs@umn.edu
Website: http://www.ce.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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 Requirements for Students Majoring in Other Fields: For a master's minor, two or more 5xxx or 8xxx courses from the same subarea of civil engineering are required, for a total of 6 or more credits.

Minor Requirements for Students Majoring in Other Fields: For a Ph.D. minor, four or more 5xxx to 8xxx 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: civesgs@umn.edu
Website: http://www.ce.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Ph.D. degree couples independent research with coursework in a comprehensive program for those wishing to attain mastery of their field. The Ph.D. 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 Ph.D. degree.

Students enter the Ph.D. program two to four years following the bachelor's degree, normally after completing the M.S. degree. The Ph.D. 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:
Applicants are required to submit results of the GRE in support of their applications. A preferred TOEFL score of 550 (paper), 213 (computer), or 79 (Internet) is required of foreign applicants from non-English-speaking countries. Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student's research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are strongly encouraged to submit their applications by December 3 in order to begin the following fall semester.

Special Application Requirements:
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.

Applicants must submit their test score(s) from the following:

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Information current as of January 21, 2015
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.
- 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 M.S. program may be presented in partial fulfillment of the Ph.D. requirements. Rigid requirements for the number of 8xxx courses appropriate for Ph.D. programs have not been set; nonetheless, the Ph.D. represents the highest level of scholarly achievement and coursework should be selected accordingly.


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 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: Master's
- Requirements for this program are current for Fall 2014
- 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 coursework-only degree that is intended to be a terminal degree.

The department also offers the M.S. (Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects) and the Ph.D. 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)

Prerequisites for Admission
The preferred undergraduate GPA for admittance to the program is 3.00.

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. The department only accepts students for fall admission; the application deadline is April 1.

Special Application Requirements:
A degree in any major with a substantial background in computer science is required; a computer science major is preferred. 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
• 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 credits of graduate work. At least 16 credits must be in computer science courses, including one course from each of the 3 breadth areas: theory, systems, and applications; and 1 credit of colloquium (CSCI 8970). At least 6 credits must be in computer science 8xxx-level courses. The remaining 15 course credits may be taken in the major field or any supporting field. Students must maintain a GPA above 3.00 after completing 8 credits.

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

University of Minnesota Rochester (UMR) offers the M.C.S. degree. Students may complete all degree requirements in Rochester by combining courses taught via streaming video using the UNITE (University-Industry Television for Education) instructional television system. Students are able to watch class live via the internet or pick up class on a special server at a later time.
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 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: Master's
- Requirements for this program are current for Fall 2014
- 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; bio-informatics 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.S. (offered Plan A with thesis, Plan B with project, or coursework-only Plan C with coursework-based projects), the M.C.S. (a terminal, coursework-only degree), 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 3.25.

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 M.S. program applicants. Master's students are accepted for fall admission only. The application deadline is April 1. Students seeking financial aid must apply by December 5.

Special Application Requirements:
A degree in any major with a substantial background in computer science is required; a computer science major is preferred. Applicants with an inadequate background must resolve any deficiencies before applying to the program.

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 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 M.S. 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: theory, systems, and applications; and 1 credit of colloquium (CSCI 8970). At least 3 credits must be in a computer science 8xxx-level course.

Plan A requires 13 credits in computer science coursework and 10 thesis credits. The remaining 8 credits may be taken in the major field or any supporting field.

Plan B and Plan C require 16 credits in computer science coursework. The remaining 15 credits may be taken in the major field or any supporting field.

Plan B requires 3 credits of the Plan B project course, CSCI 8760, which is in addition to the required 3 credit 8xxx-level CSCI course. 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.

Plan C is a coursework only degree. Students must take an additional 8xxx CSCI course and also 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.

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

University of Minnesota Rochester (UMR) offers the M.S. in computer science. Students may complete all degree requirements in Rochester via streaming video using the UNITE (University-Industry Television for Education) instructional television system. Students are able to watch class live via the internet or pick up class on a special server at a later time.
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 2014
- 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.

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.

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.
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: admissions@cs.umn.edu
Website: http://www.cs.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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; bio-informatics 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 Ph.D., as well as the M.C.S. (a terminal, coursework-only degree), and the M.S. (offered Plan A with a 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 Ph.D. program applicants. Ph.D. students are accepted for fall admission only. The application deadline is April 1. Students seeking financial aid must apply by December 5.

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 January 21, 2015
**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 Ph.D. 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, systems, and applications; plus 1 credit of colloquium (CSCI 8970). The remaining 9 credits may be taken as additional graduate-level courses, including as part of a designated minor.

Students are expected to complete all courses in their degree program with a GPA of at least 3.45.

All doctoral students must demonstrate background knowledge in computer science as explained in the program requirements at http://www.cs.umn.edu/academics/graduate/index.php
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: TBD
Website: http://TBD

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.S. 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
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 multivariable calculus, linear algebra, and mathematical software environments such as Matlab or R or the equivalent. Also required is programming experience including basic algorithms and data structures normally taught in beginning computer science courses either as part of the undergraduate degree or subsequent work 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
  - 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 oral. A capstone project is required.

**Capstone Project:** Students must complete a capstone project supervised by a faculty member.

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; 6 credits in approved electives; 1 credit of research colloquium; and 6 credits for the capstone project.
**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, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-1333; fax: 612-625-3819)  
Email: [esci@umn.edu](mailto:esci@umn.edu)  
Website: [http://www.esci.umn.edu/programs/graduate](http://www.esci.umn.edu/programs/graduate)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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**

Other requirements to be completed before admission:  
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 January 8. 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.

**Special Application Requirements:**

Most candidates for advanced degrees have completed a bachelor's degree in geology, geophysics, or the broad field of earth and material sciences. However, the department encourages applications from students in fields such as chemistry, physics, or biology.

At least one year each of study in calculus, chemistry, and physics is required. In general, an outstanding academic record is expected.

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 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. 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.

At the onset of studies, a coursework "compact" will be developed with the student, his/her adviser, and the graduate studies committee. The compact will be reviewed annually to assure timely progress and revise as needed.

For Plan A and Plan B, 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.

Plan A (thesis) requires 14 credits in the major, 6 outside the major, and 10 thesis credits. Plan B (project) requires a minimum of 14 credits in the major and a minimum of 8 credits outside the major. The remaining 8 credits can be taken in the major or in any supporting field.

Plan C is a coursework only option with an emphasis in hydrogeology and environmental science. A minimum of 14 credits are required in the major and a minimum of 9 credits outside the major. The remaining 7 credits can be taken in the major or in any supporting field.

All students must complete ESCI 8001 (Introductory Graduate Seminar), preferably in the first year.

With approval of the DGS, credits for ESCI 5093 (Directed Studies in Earth Sciences) may be applied to track 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.

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.

[ESCI 8402 - Biogeochemical Cycles in the Ocean (3 cr); ESCI 4801 - Geomicrobiology (3 cr)]

Earth Sciences
This generalist track exists for students whose curriculum and/or thesis (paper or project for M.S. Plan B) do not fit any of the other four
tacks. 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.

6-credit minimum from any two of the following courses: ESCI 5302 - Isotope Geology; ESCI 5351 - Geochemical Modeling of Aqueous
Systems; ESCI 5353 - Electron Microprobe Theory and Practice; ESCI 5502 - Advanced Structural Geology; ESCI 5503 - Advanced
Petrology; ESCI 5601 - Advanced Sedimentology; ESCI 5602 - Depositional Mechanics; ESCI 5705 - Limnogeology and
Paleoenvironment.

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.

6-credit minimum including ESCI 4211 - Solid Earth Geophysics I; plus at least one of the following courses: ESCI 4203 - Principles of
Geophysical Exploration; ESCI 8243 - Geomagnetism and Paleomagnetism; ESCI 4212 - Solid Earth Geophysics II; ESCI 5201 - Time-
Series Analysis of Geological Phenomena; ESCI 5203 - Rock and Mineral Physics; ESCI 5204 - Geostatistics and Inverse Theory.

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.

6-credit minimum including ESCI 4702 - General Hydrogeology; plus at least one of the following courses: ESCI 5108 - Principles of
Environmental Geology; ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences; ESCI 5713 - Tracers and Karst
Hydrogeology; ESCI 5971 - Field Hydrogeology; ESCI 8712 - Transport Phenomena and Analytical Geohydrology; ESCI 8718 -
Numerical Methods in Hydrogeology.
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:
Graduate Program, Department of Earth Sciences, University of Minnesota, 310 Pillsbury Drive S.E., 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 2014
• 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. Typically, no more than 50 percent of the total course credits are 4xxx.
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:
Graduate Program, Department of Earth Sciences, University of Minnesota, 310 Pillsbury Drive S.E., 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 2014
- 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
Other requirements to be completed before admission:
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 January 8. 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.

Special Application Requirements:
Most candidates for advanced degrees have completed a bachelor's degree in geology, geophysics, or the broad field of earth and material sciences. However, the department encourages applications from students in fields such as chemistry, physics, or biology.

At least one year of study each in calculus, chemistry, and physics is required. In general, an outstanding academic record is expected.

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

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Information current as of January 21, 2015
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 adviser, 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 Ph.D. requires a minimum 12 credits of coursework in Earth Sciences and a minimum of 12 credits in a minor or supporting field, plus 24 thesis credits. All students must complete 8001 (Introductory Graduate Seminar), preferably in the first year.

With approval of the DGS, ESCI 5093 (Directed Studies in Earth Sciences) may be applied to track 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.

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.

ESCI 8402 - Biogeochemical Cycles in the Ocean (3 cr); ESCI 4801 - Geomicrobiology (3 cr).

Earth Sciences
This generalist track exists for students whose curriculum and/or thesis (paper or project for M.S. 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.

6-credit minimum from any two of the following courses: ESCI 5302 - Isotope Geology; ESCI 5351 - Geochemical Modeling of Aqueous Systems; ESCI 5353 - Electron Microprobe Theory and Practice; ESCI 5502 - Advanced Structural Geology; ESCI 5503 - Advanced Petrology; ESCI 5601 - Advanced Sedimentology; ESCI 5602 - Depositional Mechanics; ESCI 5705 - Limnogeology and Paleoenvironment.

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.

6-credit minimum including ESCI 4211 - Solid Earth Geophysics I; plus at least one of the following courses: ESCI 4203 - Principles of Geophysical Exploration; ESCI 8243 - Geomagnetism and Paleomagnetism; ESCI 4212 - Solid Earth Geophysics II; ESCI 5201 - Time-Series Analysis of Geological Phenomena; ESCI 5203 - Rock and Mineral Physics; ESCI 5204 - Geostatistics and Inverse Theory.

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.

6-credit minimum including ESCI 4702 - General Hydrogeology; plus at least one of the following courses: ESCI 5108 - Principles of Environmental Geology; ESCI 5205 - Fluid Mechanics in Earth and Environmental Sciences; ESCI 5713 - Tracers and Karst Hydrogeology; ESCI 5971 - Field Hydrogeology; ESCI 8712 - Transport Phenomena and Analytical Geohydrology; 8718 - Numerical Methods in Hydrogeology.

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Information current as of January 21, 2015
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 S.E., 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 2014
- 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)
- 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.

Every applicant must submit the University of Minnesota application for graduate admission and the Electrical Engineering Department Application (this is part of the application for graduate admission).

The department requires three letters of recommendation. Letters of recommendation must be written on university stationery and include the recommender's signature. Recommenders will be emailed a link where they can submit their letters of recommendation electronically.

Every applicant must upload a resume to the online department application.

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:
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.
M.S. students who want to continue on to the Ph.D. must pass the Ph.D. Preliminary Written Examination by the end of their second year in residence. Students have two chances to pass the exam. The Ph.D. Preliminary Written Examination is typically held in November and in April.

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.

At least 1 semesters must be completed before filing a Degree Program Form.

The M.S. requires a minimum of 30 credits. Plan A requires 14 credits from EE courses 5xxx and above, 6 credits from related fields outside of the department but within CSE, and 10 thesis credits. Plan C requires 18 credits from EE courses 5xxx and above, 6 credits from related fields within CSE, and an additional 6 credits, which can be either major or related field credits.

Plan C students must satisfy a paper and a project requirement, which may be fulfilled either in approved EE coursework or by registering for the Plan C Project. Students choosing to pursue a minor must satisfy both EE and the outside minor department requirements. Courses that are cross-listed with EE must be counted for major field credit. Part-time students must choose Plan C; full-time students may choose either Plan A or Plan C. The student's Graduate Degree Plan, listing all courses to be included toward the degree, should be submitted no later than the end of the first year of the program. The department limits project, seminar, special investigation, directed study credits, and GRAD 0999 registrations.

Use of 4xxx courses toward program requirements is permitted, limited to 9 credits. 4xxx courses may not be counted toward the major field requirement. Only 4xxx credits from the approved list may be counted toward degree requirements.

All coursework must be taken A-F, unless only offered S-N, to be counted toward degree requirements.

A 5-year combined bachelor's/master's degree is available for select U of M undergraduates.

**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 M.S. 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.
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 S.E., 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 2014
- 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, computer 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 coursework must be taken A-F.

Minor credits must be 5xxx or 8xxx. Coursework must be from classroom and laboratory courses. No colloquia, seminar, or special investigation credits count toward meeting the minor 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 S.E., 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 2014
• 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.

Every applicant must submit the University of Minnesota application for graduate admission and the Electrical Engineering Department Application (this is part of the application for graduate admission).

The department requires three letters of recommendation. Letters of recommendation must be written on university stationery and include the recommender’s signature. Recommenders will be emailed a link where they can submit their letters of recommendation electronically.

Every applicant must upload a resume and a writing sample to the online department application. The writing sample should consist of a minimum of one, to a maximum of three, class papers or publications.

Special Application Requirements:
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.

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.

At least 2 semesters must be completed before filing a Degree Program Form.

The Ph.D. degree requires a minimum of 40 course credits and 24 thesis credits. The program must include 14 credits of EE courses 5xxx and above and 12 credits from the supporting field outside of EE but within the College of Science and Engineering. The remaining 14 credits may be taken in the major field or in any supporting field within the College of Science and Engineering.

Ph.D. students who enter the department with a M.S. degree in Electrical Engineering must pass the Ph.D. Preliminary Written Examination by the end of their third semester in residence. Ph.D. students who enter with an M.S. in another field have until the end of their second year in residence to pass the exam. 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.

Students choosing to minor must satisfy both EE and the outside minor department requirements.

Courses that are cross-listed with EE must be counted for major field credit.

The department limits seminar, special investigation, and GRAD 0999 registrations.

Use of 4xxx courses toward program requirements is permitted, but limited to 9 credits. 4xxx courses may not be counted toward the major field requirement. Only 4xxx credits from the approved list may be counted toward degree requirements.

All coursework must be taken A-F unless only offered S-N to be counted toward degree requirements.

Ph.D. students may obtain a M.S. degree as part of their Ph.D. degree.
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 S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: volle001@umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 yet 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.

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. The is no final exam. A capstone project is required.
Capstone Project: Students complete the capstone project either by undertaking a field research internship offered as CE 8603 - Environmental Restoration Field Research for 6 credits, or by taking one additional course from the Restoration Methods and Practice
theme area and conducting an independent research course. In both routes, students will be required to document 100 hours of project-based work. Students will complement this work with a required 10-minute oral presentation on the required Restoration Practice and Tools course.

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.

Completion of the program requires a minimum of 30 credits. Three required core classes (Introduction to Stream Restoration, Ecological Restoration, and Stream Restoration Practice) account for 9 credits. An additional 15 credits are made up of approved electives chosen from four theme areas: Restoration Environmental Policy and Management; Restoration Physical Science and Engineering; Restoration Ecology, Biology, and Chemistry; and Restoration Methods and Practice. The remaining 6 credits are met by undertaking a field-based internship or additional coursework with a documented research/practice component.

The following courses are required:

CE 8601 (EEB 8601, ESCI 8601) - Introduction to Stream Restoration (3 cr)
HORT 5071 - Ecological Restoration (4 cr)
CE 8602 (EEB 8602, ESCI 8602) - Stream Restoration Practice (2 cr)
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 Drive S.E., Minneapolis, MN 55455 (612-625-5522; fax: 612-626-7750)
Email: volle001@umn.edu
Website: http://www.ce.umn.edu

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

This program is not yet 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.

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.

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 following courses are required:
CE 8061 (EEB 8061, GEO 8061) - Introduction to Stream Restoration (3 cr)
HORT 5071 - Restoration and Reclamation Ecology (3 cr)
CE 8062 (EEB 8062, GEO 8062) - Environmental Restoration Practice and Tools (2 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 S.E., Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: mfmath@umn.edu
Website: http://www.math.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited U.S. university or foreign equivalent.

Other requirements to be completed before admission:
At least one year of college freshman calculus with a grade of B 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
  - Internet Based - Speaking Score: 23

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. 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.

At least 1 semesters must be completed before filing a Degree Program Form.

The M.F.M. requires 32 credits, consisting of four year-long course sequences. Each sequence has a fall term course and a spring term course, which must be taken in sequence. All courses are 4 credits. The course sequences are: FM 5011/5012 - Mathematical Background for Finance; FM 5021/5022 - Mathematical Theory Applied to Finance; FM 5031/5032 - A Practitioner's Course in Finance; and FM 5091/5092 - Computation, Algorithms, and Coding in Finance. 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.
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: gradprog@math.umn.edu
Website: http://www.math.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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
The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited U.S. university or foreign equivalent.

Other requirements to be completed before admission:
Applicants should have a good background in mathematics, but not necessarily at the level of 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.

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

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.

At least 1 semesters must be completed before filing a Degree Program Form.
Students must complete the following four required courses for 14 credits:

FM 5001 - Preparation for Financial Mathematics I (3 cr)
FM 5002 - Preparation for Financial Mathematics II (3 cr)
FM 5091 - Computation, Algorithms, and Coding in Finance I (4 cr)
FM 5092 - Computation, Algorithms, and Coding in Finance II (4 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: civesgs@umn.edu
Website: http://www.ce.umn.edu

Program Type: Master's
Requirements for this program are current for Fall 2014
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 geoengineering (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 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 selected with the help of a faculty adviser 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 Ph.D. 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:
Applicants are required to submit results of the GRE in support of their applications. The TOEFL is required of foreign applicants from non-English-speaking countries. A TOEFL score of at least 550 (paper), 213 (computer), or 79 (Internet) is required for admission. Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student's research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are encouraged to begin fall semester and to submit their applications by December 3 before the year their studies are expected to begin.

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 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 at least 30 credits and is offered under two plans. Plan A requires at least 20 course credits and preparation of a thesis/design project (10 cr). 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 and requires at least 30 course credits.
Twin Cities Campus
Geoengineering 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: civesgs@umn.edu
Website: http://www.ce.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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 (M.S.) 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 Ph.D. degree.

Students interested in pursuing doctoral studies should see the Ph.D. 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:
Applicants are required to submit results of the GRE in support of their applications. A preferred TOEFL score of 550 (paper), 213 (computer), or 79 (Internet) is required of foreign applicants from non-English-speaking countries. Admission requirements also include three letters of recommendation and a statement of purpose that outlines the prospective student's research interests, reasons for pursuing graduate studies, and career plans after graduation. Students are admitted each semester, but applicants are strongly encouraged to submit their applications by December 3 in order to begin the following fall semester.

Special Application Requirements:
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.

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.

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.S. 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 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. Plan A requires at least 20 course credits and 10 thesis credits. Plan B requires a minimum of 30 credits, which includes at least 27 course credits, and may include a maximum of 3 credits of CE 8094 for the Plan B project. Plan C requires 30 course credits and must include at least 2 courses at the 8xxx-level. A program typically takes 18 to 24 months to complete.
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: civesgs@umn.edu
Website: http://www.ce.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

For a master's minor, two or more 5xxx to 8xxx courses from the same area of geoengineering are required, for a total of 6 or more credits.
Twin Cities Campus
Industrial and Systems Engineering M.S.I.SY.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 2014
- 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 (ISyE) offers an MS degree with two tracks; the Industrial Engineering (IE) track and the Systems Engineering (SE) track, as well as a PhD degree. MS degree applicants must indicate which track they are applying for on the application form. Note that the admission requirements for the two tracks are different. In addition, the ISyE program also offers a dual MS in ISyE and Civil Engineering (Transportation Engineering focus).

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:
For applicants to the SE Track, at least two years of professional work experience in a technical field are required. 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 IE Track must submit a GRE score. Letters of recommendation are not required, but are highly recommended if you want to be considered for financial aid.

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
The Master of Science in Industrial and Systems Engineering (M.S.I.Sy.E.) is offered with two tracks. The industrial engineering (IE) track has three options: Plan A (thesis), Plan B (project), or Plan C (coursework). Plans A and B require 30 credits and Plan C requires 32 credits. At least 14 course credits are required in the major if Plan A is chosen; and 16 course credits in the major if Plan B or Plan C is chosen. For all plans, at least 6 course credits in a minor or related field and at least 1 credit of graduate seminar must be included. The remaining credits may be taken in the major field or any supporting field.

The systems engineering (SE) track is a coursework-only option (Plan C) requiring 30 credits. It requires at least 17 course credits in the major field, and 6 course credits in a minor or related field. The remaining 7 credits may be taken in the major or in any supporting field.

All M.S.I.Sy.E. students must complete a zero-credit Research Ethics and Professional Conduct course offered by the Department of Mechanical Engineering.

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 (thesis) Option: Required courses include IE 5531, IE 8532, and one of the following courses--IE 5545, 5551, or 8541. 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. Students must also take 10 thesis credits.

Plan B (non-thesis) Option: Required courses include IE 5531, IE 8532, and two of the following courses--IE 5545, 5551, or 8541. 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. Students must either take the Plan B course IE 8951/8953, or complete one to three Plan B papers, determined in consultation with the adviser.

Plan C (coursework) Option: Required courses include IE 5531, IE 8532, and two of the following courses--IE 5545, 5551, or 8541. 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.
Systems Engineering
Required courses are IE 5111, 5112, 5113, 5541, and 5553.
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

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

At least 6 credits in industrial and systems engineering are required for a master's minor. At least 12 credits in industrial and systems engineering are required for a doctoral minor.
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 2014
- 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.

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 toward program requirements is permitted under certain conditions with adviser approval.

At least 2 semesters must be completed before filing a Degree Program Form.

The Ph.D. degree requires at least 44 course credits, including at least 12 course credits in a minor field or supporting program, and at least 2 credits of graduate seminar; 24 thesis credits are also required. Required courses include IE 5531, IE 8532, and two of the following courses: IE5545, 5551, or 8541. 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.

All Ph.D. students must complete a zero-credit Research Ethics and Professional Conduct course offered by the Department of Mechanical Engineering.

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: isme@umn.edu
Website: http://tli.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.S.I.S.M.E.) 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 B.S. degree in engineering, plus a minimum of one year of professional work experience in an infrastructure area, or a B.S. 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 credits).

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.

The M.S.I.S.M.E. requires 30 credits. In addition, students must complete a capstone project to address an on-the-job issue or problem.
Twin Cities Campus
Management of Technology M.S.M.O.T.
Technological Leadership Institute
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Management of Technology 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: MOT@umn.edu
Website: http://www.tli.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 36
- This program does not require summer semesters for timely completion.
- Degree: Master of Science in Management of Technology

Along with the 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 (M.S.MOT.) 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.

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 completed coursework (or show proficiency) in economics, mathematical modeling, statistics, and computer literacy.

Special Application Requirements:
At least 5 years of professional experience in the applicant's technical field. (In exceptional circumstances, promising candidates with less experience may be considered.) Applicants must submit three letters of recommendation, a resume, and a statement of purpose.

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 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.

The M.S.MOT. requires 36 credits. In addition to course requirements, students must complete an oral exam and a written report for the capstone project (MOT 8234).

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Information current as of January 21, 2015
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 S.E., 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 2014
- 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 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, to provide engineers and scientists preparing for a career in industry with the business knowledge and interpersonal skills needed to assume a leadership role within their organizations. The program focuses on leadership in technology-based environments in traditional and emerging industries. The curriculum includes the basics of business, such as finance, marketing, operations, managerial decision-making and strategic planning. It also covers technology forecasting, project management, new product management processes, leading innovation, intellectual property, and strategic management of technology. 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 following courses are required for the minor: MOT 5001 Technological Business Fundamentals (2 credits) and MOT 5002 Creating Technological Innovation (2 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.

Course Group 0
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 S.E., 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 2014
- 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 Ph.D. 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 Ph.D.

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.

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 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 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 master's students must complete the four required core courses, MATS 8001, 8002, 8003, and 8004. In addition, master's students must complete a total of 30 credits, including 14 from the major program (this includes the 4 required courses), 6 from the minor or related program, and 10 thesis credits (for the M.Mat.S.E., thesis credits are used for the design project). Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 2.80.

In addition to their coursework, M.Mat.S.E. students are required to complete a design project. This work-related 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 that required for an M.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.
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 S.E., 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 2014
- 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 Ph.D. 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.

Special Application Requirements:
Note: 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 Ph.D. and does not generally admit students directly to the M.S.Mat.S.E. Plan 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: 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 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan C:** Plan C requires 18 major credits and 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 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 M.S. Mat.S.E. is offered under Plan A (with thesis) or Plan C (coursework only); both require 30 credits.

All master's students must complete four required core courses: MATS 8001, 8002, 8003, and 8004. Plan A master's students complete 14 credits from the major program (this includes the 4 required courses), 6 from the minor or related program and 10 thesis credits. Plan C master's students complete 18 credits from the major program (this includes the 4 required courses) and 12 credits in one or more related fields.

Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 2.80.
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 S.E., 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 2014
- 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.

For a minor in materials science, students must successfully complete at least two (for a master's) and four (for a PH.D.) of the core graduate courses in the minor program and obtain approval by the director of graduate studies. Core courses in materials science and engineering are: MATS 8001, 8002, 8003, and 8004.
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 and Engineering, University of Minnesota, 151 Amundson Hall, 421 Washington Avenue S.E., 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 2014
- 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.

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. Submission of all application materials by January 1 is strongly encouraged to ensure priority consideration for fellowships and assistantships; late applications are considered if space is available.

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.

At least 3 semesters must be completed before filing a Degree Program Form.

All Ph.D. students must complete the four required core courses, MATS 8001, 8002, 8003, and 8004. In addition, Ph.D. students must complete a total of 57 credits, including 21 from the major program (this includes the 4 required courses), 12 from the minor or related program, and 24 thesis credits. Precise coursework plans are approved by the director of graduate studies. The minimum required GPA for completion is 3.00.
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 S.E., Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• 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 (M.S.) in mathematics. Students may also earn the M.S. 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
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.

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
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 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.S. is offered under Plan A and Plan B. Plan A requires 14 credits in Mathematics, including one sequence of two 8xxx-level courses in the student's concentration area, 6 credits outside the major, and 10 thesis credits.

Plan B allows more breadth; students complete at least 30 credits, half of which may be in a related area outside of Mathematics. Two sequences of year-long 8xxx-level courses, one in the student's concentration area, must be included.
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 S.E., Minneapolis, MN 55455 (612-624-6391, fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 Ph.D.

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 Ph.D. minor requires a minimum of 12 credits, consisting of four 5xxx or 8xxx level courses.

Courses must be completed with a grade higher than B- to satisfy the requirements.
We recommend that you consult the director of graduate studies in Mathematics in advance for course approval.
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 S.E., Minneapolis, MN 55455 (612-624-6391; fax: 612-624-6702)
Email: gradprog@math.umn.edu
Website: http://www.math.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• 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 Ph.D. in mathematics, and a Ph.D. in mathematics with emphasis in applied and industrial 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
Undergraduate degree in mathematics or equivalent.

Other requirements to be completed before admission:
Applicants should have the prerequisite material of abstract algebra and real analysis, and should be ready for graduate level courses in Mathematics. The GRE Math Subject test is strongly recommended.

International applicants must submit score(s) from one of the following tests:
• TOEFL
  - Internet Based - Total Score: 100
  - Internet Based - Speaking Score: 23

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 Ph.D. requires 24 credits in mathematics core courses, 12 credits in a minor or supporting field, 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. Mathematics core courses can be passed by examination; however, students who test out are still required to complete 12 course credits in mathematics and 12 credits in a supporting program to earn a Ph.D.

The Ph.D. preliminary written examination, given twice each year, covers real analysis, complex analysis, algebra, and manifolds and topology. Students are expected to pass the exam by the end of their second year. After passing the exam and completing required coursework, students may take the preliminary oral exam, which they are expected to pass by the end of their fourth year.

Reading proficiency is required in one of the following: French, German, Italian, or Russian

For more information, see the program's website at www.math.umn.edu/grad.
Twin Cities Campus
Mechanical Engineering M.S.M.E.
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: gradinfo@me.umn.edu
Website: http://www.me.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

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

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 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. 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.

The M.S.M.E. requires at least 30 credits and is offered under three plans. Plan A (thesis) requires 14 credits in the major, 6 additional graduate level credits, and 10 thesis credits. Plan B (project) 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 adviser. Plan C (coursework) requires 24 credits in the major and 6 additional graduate level credits. All three plans require completion of 1-2 graduate seminar credits and one research and professional ethics course (3 credit max), which are included in the 30 credit total.
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: gradinfo@me.umn.edu
Website: http://www.me.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 toward program requirements is permitted under certain conditions with adviser approval.

At least 6 credits in mechanical engineering are required for a master's 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: gradinfo@me.umnx.edu
Website: http://www.me.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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
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.

At least 2 semesters must be completed before filing a Degree Program Form.

The Ph.D. requires at least 38 course credits, including 18 credits in the major and 20 additional graduate level credits. Students must complete 2-3 graduate seminar credits and one research and professional ethics course (3 credit max), which are included in the 38 credit total. At least 12 credits must be at the 8000-level. 24 thesis credits are also required.
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:
Medical Device Innovation Program, Technological Leadership Institute, University of Minnesota, Suite 290 McNamara Alumni Center, 200 Oak Street S.E., Minneapolis, MN 55455 (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 2014
- Length of program in credits: 34
- This program requires 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 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 Technology Macro Environment, and enhanced with hands-on innovation experience through practicums at the Medical Device Center. Elective courses from the College of Science and Engineering and Carlson School of Management will further develop depth in technical and medical industry concentration areas. The 14-month program will specifically draw upon the fields of technology innovation, product development, project management, business management, life-cycle management, intellectual property, regulatory affairs, clinical needs, entrepreneurship, human factors, emerging trends, globalization, reimbursement, and public policy to teach and investigate medical devices and the rapidly growing global medical technology industry. This program will provide students with a systemic understanding of end-to-end medical device innovation dynamics that includes but goes well beyond the traditional technology focus.

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:
Applicants must have undergraduate degree in science and engineering, with at least 2-5 years of work experience.

Minimum requirements include one year of calculus, probability/statistics, and two science or engineering courses.

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 25 major credits and 9 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The capstone project is an independent, original, and applied investigation on a relevant subject, problem or issue in the area of Medical Device Development. An integrative applied project to provide students the opportunity to expand their ability to enact the knowledge and technical learning acquired in the courses leading up to the capstone. The capstone integrative experience and the material in other MDI courses, taken together, will provide students with the motivation and skills to perform their professional roles in new ways, ways that will initiate and sustain change even at the level of the broader institutional context of governance in which they must function. The culmination of the program will be submission of a capstone project.

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.

All students will be required to complete 34 credits consisting of 11 credits in TLI designed Technology Innovation Management courses, 6 credits in the Medical Device Innovation Practicum, 6 credits in Medical Technology Macro Environments, 2 credits through the Capstone course and project, and 9 credits in Medical-Technical subject-specific electives outside the major field.
Twin Cities Campus
Nanoparticle Science and Engineering Minor
Mechanical Engineering
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Graduate Minor Program in Nanoparticle Science and Engineering, Integrative Graduate Education and Research Traineeship Program, University of Minnesota, 2101 Mechanical Engineering, 111 Church Street S.E., Minneapolis, MN 55455 (612-625-4028; fax: 612-625-4344)
Website: http://www.nanoigert.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 Integrative Graduate Education and Research Traineeship Program offers a minor in nanoparticle science and engineering for M.S. and Ph.D. students. The curriculum is designed to allow completion of the minor without an increase in overall course load. The minor requires one or two core courses and electives relevant to nanoparticle research. The program of courses is tailored in advance consultation between the student and director of graduate 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:
Admission to a master's or doctoral degree-granting program in the College of Science and Engineering and preparation of a minor program of coursework approved by the director of graduate studies is required. Students in programs outside the College of Science and Engineering must be approved by 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.

M.S. students must complete NPSE 8001 - Introduction to Nanoparticle Science and Engineering (3 cr) and 3 elective credits. Ph.D. students must complete NPSE 8001 and 8002 - Nanoparticle Science and Engineering Laboratory (3 cr) and 6 elective credits.

Electives must be chosen from existing courses relevant to nanoparticle research. Examples include CHEM 8021 - Computational Chemistry, EE 5624 - Optical Electronics, ME 8361 - Introduction to Plasma Technology, PHYS 5701 - Solid State Physics for Engineers and Scientists, CHEN 8301 - Physical Rate Processes I: Transport, and MATS 8212 - Solid State Reaction Kinetics.
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: igert-ne@umn.edu
Website: http://neuroengineering.umn.edu/

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 Ph.D. students who have the necessary science background to complete the coursework and who are in good standing in their major program.

Special Application Requirements:
Ph.D. students majoring in programs other than Biomedical Engineering, Electrical Engineering, Mechanical Engineering, and Neuroscience must have approval from the Neuroengineering Director of Graduate Studies (DGS) to participate in the minor program. Students will declare the minor by including it on the Graduate Degree Plan, following consultation with the DGS.

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.

The minor course selection must be approved by the Neuroengineering Director of Graduate Studies (DGS) who can be found here:
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.

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 NSCI 5101 as both a Neuroengineering Minor course and a core Neuroscience course).

Introduction Course
Take 1 or more course(s) from the following:
- BMEN 5411 - Neural Engineering (3.0 cr)
- NSCI 5101 - Introduction to Neuroscience for Graduate Students (3.0 cr)
- NSC 5561 - Systems Neuroscience (4.0 cr)

**Neuroengineering Core Courses**
At least one course from the following must be taken: BMEN 5412, BMEN 5413.
Take 2 or more course(s) from the following:
- BMEN 5411 - Neural Engineering (3.0 cr)
- BMEN 5412 - Neuromodulation (3.0 cr)
- BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
- BMEN 8335 - Neuroengineering Practicum (3.0 cr)

**Elective Course**
One additional course from either an engineering or neuroscience discipline. The following is not an exhaustive list but merely a representative sample of courses that would be appropriate to satisfy this requirement. Additional courses may be approved as electives by the Neuroengineering DGS.
Take 1 or more course(s) from the following:
- BMEN 5411 - Neural Engineering (3.0 cr)
- BMEN 5412 - Neuromodulation (3.0 cr)
- BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
- BMEN 8335 - Neuroengineering Practicum (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)
- ME 5281 - Analog and Digital Control (4.0 cr)
- ME 5286 - Robotics (4.0 cr)
- NSC 5202 - Theoretical Neuroscience: Systems and Information Processing (3.0 cr)
- NSC 8217 - Systems and Computational Neuroscience (2.0 cr)
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. S.E., 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 2014
- 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 M.S. degree are not admitted, unless they arrange for their own financial support. Students admitted to the Ph.D. program are automatically eligible for the M.S. 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 3.50.

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.

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 adviser. 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. 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.

At least 2 semesters must be completed before filing a Degree Program Form.

All courses must be at the 4xxx, 5xxx or 8xxx level. Physics 4001, 4002, 4101, 4201, and 4303 cannot be used to satisfy the requirements.

A minimum GPA of 2.80 is required for Plans A and B and a minimum GPA of 3.30 is required for Plan C for students to remain in good standing.

The M.S. requires a minimum of 30 credits and is offered under three plans. Plan A (thesis) requires 20 course credits and 10 thesis credits. Plan B (project) requires 30 course credits plus completion of a project or 1-3 Plan B papers. For both Plan A and Plan B, Physics 5001/2 or Physics 5011/12 must be included in the degree coursework.

Plan C requires 30 course credits including completion of Physics 5001/2, 5011/12, and 5201. Students in the Plan C program must also pass the Physics Graduate Written Exam and maintain a 3.30 GPA.
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. S.E., 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 2014
• 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.

For the master's minor, students must complete a minimum of 6 credits in physics including either Physics 5001 or 5011.

For the doctoral minor, students must complete a minimum of 12 credits in physics, including either the classical physics sequence (PHYS 5011-5012) or the quantum mechanics sequence (PHYS 5001-5002).

Use of certain 4xxx courses toward degree requirements is permitted under certain conditions with director of graduate studies approval. Physics 4001, 4002, 4101, 4201, and 4303 cannot be used to satisfy the requirements.
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. S.E., 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 2014
- Length of program in credits: 64
- 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.

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.

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.

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: 55
- 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

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.

All courses must be at the 4xxx, 5xxx or 8xxx level. Physics 4001, 4002, 4101, 4201, and 4303 cannot be used to satisfy the requirements.

The Ph.D. requires 40 course credits including classical physics (PHYS 5011-5012), quantum mechanics (PHYS 5001-5002), thermal and statistical physics (PHYS 5201) and two semesters of seminar, plus 24 thesis credits.

Required Orientation: During the two weeks 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.
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:
Director of Graduate Studies, Quaternary Paleoecology Graduate Program, University of Minnesota, 108 Pillsbury Hall, 310 Pillsbury Drive S.E., 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 2014
- 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 (M.A. and M.S.) 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 Ph.D.) 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.

Students develop their curricula in consultation with their major advisers and the director of graduate studies in the quaternary paleoecology program. Students choose courses from relevant fields outside their major field. A list of courses that fulfill the QP requirement can be obtained from the program web page (updated periodically). Master's students must take a total of 6 credits. Ph.D. students take a total of 12 credits (one course may be in the major field). Some requirements may be waived depending on the student's background.
**Twin Cities Campus**

**Scientific Computation M.S.**

*Chemical Engineering & Materials Science*

**College of Science and Engineering**

Link to a list of faculty for this program.

**Contact Information:**
Scientific Computation Program, University of Minnesota, 151 Amundson Hall, 421 Washington Ave S.E., Minneapolis, MN 55455 (612-625-6345; fax: 612-626-7246)  
Email: wentz002@umn.edu  
Website: [http://www.scicomp.umn.edu](http://www.scicomp.umn.edu)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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 graduate degree program in scientific computation encompasses course work and research on the fundamental principles necessary to use intensive computation to support research in the physical, biological, and social sciences and engineering. There is a special emphasis on research issues, state-of-the-art methods, and the application of these methods to outstanding problems in science, engineering, and other fields that use scientific computation, numerical analysis and algorithm development, symbolic and logic analysis, high-performance computing tools, supercomputing and heterogeneous networks, and visualization.

**Program Delivery**

This program is available:

- via classroom (the majority of instruction is face-to-face)

**Prerequisites for Admission**

A bachelor's degree in a field that uses scientific computation is required for admission.

**Special Application Requirements:**

Three letters of recommendation are required for all applications. GRE General Test scores are required for consideration of financial support and recommended for all applicants. International applicants are required to submit TOEFL scores.

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.

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.

The program is offered under Plan A (thesis), which includes a minimum of 20 course credits and 10 thesis credits. The course credits must include at least 6 credits from the scientific computation core and at least 6 credits in a minor. Only 3 credits from courses offered in a student's minor may be counted toward the core requirements in scientific computation. A course listed in both the core requirements of scientific computation and a student's minor may not be counted under both.
Twin Cities Campus
Scientific Computation Minor
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Scientific Computation Program, University of Minnesota, 151 Amundson Hall, 421 Washington Ave S.E., Minneapolis, MN 55455 (612-625-6345; fax: 612-626-7246)
Email: wentz002@umn.edu
Website: http://www.scicomp.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 degree program in scientific computation encompasses course work and research on the fundamental principles necessary to use intensive computation to support research in the physical, biological, and social sciences and engineering. There is a special emphasis on research issues, state-of-the-art methods, and the application of these methods to outstanding problems in science, engineering, and other fields that use scientific computation, numerical analysis and algorithm development, symbolic and logic analysis, high-performance computing tools, supercomputing and heterogeneous networks, and visualization.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Special Application Requirements:
The minor requires the approval of 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.

The master's minor requires a minimum of 6 credits from the core curriculum; the credits may not be from courses in the student's major field.

A doctoral minor requires a minimum of 12 credits (a minimum of 6 of these in core courses with remaining credits from supplementary courses). A student may use one course from their major field to satisfy the requirement of a minor in scientific computation, provided there is no rule prohibiting this in the student's major field.
Twin Cities Campus
Scientific Computation Ph.D.
Chemical Engineering & Materials Science
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Scientific Computation Program, University of Minnesota, 151 Amundson Hall, 421 Washington Ave S.E., Minneapolis, MN 55455 (612-625-6345; fax: 612-626-7246)
Email: wentz002@umn.edu
Website: http://www.scicomp.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 degree program in scientific computation encompasses course work and research on the fundamental principles necessary to use intensive computation to support research in the physical, biological, and social sciences and engineering. There is a special emphasis on research issues, state-of-the-art methods, and the application of these methods to outstanding problems in science, engineering, and other fields that use scientific computation, numerical analysis and algorithm development, symbolic and logic analysis, high-performance computing tools, supercomputing and heterogeneous networks, and visualization.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
A bachelor's degree in a field that uses scientific computation is required for admission.

Special Application Requirements:
Three letters of recommendation are required for all applications. GRE General Test scores are required for consideration of financial support and recommended for all applicants. International applicants are required to submit TOEFL scores.

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 3.00 is required for students to remain in good standing.

A minimum of 24 course credits is required with a minimum of 12 credits in core courses; 24 thesis credits are also required. Students have two options:

1. Ph.D. with supporting program - In addition to the core credits, this option requires 12 credits in subjects that support computational science. These can include core credits beyond the required 12 credits.

2. Ph.D. with minor - In addition to the core credits, this option requires 12 credits in a minor. Many minor programs require more than 12 credits; in such cases, the greater requirements will be in effect. The minor field must be declared before the student takes the preliminary oral exam.
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://www.tli.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.S.S.T.) shapes tomorrow's analytical and risk management policymakers 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:
Minimum requirements include one year of calculus, probability/statistics, and two science or engineering courses.

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 25 major credits and 7 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. Students must register for the capstone course ST 8620 (2 credits).

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 M.S.S.T. 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 25 credits in MSST core courses, including 2 credits for the capstone course, and 7 credits in electives outside the major.

The curriculum comprises a balance of courses from the following core areas:

* Foundations of security science and technology, methods, and algorithms
* Application areas, including critical infrastructures (e.g., communications/IT/cyber, power/energy, water, and transportation; food/infectious diseases, financial networks, supply chain management, etc.)
* Coupled dynamic systems infrastructure interdependencies and dynamics of coupled infrastructures, system-wide risk/threat management, and complex interactive networks (including finance and economics, policy and regulation)
* Management and leadership development (including communication skills, change management, ethics, project management, and conflict management)
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://www.tli.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 policymakers 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 M.S. minor must be enrolled in a master's 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.
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; fax: 612-625-0572)
Email: msse@cs.umn.edu
Website: http://www.msse.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 (M.S.S.E.) program provides a thorough understanding of the fundamental issues related to software development and the software development process. It fosters an awareness of the problems and opportunities associated with software-intensive systems and explains the methods for quickly evaluating, adopting, and taking advantage of emerging technologies. This program introduces emerging technologies and their applications and lays the foundation for lifelong learning and professional development in a rapidly changing field. The M.S.S.E. 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.

Other requirements to be completed before admission:
Prospective students should have an undergraduate degree in computer science or a closely related field and a minimum of one year of professional experience working in the software industry. Students with degrees in other fields may be considered for admission based on extensive industrial experience.

Special Application Requirements:
Because the M.S.S.E. program is designed for full-time working professionals, international applicants must hold an H-1B visa.

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 3.00 is required for students to remain in good standing.

The M.S.S.E. requires 30 credits. Students take eight core courses, two industrial seminar courses and two elective courses. The project requirement can be met by a combination of class projects, or by an independent project elective.
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 S.E., Minneapolis, MN 55414 (612-624-4606; fax: 612-624-0066)
Email: volle001@umn.edu
Website: http://www.nced.umn.edu/srcp

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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.

Applicants must have a bachelor's degree in a related field from an accredited postsecondary U.S. 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 http://nced.umn.edu/apply-certificate-program-stream-restoration

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 core courses:

ESCI/CE/EEB 8601 - Introduction to Stream Restoration (3 cr, offered alternative fall terms) covers key background topics and skills involved in stream restoration.

ESCI/CE/EEB 8602 - Stream Restoration Practice (2 cr, offered alternative fall terms) is a course in which students participate in a stream restoration design experience.

Students obtaining a degree in either earth sciences; civil engineering; or ecology, evolution and behavior should register for these courses under a designator other than their major field. In addition to core courses, students are required to take a minimum of 11 elective credits from four theme areas: river and floodplain science and engineering (3 to 8 cr); river and floodplain ecology (up to 8 cr); water quality (up to 8 cr); water policy and management (up to 4 cr). A full listing of approved electives can be found on the web page http://www.nced.umn.edu/srcp.
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 2014
- Length of program in credits: 15
- This program does not require summer semesters for timely completion.
- Degree: Advanced Dental Therapy P'Bacc 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:
- partially online (between 50% to 80% of instruction is 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.

The ADT Post-baccalaureate Certificate will be awarded after the completion of the specified 15 master's level credits, which include five didactic-based credits and 10 clinical-based credits. 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.
Course Group 0
Didactic Courses
Take 3 or more course(s) totaling 5 or more credit(s) from the following:
- DT 6162 - 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)

Course Group 1
Clinical
DT 6340 - Advanced Dental Therapy Prep Clinic (10.0 cr)
Twin Cities Campus
Dental Hygiene M.S.D.H.
Dentistry Primary Care Administration
School of Dentistry

Contact Information:
Division of Dental Hygiene, 9-372 Moos Tower, 515 Delaware Street S.E., 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 2014
- Length of program in credits: 35 to 39
- 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 his/her 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:
- 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 or Associate degree in dental hygiene required from an accredited U.S. institution or foreign equivalent dental hygiene program.

Other requirements to be completed before admission:
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. Application deadline is March 1.

Applicants pursuing the management 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 25 to 26 major credits, up to null credits outside the major, and 10 thesis credits. The final exam is oral.

Plan C: Plan C requires 39 major credits and up to null credits outside the major. There is no final exam. A capstone project is required. Capstone Project: Internship 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.

Students in both the management and dental hygiene education tracks will participate in the following five core courses: instructional strategies, research methods in health sciences, administrative leadership and professional development, statistics and grantwriting.

In addition to the core courses, management track students will complete the following courses: financial accounting, marketing management, operations management and electives chosen from the MBA and Medical Industry Leadership Institute (MILI) curricula.

Dental hygiene education track students will participate in the following courses: the discipline of dental hygiene, curriculum and course development, dental hygiene supervised clinical teaching, dental hygiene clinic administration, web-based teaching/learning strategies, principles of educational and psychological measurement and dental hygiene supervised didactic teaching.

MSDH students pursuing the Plan A option must complete a thesis. Plan C students must complete an internship and Capstone project.

MSDH Core Curriculum

DH 5401 - Research Methods in Health Sciences (2.0 cr)
DH 5407 - Instructional Strategies for Effective Teaching (2.0 cr)
DH 5411 - Administrative Leadership and Professional Development (1.0 cr)
DH 5421 - Grant Writing for Health Professionals (1.0 cr)

Statistics

PUBH 6414 - Biostatistical Literacy (3.0 cr)
or 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
Management
This sub-plan is limited to students completing the program under Plan A or Plan C.

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
MBA 6030 - Financial Accounting (3.0 cr)
MBA 6210 - Marketing Management (3.0 cr)
MBA 6220 - Operations Management (3.0 cr)

Plan A Choice
DH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or Plan C Choice
DH 5201 - Management Internship (5.0 cr)
DH 5203 - Capstone Project (3.0 cr)

MBA Electives
Plan A chooses 8 electives; Plan C chooses 13 elective credits. Not inclusive list.
Take 8 - 13 credit(s) from the following:
• 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)
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 2014
- 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 - Head and Neck Anatomy (1.0 cr)
DT 5330 - Clinical Application I (3.0 cr)
DT 5429 - Introduction to Psychomotor Skill Development (1.0 cr)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>DT 5430</td>
<td>Oral Anatomy (2.0 cr)</td>
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<tr>
<td>DT 5431</td>
<td>Oral Anatomy Laboratory (3.0 cr)</td>
</tr>
<tr>
<td>DT 5521</td>
<td>Foundations of Interprofessional Professionalism, Communication, and Collaboration (1.0 cr)</td>
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<tr>
<td>DT 5212</td>
<td>Local Anesthesia and Pain Management (2.0 cr)</td>
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<tr>
<td>DT 5230</td>
<td>Oral and Maxillofacial Radiology (2.0 cr)</td>
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<td>DT 5250</td>
<td>Oral Histology and Embryology (2.0 cr)</td>
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<tr>
<td>DT 5331</td>
<td>Provider Patient Relationships (2.0 cr)</td>
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<td>DT 5332</td>
<td>Cariology and Applied Nutrition in Dental Therapy Care (3.0 cr)</td>
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<tr>
<td>DT 5410</td>
<td>Applied Dental Biomaterials (1.0 cr)</td>
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<tr>
<td>DT 5110</td>
<td>Periodontology I (1.0 cr)</td>
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<tr>
<td>DT 5130</td>
<td>Preclinical Pediatric Dentistry (2.0 cr)</td>
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<td>DT 5211</td>
<td>Applied Pharmacology for the Dental Therapist (2.0 cr)</td>
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<td>DT 5232</td>
<td>Oral and Maxillofacial Radiology Preclinical Laboratory (0.0 cr)</td>
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<td>DT 5251</td>
<td>General and Oral Pathology (1.0 cr)</td>
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<td>DT 5432</td>
<td>Operative Dentistry I (2.0 cr)</td>
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<tr>
<td>DT 5433</td>
<td>Operative Dentistry I Pre-Clinic Laboratory (2.0 cr)</td>
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<td>DT 5140</td>
<td>Preventive Pediatric Dental Clinic (1.0 cr)</td>
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<td>DT 5231</td>
<td>Oral and Maxillofacial Radiology II (1.0 cr)</td>
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<td>DT 5333</td>
<td>Dental Public Health and Academic Service Learning I (3.0 cr)</td>
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<tr>
<td>DT 5334W</td>
<td>Dental Therapy Care Process: Clinical Application II [WI] (4.0 cr)</td>
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<td>DT 5336</td>
<td>Ethics and Jurisprudence for the Dental Therapist (1.0 cr)</td>
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<td>DT 5434</td>
<td>Operative Dentistry II Lecture (1.0 cr)</td>
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<tr>
<td>DT 5471</td>
<td>Prosthodontic Topics for Dental Therapy (2.0 cr)</td>
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<tr>
<td>DT 5335</td>
<td>Dental Practice Management (2.0 cr)</td>
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<td>DT 5337</td>
<td>Dental Public Health and Service Learning II (2.0 cr)</td>
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<tr>
<td>DT 5338W</td>
<td>Research Methods in Dental Therapy [WI] (3.0 cr)</td>
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<tr>
<td>DT 5460</td>
<td>Essentials of Clinical Care II for the Dental Therapist (5.0 - 10.0 cr)</td>
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<tr>
<td>DT 5141</td>
<td>Clinical Pediatric Dentistry III (2.0 cr)</td>
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<td>DT 5241</td>
<td>Oral Radiology Clinic II (1.0 cr)</td>
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<tr>
<td>DT 5320</td>
<td>Comprehensive Care Clinic (4.0 cr)</td>
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<tr>
<td>DT 5361</td>
<td>Outreach Experiences II (2.0 cr)</td>
</tr>
<tr>
<td>DT 5443</td>
<td>Operative Clinic III (4.0 cr)</td>
</tr>
<tr>
<td>DT 5435</td>
<td>Operative Dentistry II for the Dental Therapist, Lab (1.0 cr)</td>
</tr>
</tbody>
</table>
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 (612-624-7934; 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 2014
- 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 M.S. 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 M.S. degree include endodontics, orthodontics, pediatric dentistry, periodontics, and prosthodontics and TMJ disorders/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 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 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 pursuing either Plan A or Plan B must complete a minimum of 14 credits in the major, including four core courses in teaching and evaluation in dentistry, basic research methodology, introductory biostatistics, and fundamentals of health care administration. Courses from other disciplines may also be taken for credit in the major with the approval of the student's adviser and the director of graduate studies. All students must complete at least 6 credits outside the major field (either as a minor or related field credits), as well as program requirements for training in the Responsible Conduct of Research.
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 2014
- 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.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 500
  - General Test - Quantitative Reasoning: 600
  - General Test - Analytical Writing: 5

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
  - 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 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 2 semesters must be completed before filing a Degree Program Form.

The M.S. 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 and a total of 30 credits. Students must complete the Plan A (with thesis) program, which requires a minimum of 14 credits in the major, including 4 credits of oral biology topics courses (8021-8028). Courses in the major may be taken from other disciplines with the approval of the adviser and the director of graduate studies. Registration and participation in the oral biology student seminar series (8030) is required each semester. Students must also complete a minor or related field program in an associated nonclinical discipline (minimum 6 credits) and 10 thesis credits. Students must conform to the University's GPA requirements for master's degree students.
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 2014
- 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 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.

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 in oral biology consists of 6 credits, at least two advanced courses in oral biology, and other coursework determined in consultation with the director of graduate studies.

A Ph.D. minor in oral biology consists of 12 credits, at least two advanced courses in oral biology, and other coursework in consultation with the director of graduate studies.
**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](http://www.oralbiology.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 59 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), and 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: 500
  - General Test - Quantitative Reasoning: 600
  - General Test - Analytical Writing: 5

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
  - 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
23 to 25 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 3.00 is required for students to remain in good standing.

The Ph.D. in oral biology is a four-year program. The first year consists primarily of a core curriculum specifically chosen for each student. The curriculum provides students with a working knowledge of the major concepts and research paradigms in their scientific area, a working vocabulary, and the basis for continued learning. During months 13-15, the student writes a major research thesis proposal, which is defended orally by month 16. The oral exam must capture the student's ability to think critically about the field and the application of logical experimental designs to test hypotheses and answer questions. Months 17-45 will focus on thesis research. Months 45-48 are used for dissertation writing. Students must also present a public seminar describing their thesis research (which is attended by the final oral exam committee) no later than 6 months before defense of the thesis. The dissertation is defended in month 48. Students are expected to complete a core curriculum of 23-25 credits including 8 credits of oral biology topics courses (8021-8028) and continued participation in the oral biology student seminar series (8030). Courses may be selected from departments and programs outside the oral biology program with the approval of the adviser and director of graduate studies. A minor (minimum 12 cr) in a nonclinical discipline and 24 thesis credits are also required. A cumulative GPA of at least 3.00 in both the major and minor is required. Only grades of A or B are acceptable in the core courses.

Joint- or Dual-degree Coursework: D.D.S./Ph.D. students typically complete all requirements for the Ph.D. program, except for the thesis defense, before entering the D.D.S. program. The Ph.D. and D.D.S. degrees may be awarded concurrently or separately.
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 2014
- 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 (M.D.P.) 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 M.D.P. 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 M.D.P. 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 U.S. university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
A grade of B or better in an introductory microeconomics or general economics course that includes introductory microeconomics is required. A macroeconomic course will not satisfy this requirement. Competence in college-level algebra (including facility with functional notations, algebraic manipulation of polynomials, logs, and exponentials, and graphic representation of equations) is required for M.D.P. students. A grade of B or better in a college-level course in biology, chemistry, or ecology. At least one course in political science (that analyzes political institutions) is strongly recommended.

Competence in MS Excel and Word is strongly recommended. 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
Program Requirements

Plan C: Plan C requires 50 major credits and up to null credits outside the major. The is no final exam. A capstone project is required.

Capstone Project: The capstone project is an opportunity for M.D.P. 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.

Required Core Courses

AGRO 5321 - Ecology of Agricultural Systems (3.0 cr)
MDP 5001 - Ways of Knowing and Sustainable Livelihoods (2.0 cr)
MDP 5002 - Research Methods for Sustainable Livelihoods (4.0 cr)
MDP 5003 - Field Study Pre-Départure Seminar (1.0 cr)
MDP 5004 - International Field Experience (3.0 cr)
MDP 5100 - International Field Seminar (1.0 cr)
MDP 5200 - Capstone Workshop in Development Practice (1.0 - 2.0 cr)
PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
PA 5031 - Empirical Analysis I (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)

Education Policy

OLPD 5121 - Educational Reform in International Context (3.0 cr)

or
OLPD 5080 - Special Topics: Organizational Leadership, Policy, & Development (1.0 - 3.0 cr)

Environmental Science

GEOG 5401 - Geography of Environmental Systems and Global Change (4.0 cr)

or
EEB 5146 - Science and Policy of Global Environmental Change (3.0 cr)

or
FNRM 5146 - Science and Policy of Global Environmental Change (3.0 cr)

Leadership

PA 5105 - Integrative Leadership Seminar (3.0 cr)

or
PA 5251 - Strategic Planning and Management (3.0 cr)

or
PA 5941 - Leadership for the Common Good (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.hh.humn.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 2014
- 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.

The 12-credit certificate consists of one cornerstone course: PA5413/CPSY 5413 - Early Childhood and Public Policy (3 cr), one policy elective (3 cr), one open elective (3 cr), and a capstone workshop, professional paper, or independent study focused on early childhood policy (PA 8081, 8082, 8921 or 8991). The certificate can be completed in two to four semesters.
Twin Cities Campus

Executive 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:
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/degrees/certificate/pls_certificate.html

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Executive Leadership 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.

Public safety professionals face extraordinary challenges that require innovative thinking and an interdisciplinary approach. The Certificate in Executive Leadership: Public Safety provides mid-career professionals knowledge and skills in leadership, management, public policy, and communication for greater success plus increased potential for advancement to serve in chief, deputy, director, and mid- to senior-level leadership positions.

Intended for working professionals in law enforcement, fire, emergency management, emergency health services, and related public safety fields, the program was designed by highly respected leaders in those same fields. The program allows students to complete a professional graduate-level certificate in an integrative cohort format in nine months, earning 12 graduate credits that can serve as a stepping stone to the mid-career Master of Public Affairs degree.

Program Delivery
This program is available:
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission
Special Application Requirements:
7 years minimum (10 years preferred) of professional experience in public safety or related fields. A complete application will include Graduate School application, personal statement, resume or C.V., transcripts, TOEFL scores (if applicable), at least two letters of recommendation (preferred from candidate’s organizational supervisor and from a community professional colleague), and 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

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
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 Courses**
- PA 5057 - Executive Leadership I (6.0 cr)
- PA 5058 - Executive Leadership II (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.

Public Safety
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 2014
- 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 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. Jointly sponsored by the Humphrey School of Public Affairs, the School of Social Work, the School of Public Health, and the College of Education and Human Development, 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. Mathematics courses through algebra. A one-semester course in microeconomics.

Special Application Requirements:
A complete application will include a University of Minnesota application, personal statement, resume or C.V., transcripts, and nonprofit experience form.

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)
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 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 2014
- 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 semester must be completed before filing a Degree Program Form.

Required Core Courses (5 credits)

PA 5431 - Public Policies on Work and Pay (3.0 cr)

Note: Only the section of PA 5022 specifically titled Economics of Social Insurance Programs (3 cr) will count toward the certificate.

HRIR 5654 - Public Policies on Employee Benefits: Social Safety Nets (2.0 cr)

or PA 5022 - Economics For Policy Analysis and Planning II (1.5 - 3.0 cr)

Elective Courses (minimum of 10 credits)

Note: HRIR 5000: Topic of section must cover public policies. PA 8390 topic is Research Methods in Public Policy.

Take 3 - 5 course(s) totaling 10 or more credit(s) from the following:

• HRIR 5000 - Topics in Human Resources and Industrial Relations (2.0 cr)
• HRIR 5222 - Managing Diversity (2.0 cr)
• HRIR 5252 - Employment and Labor Law for the HRIR Professional (2.0 cr)
• HRIR 5225 [Inactive] (2.0 cr)
• HRIR 6701 - Labor Relations and Collective Bargaining (4.0 cr)
• PA 5401 - Poverty, Inequality, and Public Policy (3.0 cr)
• PA 8390 - Advanced Topics in Advanced Policy Analysis Methods (1.0 - 3.0 cr)
• HIST 5844 [Inactive] (3.0 cr)
• LAW 6203 - Labor Law (2.0 - 3.0 cr)
• LAW 6631 - Employment Discrimination (3.0 - 4.0 cr)
• LAW 6625 - Disability Law (3.0 cr)
• LAW 6632 - Employment Law (2.0 - 3.0 cr)
• LAW 6833 - Alternative Dispute Resolution (2.0 - 3.0 cr)
• APEC 5511 - Labor Economics (3.0 cr)
• SOC 8421 - Work and Occupations (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 2014
- 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. (Students also may pursue the certificate by taking courses in a weekly classroom format.)

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 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:
Students must have 10 years of professional experience and a demonstrated interest in public affairs.

A complete application will include a Graduate School 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.

Curriculum

Cohort Option
PA 5051 - Cohort Leadership I (2.0 cr)
PA 5052 - Cohort Leadership II (2.0 cr)
PA 5053 - Cohort Policy Analysis I (2.0 cr)
PA 5054 - Cohort Policy Analysis II (2.0 cr)
PA 5055 - Cohort Analytics for Leaders I (2.0 cr)
PA 5056 - Cohort Analytics for Leaders II (2.0 cr)

-OR-

Weekly Classroom Option
PA 5941 - Leadership for the Common Good (3.0 cr)
PA 5038 - Analytics for Leaders I (3.0 cr)
PA 5039 - Analytics for Leaders II (3.0 cr)
PA 8001 - Transforming Public Policy (3.0 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 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 2014
- 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 (M.P.A.) 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 may be taken in a traditional weekly on-campus classroom setting or through 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)
- 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 four-year bachelor's degree from an accredited U.S. university or foreign equivalent at time of enrollment.

Special Application Requirements:
Ten years or more of postbaccalaureate professional career or public affairs experience. Demonstrated basic competency in MS Excel and Word. A complete application will include a Graduate School 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. The final exam is required. 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, an oral presentation to the client that summarizes the major findings of the report, and a reflection paper on the workshop experience.

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)**

**Weekly Class Option**
- PA 5941 - Leadership for the Common Good (3.0 cr)
- PA 5038 - Analytics for Leaders I (3.0 cr)
- PA 5039 - Analytics for Leaders II (3.0 cr)
- PA 8001 - Transforming Public Policy (3.0 cr)

**or Cohort Option**
- PA 5051 - Cohort Leadership I (2.0 cr)
- PA 5052 - Cohort Leadership II (2.0 cr)
- PA 5053 - Cohort Policy Analysis I (2.0 cr)
- PA 5054 - Cohort Policy Analysis II (2.0 cr)
- PA 5055 - Cohort Analytics for Leaders I (2.0 cr)
- PA 5056 - Cohort Analytics for Leaders II (2.0 cr)

**Capstone Project**
- PA 5080 - Capstone Preparation Workshop (1.0 cr)
- PA 8081 - Capstone Workshop (3.0 cr)

**Remaining Credits (14)**

M.P.A. students self-design their courses of study, choosing from a wide variety of classes, including skills courses in management, analysis, and planning; and concentration 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. For a list of ideas on how to formulate their concentrations, students should read the program planning worksheet for M.P.A.s.
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 South, 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 2014
- 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.

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; Public and Nonprofit Management; 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 Ph.D.-level work. Normally, a student 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, 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 catalog website.
Program Requirements
39 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 2 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. Training options may include for-credit courses in the Preparing Future Faculty program (e.g., GRAD 5102, 5105, 8101, 8102, and 8200); completion of Center for Teaching and Learning non-credit courses on teaching techniques; and informal training or courses offered in other units at the University.

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.

Integrative Seminars
- PA 8003 - Integrative Doctoral Seminar in Public Affairs I (3.0 cr)
- PA 8004 - Integrative Doctoral Seminar in Public Affairs II (3.0 cr)

Research Seminar
- PA 8005: Research Seminar is taken at the end of students' Ph.D. coursework as capstone experience and is a means of developing and refining their research ideas.
- PA 8005 - Research Seminar (3.0 cr)

Research Methods
Minimum of 12 credits in research methods, including at least one course each in: research design, quantitative methods, and qualitative methods. Courses are chosen in consultation with adviser based on student's background and research interests.

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 well-prepared students the opportunity for advanced, rigorous study in the theory, methods, and practice in their field.

Thesis
Minimum of 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.

Public and Nonprofit Management
- PA 8106: Research Seminar in Leadership and Management
- PA 8106 - Research Seminar in Leadership and Management (3.0 cr)
- PA 5012: Politics of Public Affairs
- 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 adviser based on student's background and research interests.

Public Policy
The Public Policy sub-plan is a self-designed set of topic-based courses determined by the student and advisor with the consent of the other faculty in the sub-plan area.
Science, Technology, and Environmental Policy
PA 8706: Science of Science Policy: Theory and Research Methods
   PA 8706 - Science of Science Policy: Theory and Research Methods (3.0 cr)
PA 5702: Science Education or PA 5703: Science Communication
   PA 5702 - Science Education (1.0 cr)
   or PA 5703 - Science Communication (1.0 cr)
PA 5704: STEP Research Seminar
   PA 5704 - STEP Research Seminar (1.0 cr)
PA 5711: Science and Technology Policy
   PA 5711 - Science and Technology Policy (3.0 cr)
Courses in Law, Economics, Decision or Behavioral Science, and Technology
Law: one course from approved list (e.g., renewable energy law, IP law, environmental law); Economics/Finance of Science and
Technology: one course from approved list; Decision Science or Behavioral Science: one course from approved list; Technical Area:
one course from approved list (e.g., renewable energy, nanotechnology, materials science, electrical engineering, biotechnology)

Urban Planning
PA 8206: Planning Theory
   PA 8206 - Planning Theory (3.0 cr)
PA 5204: Urban Spatial and Social Dynamics
   PA 5204 - Urban Spatial and Social Dynamics (3.0 cr)
Urban Planning Electives
Four additional courses to be determined by student and advisor; demonstrated 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 2014
- 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 (M.P.P.) 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; public finance and budgeting; 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 M.P.P./master of business administration; M.P.P./juris doctor; M.P.P./master of public health; and M.P.P./master of social 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 3.00.

A four-year bachelor’s degree from an accredited U.S. university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:
Competence in college-level algebra (including facility with functional notations; algebraic manipulation of polynomials, logs, and exponentials; and graphic representation of equations) is required. A grade of B or better in an introductory course in microeconomics is required. At least one course in political science (that analyzes political institutions) is strongly recommended.

Competence in MS Excel and Word is strongly recommended.

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

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The University of Minnesota is an equal opportunity educator and employer.
Information current as of September 19, 2014
- 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 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 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.

This program offers options for four dual degrees. Each dual degree option within the M.P.P. allows for a different number of credits in common between the two programs:

- M.P.P./M.B.A.: 24 credits in common allowed
- M.P.P./J.D.: 29 credits in common allowed
- M.P.P./M.P.H. - Public Health Practice: 24 credits in common allowed
- M.P.P./M.S.W.: 21 credits in common allowed for full program, 15 for advanced standing, 11 for Direct Practice.

In addition, an accelerated bachelor's/master's (BA/MPP in Political Engagement) is available to University of Minnesota Political Science undergraduate students.

**Core Courses**

- PA 5011 - Management of Organizations (3.0 cr)
- PA 5012 - The Politics of Public Affairs (3.0 cr)
- PA 5021 - Economics For Policy Analysis and Planning I (3.0 cr)
- PA 5031 - Empirical Analysis I (4.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5003 - Introduction to Financial Analysis and Management (1.5 cr)
- PA 5022 - Economics For Policy Analysis and Planning II (1.5 - 3.0 cr)

**Methods Courses**

- PA 5032 - Regression Analysis (2.0 cr)
- or PA 5044 - Regression Analysis, Accelerated (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
- or PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)

**Concentration:** 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 - Working Group (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:** MPP/MBA, MPP/JD, MPP/MPH, MPP/MSW

**Program Sub-plans**
A sub-plan is not required for this program. Students may not complete the program with more than one sub-plan.

**Political Engagement**
This sub-plan is limited to students completing the program under Plan C.

The College of Liberal Arts and the Humphrey School of Public Affairs offer an early-admission opportunity for eligible University of Minnesota Political Science B.A. students also interested in completing the Master’s in Public Policy (M.P.P.). The M.P.P.’s Political Engagement sub-plan enables Political Science majors to take 13 M.P.P. credits during their senior (fourth) year, and to complete the M.P.P. after a fifth year of full-time graduate study plus one summer.

Interested Political Science undergraduates should contact the Department of Political Science adviser for more information. The M.P.P./Political Engagement sub-plan application deadline is December 15th of the student's junior year, and admission to the M.P.P./Political Engagement sub-plan is contingent on a formal admissions process.

Students admitted to the M.P.P./Political Engagement sub-plan must maintain timely degree progress to ensure all undergraduate degree requirements are completed by the end of their fourth year.

The M.P.P.’s Political Engagement sub-plan is open to Political Science undergraduates only. Double majors may apply, but only if they choose to complete the senior project requirement in Political Science.

In addition to Master of Public Policy degree requirements,* students in the Political Engagement sub-plan will take:
- “Political Engagement” (POL 5xxx, 4 credits).
- Methods: At least 3 credits beyond PA 5031: Empirical Analysis. Chosen from a slate of PA and POL methods courses.
- Electives: 15 credits relevant to Political Engagement sub-plan. May be chosen from PA or POL. At least 8 credits must be 8xxx POL. Satisfies MPP concentration requirement.
- Outside electives: 3 credits from outside POL or PA. Number of outside electives may be increased or reduced, in consultation with DGS.
- Research for Mentorship Placement: 1 credit directed reading with adviser.
- Mentorship placement: PA 8991 (3 credits).
- Professional paper: PA 8081, PA 8082, or PA 8921 (3 credits).

(*Political Engagement students are not required to take PA 5012 and PA 5022. They are required to take only 3 credits of methods courses beyond PA 5031.)
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 2014
- 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.

The minor in public policy consists of graduate-level public affairs (PA) courses. 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. Students are required to take a minimum of three credits from those required in the master of urban and regional planning degree program.
**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 2014
- 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.

The M.S. 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 U.S. university or foreign equivalent at time of enrollment.

Other requirements to be completed before admission:

A grade of B or better in introductory microeconomics is required. At least one course in political science (that analyzes political institutions) is strongly recommended. At least one semester of calculus is required. A degree or advanced-level coursework in the natural or engineering sciences is expected. Students who have not taken introductory statistics prior to admission must take PA 5031, above the 36 credits required for the degree.

Competence in MS Excel and Word is strongly recommended.

**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
- TOEFL
  - Internet Based - Total Score: 100
  - Paper Based - Total Score: 700
- 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 20 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 30 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 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.

Students should take 6 credits to complement their previous training: appropriate courses in natural or engineering science or its history or philosophy for those with social science backgrounds; appropriate courses in the social sciences for those with natural or engineering science backgrounds.

Elective credits are chosen in consultation with the student’s adviser.

Students who have not taken prior coursework in statistics must demonstrate to their advisers that they have adequate preparation in statistics or must take Empirical Analysis I (PA 5031). PA 5031 does not count toward fulfilling the 36-credit minimum requirement.

**Required Core Courses**

- PA 5012 - The Politics of Public Affairs (3.0 cr)
- PA 5021 - Economics For Policy Analysis and Planning I (3.0 cr)
- PA 5002 - Introduction to Policy Analysis (1.5 cr)
- PA 5711 - Science and Technology Policy (3.0 cr)
- PA 5722 - Environmental and Resource Economics Policy (3.0 cr)
- PA 5715 - Survey of Current Issues in Science, Technology, and Environmental Policy (1.5 cr)

**At least one of the following:**

- PA 5723 - Water Policy (3.0 cr)
- or PA 5721 - Energy and Environmental Policy (3.0 cr)
- or PA 5731 - Emerging Technologies and Society (3.0 cr)
- or PA 5741 - Risk Analysis and Policy (3.0 cr)
- or PA 5751 - Urban Infrastructure Systems for Sustainable and Healthy Cities (3.0 cr)

**Methods Courses**

- PA 5032 - Regression Analysis (2.0 cr)
- or PA 5044 - Regression Analysis, Accelerated (2.0 cr)
- PA 5033 - Multivariate Techniques (2.0 cr)
- or PA 5041 - Qualitative Methods for Policy Analysts (4.0 cr)

**Plan B Paper or Plan A Thesis**

**Electives**

Electives to bring total credits to at least 40.

**Joint- or Dual-degree Coursework:** Joint Degree Program in Law, Health, and the Life Sciences (M.S.-S.T.E.P./J.D.) 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 2014
- 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 in science, technology, and environmental policy 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.

**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.

The minor in public policy consists of graduate-level public affairs (PA) courses. 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. Students are required to take a minimum of three credits from those required in the M.S.-STEP degree program.
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 2014
• 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 (M.U.R.P.) 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 M.U.R.P. 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
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.

Other requirements to be completed before admission:
Competence in college-level algebra (including facility with functional notations, algebraic manipulation of polynomials, logs, and exponentials, and graphic representation of equations) is required. A grade of B or better in an introductory course in microeconomics is required. (A macroeconomics or single-semester general economics course will not satisfy this requirement.) At least one course in political science (that analyzes political institutions) is strongly recommended.

Competence in MS Excel and Word is strongly recommended. M.U.R.P. students must demonstrate competence with GIS through coursework or work experience. (Students not competent in GIS must take a GIS course as part of their 48 credits).

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 32 major credits, 6 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.

This program offers options for five dual degrees. Each dual degree option allows a different number of credits in common between the two degrees:

- M.U.R.P./M.L.A.: 37 credits in common allowed. (Applications to the joint M.U.R.P./M.L.A. degree are not currently being accepted.)
- M.U.R.P./M.S.W.: 21 credits in common allowed for the full program; 15 for advanced standing; and 11 for M.S.W. Direct Practice.

Required Core Courses

- PA 5004 - Introduction to Planning (3.0 cr)
- PA 5013 - Law and Urban Land Use (1.5 cr)
- PA 5031 - Empirical Analysis I (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)

Concentration

12-credit concentration (Plan C) or 6-credit concentration (Plan A)

Electives or Thesis Credits

Plan C students complete additional elective credits to meet the 48-credit minimum. Plan A students complete the required 10 thesis credits and additional elective credits to meet the 48-credit minimum.
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 2014
• 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.

The minor in urban and regional planning consists of graduate-level public affairs (PA) courses. 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. Students are required to take a minimum of three credits from those required in the master of urban and regional planning degree program.
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 2014
- 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 (M.A. and M.S.) and doctoral students and is individually tailored to their academic interests.

Accreditation
This program is accredited by American Bar Association (ABA)

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. To request admission to Law School courses, complete a declaration form and the non-Law student petition form (found at http://www.law.umn.edu/legaledprograms/non-id-students.html) and forward 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 master's minor requires at least 6 graduate credits; a doctoral minor requires at least 12 graduate credits.
Twin Cities Campus

Master of Science Patent Law
Law School

Link to a list of faculty for this program.

Contact Information:
612-625-4819

Chris Frank, J.D., Program Director of Master of Science in Patent Law Program
411 Walter F. Mondale Hall
229 19th Avenue South
Minneapolis, MN 55455
Email: patlaw@umn.edu
Website: http://www.law.umn.edu/legaledprograms/mspl.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 36
- 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 one year, full time, professional master's degree for scientists and engineers interested in pursuing a career in the growing field of patent law. This program is offered through the University of Minnesota Law School. Students in this program will learn practical patent drafting, patent research, patent portfolio management and innovation skills. Many courses in this program will be taken jointly with J.D. students.

Program Delivery
This program is available:
- via classroom (the majority of instruction is face-to-face)

Prerequisites for Admission
Science and Engineering 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 to 36 major credits and 0 credits outside the major. There is no final exam. A capstone project is required.
Capstone Project: CAPSTONE: Innovation (3 credits): In this course students will 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**

Students are required to take 24 credits of core coursework, plus 6 additional credits as approved by the program director.

- LAW 5000 - Introduction to the American Legal System (2.0 cr)
- LAW 5224 - Patents (3.0 cr)
- LAW 5231 - Patent Prosecution Practice I (2.0 - 3.0 cr)
- LAW 5250 - Patent Portfolio Management (3.0 cr)
- LAW 5003 - Writing, Analysis & Persuasion (2.0 cr)
- LAW 5025 - Patent Law Proseminar I (1.0 cr)
- LAW 5232 - Patent Prosecution Practice II (3.0 cr)
- LAW 5255 - Patent Transactions (2.0 cr)
- LAW 5290 - Patent Law Capstone: Innovation (3.0 cr)
- LAW 5075 - Ethics for Patent Agents (1.0 cr)
- LAW 5026 - Patent Law Proseminar II (1.0 cr)
Twin Cities Campus
Experimental Surgery M.S. Exp.Surg.
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, MMC 328, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-2590)
Email: surgwww@umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g167.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 42
- This program requires summer semesters for timely completion.
- Degree: Master of Science in Experimental 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 program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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 26 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 towards program requirements is not permitted.
Twin Cities Campus
Experimental Surgery Minor
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, MMC 326, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-2590)
Email: surgwww@umn.edu
Website: http://www.catalogs.umn.edu/grad/programs/g167.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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**

**Integrative Biology and Physiology M.S.**

*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: 612-625-5149)  
Email: ibpdept@umn.edu  
Website: [http://physiology.med.umn.edu/index.html](http://physiology.med.umn.edu/index.html)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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**

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

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/grad/index.html

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.
Twin Cities Campus

Integrative Biology and Physiology Ph.D.

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://www.umnphysiology.com/grad/home

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• Length of program in credits: 53
• 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. Ph.D. 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 a cardiovascular emphasis, although many other areas of specialization are represented.

Students can enter the Ph.D. 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 Ph.D. 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
The preferred undergraduate GPA for admittance to the program is 3.50.

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 either the General Test of the GRE or the Medical College Admission Test. In addition, all applicants need three letters of recommendation. Admission can be in either fall (preferable) or 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
17 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 4 semesters must be completed before filing a Degree Program Form.

The Ph.D. 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 adviser. During the first year, students rotate through three laboratories, attend weekly seminars, choose an adviser, 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.

Minor Requirements for Students Majoring in Other Fields: Ph.D. students are expected to take PHSL 5101 or the equivalent plus additional courses for a total of 12 credits.
Twin Cities Campus

Medical Physics M.S.

Radiation Oncology Administration, Radiology

Medical School

Link to a list of faculty for this program.

Contact Information:
University of Minnesota Medical School, Department of Radiation Oncology, Mayo Mail Code 494, 420 Delaware Street S.E., Minneapolis, MN 55455 (phone: 612-626-6154; fax: 612-626-7060)
Email: gerbi001@umn.edu
Website: http://www.med.umn.edu/trad/GraduateProgram/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 departments that include radiation oncology, radiology, physics, engineering, computer science, physiology, dentistry, and biochemistry. In addition to providing clinical experience in areas such as radiation oncology, radiation safety and quality assurance, the program is active in research and provides graduate level training in medical physics. 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 oncology or diagnostic radiology, and (3) to provide the mathematical and technical knowledge needed to succeed in the increasingly complex 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 2.80.

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 are required. The General Test of the GRE is required. The computer based GRE exam is provided year round by the Educational Testing Service. A list of test centers can be found at: http://www.ets.org/gre. Our institution code is R6874 with no department code. If the GRE was taken more than two years prior to application, the applicant will need to retake the examination. We have no absolute GRE cutoff score, but the score is taken into consideration among many individual factors in the evaluation of each application. Applicants are considered for admission in both semesters.

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 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.

The M.S. is offered under one plan. Plan B students complete a project under the direction of a faculty member/advisor, submit a written document to their oral exam committee, and defend their work in front of the committee.

**Required Courses M.S.**

- MPHY 5170 - Basic Radiological Physics (3.0 cr)
- PHYS 5401 - Physiological Physics (4.0 cr)
- MPHY 5138 - Research Seminar (1.0 - 5.0 cr)
- MPHY 5173 - Medical and Health Physics of Radiation Therapy (3.0 cr)
- PHYS 5402 - Radiological Physics (4.0 cr)
- PHAR 5201 - Applied Health Sciences Terminology (2.0 cr)
- MPHY 5171 - Medical and Health Physics of Imaging I (3.0 cr)
- MPHY 5172 - Radiation Biology (3.0 cr)
- MPHY 5174 - Medical and Health Physics of Imaging II (3.0 cr)
- MPHY 5139 - Seminar and Journal Club (1.0 cr)

**Medical Physics Electives**

Other electives as advised.

- MPHY 5177 - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
- or MPHY 8149 - Advanced Topics in Radiation Therapy Physics (2.0 cr)
- or MPHY 8148 - Advanced Digital Imaging Science (3.0 cr)
- or MPHY 8147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 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:
Therapeutic Radiology, Dept of MMC 494 Mayo 8494A 420 Delaware St SE Minneapolis, MN 55455
Email: gerbi001@umn.edu
Website: http://www.med.umn.edu/trad/GraduateProgram/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 departments that include radiation oncology, radiology, physics, engineering, computer science, physiology, dentistry, and biochemistry. In addition to providing clinical experience in areas such as radiation oncology, radiation oncology, radiation safety and quality assurance, the program is active in research and provides graduate level training in medical physics. 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 oncology or diagnostic radiology, and (3) to provide the mathematical and technical knowledge needed to succeed in the increasingly complex 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 are required. The General Test of the GRE is required. The computer based GRE exam is provided year-round by the Educational Testing Service. A list of test sites can be found at: http://www.ets.org/gre. Our institution code is R6874 with no department code. If the GRE was taken more than two years prior to application, the applicant will need to retake the examination. We have no absolute GRE cutoff score, but the score is taken into consideration among many individual factors in the evaluation of each application. Applicants are considered for admission in both semesters.

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 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.

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. Additionally, 24 thesis credits are required.

Required Courses
- MPH5170 - Basic Radiological Physics (3.0 cr)
- PHYS 5401 - Physiological Physics (4.0 cr)
- MPH5138 - Research Seminar (1.0 - 5.0 cr)
- MPH5173 - Medical and Health Physics of Radiation Therapy (3.0 cr)
- PHYS 5402 - Radiological Physics (4.0 cr)
- PHAR 5201 - Applied Health Sciences Terminology (2.0 cr)
- MPH5171 - Medical and Health Physics of Imaging I (3.0 cr)
- MPH5172 - Radiation Biology (3.0 cr)
- MPH5174 - Medical and Health Physics of Imaging II (3.0 cr)
- MPH5177 - Radiation Therapy Physics Lab: Radiation Physics Basics (3.0 cr)
- MPH5149 - Advanced Topics in Radiation Therapy Physics (2.0 cr)
- MPH5139 - Seminar and Journal Club (1.0 cr)

Medical Physics Electives
- Electives will be based on focus of program objectives with advisor.
  MPH58148 - Advanced Digital Imaging Science (3.0 cr)
  or MPH58147 - Advanced Physics of Magnetic Resonance Imaging (MRI) (3.0 cr)
  or Other electives as advised.

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, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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
The preferred undergraduate GPA for admittance to the program is 3.50.

Applicants must have a bachelor's degree (B.S. preferred).

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
  - Paper Based - Total Score: 600
- IELTS
  - Total Score: 7
- MELAB
  - Final score: 85

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 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, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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
The preferred undergraduate GPA for admittance to the program is 3.50.

Applicants must have a bachelor's degree (B.S. 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.

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

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
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.
Twin Cities Campus
Microbiology, Immunology, and Cancer Biology Ph.D.
Medical School - Adm
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Microbiology, 1460 Mayo Building, 420 Delaware Street S.E., Minneapolis MN 55455 (612-624-5947; fax: 612-626-0623)
Email: micab@umn.edu
Website: http://micab.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 48 to 72
- This program does not require summer semesters for timely completion.
- NA
- 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
The preferred undergraduate GPA for admittance to the program is 3.50.

Applicants must have a bachelor's degree (B.S. 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 (GPA and GRE scores), letters (3) of recommendation, a personal statement, and research experience. The average GPA and GRE scores of accepted applicants are typically 3.50 and 80th percentile, respectively (no GRE Subject Test is required). Letters of recommendation from research advisers or mentors are preferred as these individuals can comment knowlegably 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.

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
  - 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 (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
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 adviser by doing laboratory rotations, selecting a concentration, and initiating their thesis research project. The program encourages students to take at least two of the three MICA8 track core courses, but only requires one. In the fall semester of their second year, all students take MICA 8012, which highlights the integrated nature of the three tracks 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 Ph.D. in four to five years.
Twin Cities Campus
Neuroscience M.S.
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: Master's
- Requirements for this program are current for Fall 2014
- 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
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 2014
• 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 S.E., Minneapolis, MN 55455 (612-626-6474; fax: 612-626-6460)  
Email: neurosci@umn.edu  
Website: [http://www.neuroscience.umn.edu](http://www.neuroscience.umn.edu)

- Program Type: Doctorate  
- Requirements for this program are current for Fall 2014  
- Length of program in credits: 50  
- 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](http://www.neuroscience.umn.edu) 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), 263 (computer), or 107 (Internet); or obtain 6.5 on the IELTS examination. There are no minimum GPA or GRE score requirements.

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](http://www.neuroscience.umn.edu) section of the catalog website.

**Program Requirements**

20 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 4 semesters must be completed before filing a Degree Program Form.

The neuroscience Ph.D. 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 adviser.

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 adviser.

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, psychology, and medicine; medicine is primarily for students in the M.D. Ph.D. program). Students are also expected to participate in teaching neuroscience and to attend the weekly colloquium, 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)

### 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)

### Spring - Second Year
- **NSc 8320: Neuroscience Seminar Series Journal Club (Section 2)** (1 cr)
Twin Cities Campus
Orthoptics Post-baccalaureate Certificate
Ophthalmology
Medical School

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 2014
• 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 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.

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 S.E., Minneapolis, MN 55455 (612-625-3200; fax: 612-625-2101)
Website: http://www.ent.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 55
- 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 laboratories of audiology, auditory electrophysiology, auditory neurophysiology, biochemistry, cancer biology, cell biology and genetics, electron microscopy, electrophysiology, histochemistry, morphometry, psychoacoustics, temporal bone pathology, tumor immunology, skin-flap physiology, laryngeal physiology, mandibular bone physiology, microvascular tissue transfer, 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
Other requirements to be completed before admission:
Requires a bachelor's or master's degree, preferably in an area related to otolaryngology or, for those pursuing the degree in conjunction with a residency in otolaryngology, an M.D. degree.

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

Program Requirements
19 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 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 number of credits varies depending on preparation and the research undertaken. Most students take a total of about 55 credits. A minimum of 12 credits in the minor or supporting program, plus 24 doctoral thesis credits, are required. An advisory committee, including the student, the adviser, and the director of graduate studies, determines coursework in the major. At least one seminar is selected from seminars such as OTOL 8247, 8248, 8249, and 8250. 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 concurrently in an otolaryngology residency usually take five to six years to complete research, course, and dissertation requirements.
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 (612-625-9997; 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 2014
• 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 B.A. or B.S. 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, GRE score, previous research experience, and letters of recommendation.

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.

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: 7.5

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 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 3.0. 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 2014
- 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.
Medicine School

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: Doctorate
- Requirements for this program are current for Fall 2014
- 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 B.A. or B.S. 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, GRE score, previous research experience, and letters of recommendation.

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.

Applicants must submit scores from the General Test of the GRE, with scores above the 80th percentile in all categories preferred.

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: 7.5

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
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.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Program in Physical Therapy, MMC 388, 420 Delaware Street S.E., Minneapolis, MN 55455, (612-624-2662; fax: 612-625-4274)
Email: ptquest@umn.edu
Website: http://physther.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 141
- This program requires summer semesters for timely completion.
- Courses in this Program are taught on campus for the first 7 semesters, with numerous off-site clinic visits scheduled throughout semester 2-7. The remaining 2 semesters of the Program consist of 4 full-time clinical internships. These internships 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 Physical Therapy Program, a division within the Department of Physical Medicine and Rehabilitation, offers a professional doctoral degree in physical therapy (D.P.T.). Physical therapy is a health care 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 Program in 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 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 only is required. TOEFL is required for international students. Two letters of recommendation.

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 Advanced Placement (AP) credit. A minimum grade of C is required in all prerequisite coursework. It is recommended 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 lab
- A second biology course of the student's choice, with lab
- Human anatomy
- Human physiology
- General chemistry or inorganic chemistry - minimum two courses, with lab
- General physics, which includes mechanics and electricity - minimum two courses, with 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 a 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.

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 human/animal biology classes have been helpful preparation for the D.P.T. curriculum.

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
141 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.

The program requires 141 major field credits, of which 101 are core academic credits and 40 are clinical internship credits. Nine credits of research are included in the core academic credits and a scientific poster presentation and written exam based on this research culminates the project. No minor or related field is required. Students must maintain a cumulative GPA of 2.80 while in the program.
Twin Cities Campus
Rehabilitation Science M.S.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street S.E., Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 33
- 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: The Rehabilitation Science Program prefers Ph.D. applicants over M.S. applicants. The M.S. track often applies to students who are in need of a trial program to determine whether or not the Ph.D. track is a good fit. In addition, the M.S. track is used for students who initially begin the Ph.D., but find that the Ph.D. is not the best fit and subsequently switch to the M.S.

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 US equivalent 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:
In addition to the University's application (including personal statement and fee), applicants must submit the following materials: GRE General Test scores (scores in the 60th percentile or higher are preferred); official transcripts; three letters of reference; and TOEFL score for international students. 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.

The Rehabilitation Science Program prefers Ph.D. applicants over M.S. applicants. The M.S. track often applies to students who are in need of a trial program to determine whether or not the Ph.D. track is a good fit. In addition, the M.S. track is used for students who initially begin the Ph.D., but find that the Ph.D. is not the best fit and subsequently switch to the M.S.

GRE score is mandatory. Scores in the 50th percentile or higher are preferred.

Applicants must submit their test score(s) from the following:
- GRE
General Test - Verbal Reasoning: 154
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: 23
  - 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

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, 9 credits outside the major, and 10 thesis credits. The final exam is written and oral.

**Plan B:** Plan B requires 14 to 21 major credits and 9 to 16 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The Plan B project is a demonstration of the student’s 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 graduate faculty in each major field may require as many as three such projects. The Plan B project(s) should involve a combined total of approximately 120 hours (the equivalent of three full-time weeks) of work. The graduate faculty in each major field 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 3.00 is required for students to remain in good standing.

At least 1 semesters must be completed before filing a Degree Program Form.

M.S. Plan A students must complete a minimum of 23 graduate course credits, in addition to 10 thesis credits. MS Plan B students must complete a minimum of 30 graduate course credits. The break down of credit requirements is as follows for both Plan A and Plan B: 14 credits or more of RSC course work, which include 4 credits from a core group of courses (RSC 5106, RSC 5206, RSC 5306, RSC 8106, RSC 8206, RSC 8306); 3 credits of statistics coursework (acceptable courses include, but are not limited to PUBH 6450 - Biostatistics I, PUBH 6451 - Biostatistics II, EPSY 8261 - Statistical Methods I, EPSY 8262 - Statistical Methods II), and 6 or more additional graduate credits from Rehab Science or from other graduate disciplines. For Plan B students, the remaining 7 graduate credits are determined in consultation with the student's advisor. Students may minor in a supporting field, but minors are not required. Minor areas of past students include gerontology, kinesiology, and public health. If a student chooses to declare a minor, the student must follow the minor requirements of the program offering the minor. The student's adviser may require additional courses. Students pursuing Plan A (with thesis) have the additional requirement of registering for 10 thesis credits.
**Twin Cities Campus**

**Rehabilitation Science Minor**

*Physical Medicine & Rehabilitation*

**Medical School**

Link to a list of faculty for this program.

**Contact Information:**
Department of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street S.E., Minneapolis, MN, 55455 (612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: [http://www.rehabscience.umn.edu](http://www.rehabscience.umn.edu)

- **Program Type:** Graduate minor related to major
- **Requirements for this program are current for Fall 2014**
- **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.rehabscience.umn.edu) 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](http://www.rehabscience.umn.edu) section of the catalog website.

**Program Requirements**
Use of 4xxx courses towards program requirements is not permitted.

Master's students must complete a minimum of 6 RSC credits. Doctoral students must complete a minimum of 12 RSC credits. All students pursuing the minor must take the RSC courses on the A-F grade basis, and maintain at least a 3.0 GPA in those courses. Up to 2 RCS independent study credits are allowed for the master's, and up to 4 RCS independent study credits are allowed for the doctoral degree.
Below is a list of eligible rehabilitation science courses. Independent courses are indicated with an asterisk (*).

RSC 5101 - Math Tools for Research Applications (1 cr)
RSC 5106 - RSC Past, Present, Future (1 cr)
RSC 5135 - Advanced Biomechanics I: Kinematics (3 cr)
RSC 5200 - Intro to TMS
RSC 5206 - Academic Ethos (1 cr)
RSC 5231 - Clinical Biomechanics (3 cr)
*RSC 5294 - Independent Study in Rehabilitation Science (credits arranged)
RSC 5306 - Scientific and Professional Presentation (1 cr)
RSC 5814 - Age, Exercise, and Rehabilitation (2 cr)
RSC 5841 - Rehabilitation Science Instrumentation and Methodology (4 cr)
RSC 5901 - Scholarly Inquiry in Health Sciences (4 cr)
RSC 8106 - Critical Analysis of Scientific Literature (2 cr)
*RSC 8130 - Current Literature (credits arranged)
*RSC 8170 - Special Topics in Rehabilitation Science (credits arranged)
*RSC 8185 - Problems in Rehabilitation Science (credits arranged)
RSC 8192 - Research Design in Rehabilitation Science (3 cr)
RSC 8206 - Grant Writing (2 cr)
RSC 8282 - Problems in Human Movement (4 cr)
RSC 8306 - Peer Review and Publication (2 cr)
Twin Cities Campus
Rehabilitation Science Ph.D.
Physical Medicine & Rehabilitation
Medical School

Link to a list of faculty for this program.

Contact Information:
Dept of Physical Medicine and Rehabilitation, MMC 388, 420 Delaware Street SE, Minneapolis, MN, 55455 (phone: 612-625-3966; fax: 612-625-4274)
Email: adamc002@umn.edu
Website: http://www.rehabscience.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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. 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.

Professional, graduate, or master's degree preferred but not required.

Other requirements to be completed before admission:
Applicants must hold a US equivalent 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:
In addition to the University's application (including personal statement and fee), applicants must submit the following materials: official GRE General Test scores (scores in the 60th percentile or higher are preferred); official transcripts; three letters of recommendation; and TOEFL scores for international students. Student must also have an agreed-upon faculty adviser at the time applying. Compatibility of research interests is a major determinant in the student/adviser relationship.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 154
  - 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: 23
- 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

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.
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.

The Ph.D. degree requires a minimum of 36 graduate credits, in addition to 24 dissertation credits. The minimum of 36 graduate credits is broken down as follows: 16 credits of Rehabilitation Science (RSC) credits, which include 6 credits of departmental core courses (RSC 5106, RSC 5206, RSC 5306, RSC 8106, RSC 8206, RSC 8306); 12 additional graduate credits which may be a combination of RSC courses or courses from other disciplines; and 8 graduate credits of approved statistics coursework. Minors are allowed, but not required. Sample minors of past students include gerontology, neuroscience, and public health. If a student chooses to declare a minor, the student must follow the minor requirements of the program offering the minor. RSC courses and statistics courses cannot be applied to the credits needed for the minor degree. Acceptable statistics courses include, but are not limited to: PUBH 6450 - Biostatistics I, PUBH 6451 - Biostatistics II, EPSY 8261 - Statistical Methods I, and EPSY 8262 - Statistical Methods II. To fulfill the requirement students need to take both courses in the respective series (Biostats I and Biostats II; Stat Methods I and Stat Methods II). Students cannot fulfill the statistics requirement by taking only PUBH 6450 - Biostatistics I and EPSY 8261 - Statistical Methods I. In addition to these minimum requirements, the adviser may require additional courses. Students should meet with their advisers prior to each semester to plan their courses of study.

Joint- or Dual-degree Coursework: DPT/PhD-Rehabilitation Science
Twin Cities Campus

Stem Cell Biology M.S.
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 S.E., 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/master_of_science/home.htm

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 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. This research will form the basis of the master's thesis.

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 1) a personal statement (500 words or less) outlining previous research experience, research interests, and long- and short-term goals; 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 to the Apply Yourself on-line application web site.

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
  - 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 14 to 16 major credits, 4 to 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 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, by completing a master's thesis and taking an oral exam.

The M.S. is a multidisciplinary program that prepares the basic science undergraduate for a career in research, teaching, or industry within the field of stem cell biology. In addition to taking courses in two or three semesters, students will concurrently conduct research for a full calendar year; this research will form the basis for the thesis.

**Required Courses**

All students are required to take these courses.

**Required Courses**

- **SCB 5051** - Stem Cell Biology Practical Training Module (1.0 cr)
- **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**

At least one of these courses is required.

- **BIOC 8002** - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- or **GCD 4034** - Molecular Genetics (3.0 cr)

**Required courses - at least one of these three is required.**

At least one of these courses is required.

- **GCD 8161** - Advanced Developmental Biology (3.0 cr)
- or **GCD 8008** - Mammalian Gene Transfer and Expression (2.0 cr)
- or Either 5xxx or 8xxx level course, must be approved by SCB program before registration.
Twin Cities Campus
Stem Cell Biology 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 S.E., Mail Code 2873, Minneapolis, MN 55455-3007 (612-625-0602; fax: 612-624-2436)
Email: SCBgrad@umn.edu
Website: http://www.stemcell.umn.edu/graduate_programs/master_of_science/home.htm

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 12
- Length of program in credits (Doctorate): 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.

This degree program 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, 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. This research will form the basis of the master's thesis.

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 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.
Twin Cities Campus
Surgery M.S. Surg.
Surgery
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 (612-626-2590)
Email: surgwww@umn.edu
Website: http://www.surg.umn.edu

• Program Type: Master's
• Requirements for this program are current for Fall 2014
• Length of program in credits: 63
• 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 program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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:
Prospective students must be in the general surgery training program and have two to three clinical years of training completed.

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 47 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.

The master's degree in surgery (M.S.Surg.) is offered Plan A only. Students spend two to three years in the Medical School's general surgery program. A minimum of 53 course credits (47 in the major, plus 6 in the minor or related fields) plus 10 thesis credits are required for a total of 63 credits.
Twin Cities Campus
Surgery Ph.D. Surg.
Surgery
Medical School

Link to a list of faculty for this program.

Contact Information:
Department of Surgery, University of Minnesota, MMC 328, 420 Delaware Street S.E., Minneapolis, MN 55455
Email: surgwww@umn.edu
Website: http://www.surg.umn.edu

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• Length of program in credits: 103
• This program requires summer semesters for timely completion.
• Degree: Doctor of Philosophy 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.

*Candidates are currently in our training program and we do not accept outside applications.

The general surgery program trains medical doctors for the practice of surgery and for academic positions. See the Medical School Catalog for professional degree requirements; see below for academic degree requirements. Trainees spend two to three years in laboratory research, either in a basic science or in surgery, after which they begin their senior residency and chief residency training. The Medical School's laboratory departments offer many graduate courses closely related to surgery (see the graduate programs in biochemistry, molecular biology, and biophysics; cellular and integrative physiology; microbiology, immunology, and molecular pathobiology; and pharmacology). These fields also offer opportunities for research work. The Department of Surgery offers supervised work in its experimental research laboratories, as well as in its hospital and outpatient departments in the areas of surgical diagnosis and operative surgery and in some surgical specialties (such as colon and rectal surgery, transplantation, thoracic and cardiovascular surgery, and pediatric surgery).

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:
Prospective students must be in the general surgery training program and have two to three clinical years of training completed.

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

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
67 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.
Twin Cities Campus

Adult Health/Gerontological Clinical Nurse Specialist 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 2014
- Length of program in credits: 12
- 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 (D.N.P.) 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 D.N.P. 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.

Please contact the School of Nursing for detailed information about the requirements for this certificate.

Courses may include:
- 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 cr)
- NURS 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (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 (3.0 cr)
- NURS 7705 - The Adult and Gerontological Clinical Nurse Specialist in Acute Care (2.0 cr)
Twin Cities Campus

Adult Health/Gerontological Nurse Practitioner 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 2014
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Adult Hlth/Geron 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.

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 D.N.P. 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.

Please contact the School of Nursing for detailed information about the requirements for this certificate.

**Courses may include:**
- **NURS 6307** - Women's Health Care 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 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 (3.0 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)
Twin Cities Campus

Doctor of Nursing Practice D.N.P.

School of Nursing

Link to a list of faculty for this program.

Contact Information:
Office of Student Career & Advancement Services, 5-160 Weaver Densford Hall, 308 Harvard Street S.E., 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 2014
- Length of program in credits: 37 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 (D.N.P.) Program is offered as the post-baccalaureate with specialty (13 specialties). The School of Nursing also offers the Post-Master's D.N.P. Program (35-36 credits) for students who have completed a master's degree in a nursing practice specialty.

The D.N.P. 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. D.N.P. 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. D.N.P. 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 specialty coursework in public health, organizational leadership, informatics, and integrative health and healing
4. Scholarly Leadership Project - Completed by all students in a three-semester sequence during which the project is planned, implemented, evaluated, and disseminated

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 D.N.P. and post-master's D.N.P. programs require an entry-level nursing degree (e.g. B.S.N., B.A.N., post-baccalaureate certificate in nursing, or entry-level master of nursing)

A graduate degree is not required for admission to the post-baccalaureate D.N.P. program.

Applicants for the post-master's D.N.P. 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 D.N.P. program: September 1 for the nurse anesthesia specialty. All other specialties have November 1 for priority consideration, with applications accepted on a space available basis until March 1.

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 144

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 (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
37 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.

Core Courses
- NURS 6200 - Science of Nursing Intervention (3.0 cr)
- NURS 7100 - DNP Seminar I (2.0 cr)
- NURS 7101 - DNP Seminar II (3.0 cr)
- NURS 7102 - DNP Seminar III (2.0 cr)
- NURS 7110 - DNP Project Direction I: Planning (1.0 cr)
- NURS 7111 - DNP Project Direction II: Implementation (1.0 cr)
- NURS 7112 - DNP Project Direction III: Evaluation (1.0 cr)
- NURS 7300 - Program Evaluation (3.0 cr)
- NURS 7400 - Health Policy Leadership (3.0 cr)
- NURS 7600 - Nursing Research and Evidence Based Practice (4.0 cr)
- NURS 7610 - Health Innovations and Leadership (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)

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 D.N.P. 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 D.N.P. 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 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 Coursework**

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
NURS 5222 - Advanced Physiology (3.0 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 cr)
NURS 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (3.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 7406 - Advanced Nursing Practicum in Adult-Gerontology Health (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)

Statistics: As approved by D.N.P. specialty

**Adult/Gerontological Nurse Practitioner**

The D.N.P. program with a specialty in adult health and gerontological nursing as a nurse practitioner prepares nurses for leadership as advanced practice nurses and clinical experts to provide advanced nursing care to adults in a variety of settings. This D.N.P. program is designed 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 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 Coursework**

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
NURS 5222 - Advanced Physiology (3.0 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 - Women's Health Care 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 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 (3.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 7406 - Advanced Nursing Practicum in Adult-Gerontology Health (3.0 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)

Statistics: As approved by D.N.P. specialty

**Women's Healthcare Nurse Practitioner or (NP)**

The D.N.P. program with a specialty in women's health prepares nurses for leadership as advanced practice nurses. This D.N.P. program is for students who hold a baccalaureate degree in nursing, and involves both coursework and clinical practicum experiences 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 Coursework**

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
- NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
- NURS 5222 - Advanced Physiology (3.0 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 6502 - Assessment and Management of Health for Advanced Practice Nurses, II (3.0 cr)
- NURS 6925 - Advanced Concepts in Women's Health Care I (3.0 cr)
- NURS 6926 - Advanced Concepts in Women's Health for WHNP Practicum I (1.0 cr)
- NURS 6927 - Adv Concepts in Womenâ€™s Health II (2.0 cr)
- NURS 6928 - Adv Concepts in Womenâ€™s Health II WHNP Pract (1.0 cr)
- NURS 7000 - DNP Proseminar (1.0 cr)
- NURS 7200 - Economics of Health Care (3.0 cr)
- NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
- NURS 7310 - ANP/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 U.S. to be accredited to offer the entry-level D.N.P.

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 D.N.P. degree, as well as the requirements to take the National Certification Exam for nurse anesthetists.

**Required Coursework**

- NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
- NURS 5222 - Advanced Physiology (3.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 5229 - Clinical Pharmacotherapeutics (2.0 - 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)
- NURS 6911 - Basic Nurse Anesthesia Principles Practicum I (1.0 cr)
- NURS 6912 - Nurse Anesthesia Care: Cardiothoracic Disease Practicum (3.0 cr)
- NURS 6913 - Nurse Anesthesia Care: Special Populations Practicum (4.0 cr)
- NURS 7000 - DNP Proseminar (1.0 cr)
- NURS 7004 - Nurse Anesthesia Practicum A (5.0 cr)
- NURS 7005 - Nurse Anesthesia Practicum B (5.0 cr)
- NURS 7006 - Nurse Anesthesia Practicum C (5.0 cr)
- NURS 7200 - Economics of Health Care (3.0 cr)
Family Nurse Practitioner
The D.N.P. program with a specialty in the family nurse practitioner (FNP) area of study prepares nurses for leadership as advanced practice nurses. The three-year D.N.P. 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 Coursework
- **CSPH 5101** - Introduction to Integrative Healing Practices (3.0 cr)
- **NURS 5115** - Interprofessional Health Care Informatics (3.0 cr)
- **NURS 5200** - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
- **NURS 5222** - Advanced Physiology (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 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 (3.0 cr)
- **NURS 7000** - DNP Proseminar (1.0 cr)
- **NURS 7200** - Economics of Health Care (3.0 cr)
- **NURS 7202** - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
- **NURS 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** - Assessment Management of Health Practicum V: Clinical Specialty Care for Family Nurse Practitioner (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)

Statistics: As approved by D.N.P. specialty

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 D.N.P. 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.

Required Coursework
- **COMM 5441** - Communication in Human Organizations (3.0 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 Coursework

HINF 5510 - Applied Health Care Databases: Database Principles and Data Evaluation (3.0 cr)
CSPH 5711 - Optimal Healing Environments (3.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (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)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7105 - Knowledge Representation and Interoperability (2.0 cr)
NURS 7106 - Knowledge Representation and Interoperability Practicum (2.0 cr)
NURS 7108 - Population Health Informatics (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 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
Statistics: As approved by D.N.P. specialty

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.

**Required Coursework**

- CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1.0 cr)
- NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
- CSPH 5226 - Advanced Meditation: Body, 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 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 5631 - Healing Imagery I (2.0 cr)
- CSPH 5701 - Fundamentals of Health Coaching I (4.0 cr)
- CSPH 5711 - Optimal Healing Environments (3.0 cr)

Integrative Therapies (Consult with faculty advisor for approved courses.)

- NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
- NURS 5222 - Advanced Physiology (3.0 cr)
- NURS 5228 - Pharmacology for Advanced Practice Nursing (2.0 cr)
- NURS 7000 - DNP Proseminar (1.0 cr)
- NURS 7200 - Economics of Health Care (3.0 cr)
- NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
- NURS 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)

Statistics: As approved by D.N.P. specialty

- CSPH 5533 - Introduction to Energy Healing (2.0 cr)
  or CSPH 5535 - Reiki Healing (1.0 cr)
- CSPH 5536 - Advanced Reiki Healing: Level II (1.0 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. D.N.P. 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 complete a systems change project while in the program. D.N.P. midwifery graduates will be prepared to more quickly fulfill leadership roles in the health care setting.

Trip to campus to interact with faculty and other students allow for development of a professional learning community and complete a systems change project while in the program. D.N.P. midwifery graduates will be prepared to more quickly fulfill leadership roles in the health care setting.

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.
Required Coursework

CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
NURS 5222 - Advanced Physiology (3.0 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 6501 - Assessment and Management of Health for Advanced Practice Nurses, I (3.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 7213 - Midwifery Clinical and Professional Integration (3.0 cr)
Statistics: As approved by D.N.P. specialty
Women's Reproductive Healthcare 2
Women's Healthcare Practicum

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.

PCNSs 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 Coursework

NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 cr)
NURS 5222 - Advanced Physiology (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 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 7000 - DNP Proseminar (1.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 6929 - Advanced Nursing Care of Children with Acute Illness for Pediatric Clinical Nurse Specialists
OLPD 5556 - Disability Policy and Services (3.0 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)
Statistics: As approved by D.N.P. specialty

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 (C SHCN) 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.

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 Coursework

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 5115</td>
<td>Interprofessional Health Care Informatics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5200</td>
<td>Holistic Health Assessment and Therapeutics for Advanced Practice Nurses</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5222</td>
<td>Advanced Physiology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5228</td>
<td>Pharmacology for Advanced Practice Nursing</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 5229</td>
<td>Clinical Pharmacotherapeutics</td>
<td>2.0 - 4.0 cr</td>
</tr>
<tr>
<td>NURS 6102</td>
<td>Family Health Theory</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6920</td>
<td>Primary Care: Assessment of Health and Care of Well Children</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 6921</td>
<td>Assessment of Health and Care of Well Children: Primary Care Practicum</td>
<td>1.0 - 2.0 cr</td>
</tr>
<tr>
<td>NURS 6922</td>
<td>Primary Care: Assessment and Management of Common Conditions Affecting Children</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 6923</td>
<td>Primary Care Practicum: Assessment and Management of Common Conditions Affecting Children</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6924</td>
<td>Assessment and Interventions for Children and Youth With Special Health Care Needs</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 7000</td>
<td>DNP Proseminar</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>NURS 7200</td>
<td>Economics of Health Care</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 7202</td>
<td>Moral and Ethical Positions and Actions in Nursing</td>
<td>2.0 cr</td>
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<tr>
<td>NURS 7925</td>
<td>Systems of Care for Children and Youth With Special Health Care Needs Practicum</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 7926</td>
<td>Advanced Assessment, Intervention in Families of Children and Youth With Special Health Care Needs Practicum</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>OLPD 5356</td>
<td>Disability Policy and Services</td>
<td>3.0 cr</td>
</tr>
</tbody>
</table>

Statistics: As approved by D.N.P. specialty

### 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.

### Required Coursework

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSPAN 5101</td>
<td>Introduction to Integrative Healing Practices</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5115</td>
<td>Interprofessional Health Care Informatics</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5200</td>
<td>Holistic Health Assessment and Therapeutics for Advanced Practice Nurses</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5222</td>
<td>Advanced Physiology</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5225</td>
<td>Psychopharmacology Advanced Practice Psychiatric/Mental Health Nursing</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>NURS 5228</td>
<td>Pharmacology for Advanced Practice Nursing</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 5229</td>
<td>Clinical Pharmacotherapeutics</td>
<td>2.0 - 4.0 cr</td>
</tr>
<tr>
<td>NURS 6102</td>
<td>Family Health Theory</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6504</td>
<td>Assessing, Managing Psychiatric Disorders in Adv Practice Psychiatric-Mental Health Nursing</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6505</td>
<td>PMH/APN Prac II: Assessing, Managing Psychiatric Disorders in Adv Pract Psychiatric-Mental Health Nurs</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6602</td>
<td>PMH Advanced Practice Nursing: Group as a Health Care Intervention</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6603</td>
<td>PMH APN Practicum IV: Group as a Health Care Intervention</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6604</td>
<td>Foundations for Integrative Mental Health and Psychiatric Advanced Practice Nursing</td>
<td>2.0 cr</td>
</tr>
<tr>
<td>NURS 6605</td>
<td>Psychiatric/Mental Health Advanced Nursing Practice Practicum I</td>
<td>1.0 cr</td>
</tr>
<tr>
<td>NURS 6802</td>
<td>Psychiatric/Mental Health Advance Practice Nursing: Psychotherapy with Individuals and Families</td>
<td>2.0 cr</td>
</tr>
</tbody>
</table>
NURS 6803 - Psychiatric/Mental Health Adv Prac Nurs Practicum III: Psychotherapy With Individuals,Families (1.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
NURS 7202 - Moral and Ethical Positions and Actions in Nursing (2.0 cr)
NURS 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)
Statistics: As approved by D.N.P. specialty
Complimentary Alternative Medicine (CAM) Elective: As approved by D.N.P. specialty

Public Health Nursing
The D.N.P. program with a specialty in public health nursing prepares nurses for leadership as advanced practice public health nurses in management, education, clinical practice, leadership, policy development, and advocacy. The three-year D.N.P. program is for students who already hold a baccalaureate degree in nursing, and involves both coursework and a practicum. This specialty offers leadership preparation for nurses desiring expertise in population-based public health nursing practice. 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 of populations, integrating the study of health determinants and health disparities. 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 Coursework
CSPH 5101 - Introduction to Integrative Healing Practices (3.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental and Occupational Health (2.0 cr)
PUBH 6414 - Biostatistical Literacy (3.0 cr)
NURS 6930 - Foundations of Advanced Public Health Nursing Practice (3.0 cr)
NURS 6931 - Health Equity and Social Justice (3.0 cr)
NURS 6934 - Population-focused Assessment and Prioritization (1.0 cr)
NURS 6944 - Population-focused Assessment & Prioritization Practicum (1.0 cr)
NURS 7000 - DNP Proseminar (1.0 cr)
NURS 7108 - Population Health Informatics (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 7930 - Public Health Nursing Leadership Practicum (3.0 cr)
NURS 7939 - Public Health Nurse Executive Role (3.0 cr)
NURS 7940 - Individual, Interpersonal, Community, and Organizational Change (3.0 cr)
NURS 7942 - Application of Behavior Change Theory to Population Health Practicum (2.0 cr)
Elective 1: Graduate credit (3 credits)
Elective 2: Graduate Credit (3 credits)
Either course may be taken
NURS 6942 - Health Equity and Social Justice Practicum (2.0 cr)
or
NURS 7109 - Population Health Informatics Practicum (2.0 cr)

Public Health Nursing - Adolescent Nursing

Public Health Nursing - Adolescent Nursing
Graduate study in adolescent nursing utilizes interdisciplinary courses taught by faculty from the Schools of Nursing, Medicine, and Public Health, and the Institute for Child Development. Its curriculum emphasizes the special health care needs of youth and teaches learners best practices in working with youth to promote health and health care.

Students should visit the center's website to gain a better idea of what the Center for Adolescent Nursing is about: http://www.nursing.umn.edu/CANL.
NURS 5016 - Critical Reading of Scientific Literature in Adolescent Health (1.0 cr)
NURS 5604 - Advanced Health Assessment and Interventions with Adolescents (2.0 cr)
PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 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 D.N.P. program prepares nurses for leadership as advanced practice nurses, clinical experts, health care executives, policy experts, and informaticians.

Required Courses
Students must complete the core courses of the D.N.P. program.
NURS 5115 - Interprofessional Health Care Informatics (3.0 cr)
NURS 7200 - Economics of Health Care (3.0 cr)
Twin Cities Campus

Family 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 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 2014
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Family 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 (D.N.P.) 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 D.N.P. 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.

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 D.N.P. degree and coursework. Final coursework decisions are made by the faculty adviser.

Courses may include:

- **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 (3.0 cr)
- **NURS 7500** - Health Care of Children for the Family Nurse Practitioner (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 Pract (1.0 cr)
- **NURS 7508** - Assessment Management of Health Practicum V: Clinical Specialty Care for Family Nurse Practitioner (1.0 cr)
- **NURS 7509** - Assessment and Management of Health Practicum VI: Primary Care for the Family Nurse Practitioner (1.0 cr)
Twin Cities Campus
Leadership in Health Information Technology for Health Professionals
Postbaccalaureate 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 2014
- Length of program in credits: 15
- 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 B.S./B.A. in nursing or public health.

Preferred: Advanced degree in clinical or public health discipline from an accredited institution (nursing M.S./D.N.P./Ph.D.; public health M.P.H./M.S./Ph.D.; M.S./Ph.D. 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.

Students may qualify for tuition support for informatics courses through the University Partnership in Health Informatics (UPHI). If students receive UPHI funding, they are required to complete certificate requirements within one year of starting the program.

Required Coursework
The certificate consists of seven courses (15 credits)
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)
or CSCI 5707 - Principles of Database Systems (3.0 cr)
Twin Cities Campus

Master of Nursing M.N.
School of Nursing
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 S.E., 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 2014
- Length of program in credits: 54
- 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 (M.N.) 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 (B.S.N.) 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 (M.N.) 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 54 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 (6.0 cr)
- NURS 5032 - Human Response to Health and Illness: Children and Childbearing Families (6.0 cr)
- NURS 5033 - Population Response to Health and Mental Illness (5.0 cr)
- NURS 5034 - Nursing Care of Complex Clients and Diverse Populations (2.0 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 Physiology (3.0 cr)
- NURS 5241 - Nursing Leadership for Effective Practice (3.0 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 (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.

**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 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 2014
- Length of program in credits: 12
- 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 (D.N.P.) 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 D.N.P. 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 D.N.P. degree and coursework. Final coursework decisions are made by the faculty adviser.

Courses may include:

- 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 6212 - Primary Care Practicum: for Midwives (1.0 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)
Twin Cities Campus
Nursing M.S.
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: Master's
- Requirements for this program are current for Fall 2014
- 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: The School of Nursing no longer admits students directly to the M.S. program in nursing. Students interested in pursuing graduate study in nursing may apply to the master of nursing (M.N.), doctor of nursing practice (D.N.P.) or nursing Ph.D. programs.

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
Other requirements to be completed before admission:
The School of Nursing does not accept students directly into the M.S. program.

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 towards program requirements is not permitted.

The program is offered under Plan A and Plan B. Plan A emphasizes research; Plan B prepares students to integrate research into advanced practice roles or leadership positions.

Plan A requires 30 credits: 14 credits in the major, including NURS 8170 - Research in Nursing (3 cr); NURS 8100 - The Discipline of Nursing (3 cr); NURS 8140 - Moral and Ethical Positions in Nursing (3 cr); 6 credits in a minor or related field; and 10 thesis credits.

Plan B requires a minimum of 30 credits with at least 9 credits of disciplinary core courses; 9 credits of advanced nursing core courses, including NURS 8194 - Problems in Nursing (3 cr); 6 credits of specialty core courses; and 6 credits in related fields. Individual areas of study vary in the number of credits 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.

Generalist/Undesignated
**Twin Cities Campus**
**Nursing Ph.D.**
**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 2014
- Length of program in credits: 58 to 76
- 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 Ph.D. 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**
34 to 52 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.

Required Coursework

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)
**Twin Cities Campus**

**Pediatric Clinical Nurse Specialist 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](http://www.nursing.umn.edu)

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 12
- 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 (D.N.P.) 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 D.N.P. 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.

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 D.N.P. degree and coursework; final coursework decisions are made by the faculty adviser.

Courses may include:

- NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 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 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 Pract (1.0 cr)
Twin Cities Campus

Pediatric 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 2014
- Length of program in credits: 12
- This program requires summer semesters for timely completion.
- Degree: Pediatric 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 (D.N.P.) 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 D.N.P. 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 semester 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 D.N.P. degree and coursework; final coursework decisions are made by the faculty adviser.

Courses may include:
- NURS 5200 - Holistic Health Assessment and Therapeutics for Advanced Practice Nurses (3.0 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)
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 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 2014
- Length of program in credits: 12
- 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 (D.N.P.) 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 admission to the program is 3.00.

A D.N.P. 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.

The list below is only a sample of courses and may not be applicable for all applicants. 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 D.N.P. degree and coursework; final coursework decisions are made by the faculty adviser.

Courses may include:
- 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)
Women's Health 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 2014
- Length of program in credits: 12
- 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 (D.N.P.) 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 D.N.P. 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.

Please contact the School of Nursing for detailed information about the requirements for this certificate.

Courses may include:
- **NURS 6307** - Women's Health Care Practicum (1.0 cr)
- **NURS 7504** - Assessment and Management of Health for Advanced Practice Nurses, Practicum I (1.0 - 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 (3.0 cr)
- **NURS 6926** - Advanced Concepts in Women's Health for WHNP Practicum I (1.0 cr)
- **NURS 6408** - Advanced Nursing Care of Older Adults Practicum (1.0 cr)
- **NURS 7505** - Assessment and Management of Health for Advanced Practice Nurses Practicum II (1.0 - 2.0 cr)
- **NURS 6407** - Advanced Nursing Care of Older Adults (3.0 cr)
**Twin Cities Campus**  
**Experimental and Clinical Pharmacology M.S.**  
**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](http://www.pharmacy.umn.edu/ecp/grad/home.html)

- Program Type: Master's  
- Requirements for this program are current for Fall 2014  
- 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
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.
Twin Cities Campus
Experimental and Clinical Pharmacology Minor
Experimental and Clinical Pharmacology
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: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 2014
- 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 S.E., Minneapolis, MN 55455 (612-624-9919; fax: 612-624-0139)
Email: medchem@umn.edu
Website: http://www.pharmacy.umn.edu/medchem/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.S. program. See the Medicinal Chemistry Ph.D. 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
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 12 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.

At least 2 semesters must be completed before filing a Degree Program Form.

Students must complete a core curriculum of advanced courses in organic chemistry and medicinal chemistry (totaling 12 credits); and 6 credits in a minor or related field.
Twin Cities Campus
Medicinal Chemistry Minor
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 S.E., Minneapolis, MN 55455 (612-624-9919; fax: 612-624-0139)
Email: medchem@umn.edu
Website: http://www.pharmacy.umn.edu/medchem/home.html

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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 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
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 12 credits in a focused area (which may include biochem or chem credits taken as required for the major program) is required for the doctoral minor, including introductory courses (MEDC 8001 and 8002), advanced medicinal chemistry courses, and other courses in the medicinal chemistry core curriculum.
Twin Cities Campus
Medicinal Chemistry Ph.D.
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 S.E., Minneapolis, MN 55455 (612-624-9919; fax: 612-624-0139)
Email: medchem@umn.edu
Website: http://www.pharmacy.umn.edu/medchem/home.html

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 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 B.S. or M.S. 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 Ph.D. program only, and usually are admitted fall semester only.

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.

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 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.

Students must also participate in the department seminar program, successfully complete a comprehensive exam requirement that serves as the preliminary written exam, and prepare and defend an original research proposal which serves as the preliminary oral exam.

All students must complete a core curriculum of advanced courses in organic chemistry and biochemistry (totaling 12 credits); and medicinal chemistry (12 cr).
Twin Cities Campus
Pharmaceutics M.S.
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 S.E., Minneapolis, MN 55455 USA (612-624-5153; 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 2014
- 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 M.S. program is available on a very 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. Minor fields of particular value include biochemistry, biometry, chemistry, biomedical engineering, chemical engineering, mechanical engineering, 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, a statement of career goals and research interests, and three letters of recommendation. International applicants must submit results from the TOEFL or IELTS. These collectively are used to determine each candidate's admisssibility. Prefer "First Class" or the equivalent on transcripts from foreign institutions. Fall admission is preferred and the deadline to apply is December 31. Students can receive a free evaluation of the competitiveness of their credentials by completing the pre-application form on the pharmaceutics website [www.pharmacy.umn.edu/pharmaceutics].

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
  - Internet Based - Speaking Score: 23
- IELTS
  - Total Score: 26

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.

The Plan A M.S. degree requires a total of 20 credits in upper-division coursework of which 6 credits must be outside the major as well as 10 master's thesis credits. A master's thesis must also be prepared and defended. A complete list of degree program requirements may be found on the pharmaceutics website.
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 S.E., Minneapolis, MN 55455 (612-624-5153; 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 2014
• Length of program in credits (Masters): 6
• Length of program in credits (Doctorate): 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 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.

A doctoral minor in pharmaceutics requires a minimum of 12 credits in PHM 5xxx, PHM 8xxx, or PHAR 6xxx courses and approval of the pharmaceutics director of graduate studies. A master's minor requires a minimum of 6 credits in PHM 5xxx, PHM 8xxx, or PHAR 6xxx courses and approval of the pharmaceutics director of graduate studies. In addition, one member of the Ph.D. supervisory committee must be a pharmaceutics graduate faculty member.
Twin Cities Campus
Pharmaceutics Ph.D.
College of Pharmacy

Graduate Studies in Pharmaceutics

Contact Information:
Department of Pharmaceutics, Room 9-177 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 USA (612-624-5153; 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 2014
- 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, a statement of career goals and research interests, and three letters of recommendation. International applicants must submit results from the TOEFL or IELTS. These collectively are used to determine each candidate's admissibility. The preferred English language test is Test of English as Foreign Language.

Prefer "First Class" or the equivalent on transcripts from foreign institutions. Fall admission is preferred and the deadline to apply is December 31. Students can receive a free evaluation of the competitiveness of their credentials by completing the pre-application form on the pharmaceutics website [www.pharmacy.umn.edu/pharmaceutics].

Applicants must submit their test score(s) from the following:
• GRE
  - 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 - Speaking Score: 23
• 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
12 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.

A minimum GPA of 3.00 is required for students to remain in good standing.

A minimum GPA of 3.00, successful completion of program examinations and timely progress towards the degree are required for students to remain in good standing.

The Ph.D. requires a minimum of 24 upper-division course credits (5xxx or above), of which 12 credits must be outside the major in addition to completing 24 thesis credits. In addition to coursework, a preliminary written exam, a preliminary oral exam, and preparation of a thesis and its defense are required. A complete list of degree program requirements may be found on the pharmaceutics website.

*Use of 4xxx courses toward program requirements may be permitted with program approval.

Please note that a M.S. degree is not required for the Ph.D.
Social and Administrative Pharmacy Minor
Pharmaceutical Care and Health
College of Pharmacy

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 2014
• 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 2014
• 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
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: http://www.pharmacy.umn.edu/pchs/saph/home.html

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.
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.
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-ssc@umn.edu
Website: http://www.sph.umn.edu/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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 FOR THIS CERTIFICATE ARE NOT CURRENTLY BEING ACCEPTED.
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 U.S.-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: APPLICATION ARE NOT CURRENTLY BEING ACCEPTED FOR THE CERTIFICATE PROGRAM.
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-oasr@umn.edu
Website: http://www.sph.umn.edu/

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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.

The Certificate on Aging is a 12-credit graduate level program with some courses 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)
- 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.

Special Application Requirements:
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.

*The Aging Studies Certificate will be designed by each admitted participant in consultation with the director of the program.

Suggested courses
The following are suggested courses, and are not required.

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 5110 - Biology of Aging (3.0 cr)
• GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
• GERO 5115 - Introduction to Geriatrics (2.0 cr)
• GERO 5125 - Gerontology Service Learning (3.0 cr)
• GERO 8020 - Seminar in Gerontology (2.0 cr)
• PSY 5138 - Social Work with Older Adults (2.0 cr)
• SW 5810 - Seminar: Special Topics (1.0 - 4.0 cr)
• SOC 5590 - Topics in Life Course Sociology (3.0 cr)
• PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
• PA 5412 - Aging and Disability Policy (3.0 cr)
• GERO 5105 - Multidisciplinary Perspectives on Aging (3.0 cr)
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 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: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 16
- 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.

Our Applied Biostatistics Certificate is designed for persons currently working as data managers or analysts, but who lack formal training in biostatistics and the science of uncertainty and would like to gain the corresponding technical, mathematical, and computational skills.

Our goal is to enhance one's understanding of key elements of database management and investigation, alert a student to key variables and trends, help a student judge their statistical significance, and improve a student's overall data evaluation and programming skills. Students will learn key aspects of study design, implementation and analysis for both observational and clinical studies.

Fourteen of the 16 required credits are offered entirely online, throughout the calendar year. The remaining two credits are required and are offered face-to-face/in class instruction during a single week in early June as part of the Summer Public Health Institute, University of Minnesota, Twin Cities Campus.

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.

Special Application Requirements:
Please visit www.sph.umn.edu for admission requirements and application instructions.

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.

Course Curriculum

- 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)
- 1 credit course listed under topics PubH 6400 offered during summer Public Health Institute
- 1 credit course listed under topics PubH 6400 offered during summer Public Health Institute
**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: sps-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 2014
- 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 Biostatistics M.P.H. Program requires that students meet the Association of Schools of Public Health (ASPH) Core Competencies in five core public health areas, including administration, behavioral science, biostatistics, environmental health, and epidemiology, plus an additional requirement in ethics.

The master of public health (M.P.H.) program has different course requirements than the master of science (M.S.). In place of the four elective courses (one in health science and three in biostatistics), which are required for the M.S., the M.P.H. requires five public health courses. The M.P.H. program also requires students to complete a field experience, in addition to a written master's project like the M.S. Plan B written project. Unlike the M.S., the M.P.H. does not have a comprehensive written exam requirement. More detailed information is available in the Program Requirements section below.

**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 personal statements, background and experience, record of academic achievement, demonstrated academic potential, letters of recommendation, compatibility of interests with program faculty, and other factors.

Test scores and GPAs 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. 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

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 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: Culminating Experience

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

The culminating experience project demonstrates the student's familiarity with the tools of research or scholarship in the major, the capacity to work independently, and the ability to present the results of the investigation effectively. The master's project should involve a combined total of 120 hours of work.

MPH Program Curriculum

PUBH 7405 - Biostatistics: Regression (4.0 cr)
PUBH 7406 - Advanced Regression and Design (4.0 cr)
PUBH 7450 - Survival Analysis (3.0 cr)
PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
STAT 5101 - Theory of Statistics I (4.0 cr)  
or STAT 8101 - Theory of Statistics I (3.0 cr)  
STAT 5102 - Theory of Statistics II (4.0 cr)  
or STAT 8102 - Theory of Statistics II (3.0 cr)  
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)  
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)  
PUBH 6101 - Environmental Health (2.0 cr)  
or PUBH 6102 - Issues in Environmental and Occupational Health (2.0 cr)  
PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)  
or PUBH 6341 - Epidemiologic Methods I (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)  
students can complete final 9 credits by registering for 1 or both of the courses below  
PUBH 7494 - Culminating Experience: Biostatistics (1.0 - 3.0 cr)  
or PUBH 7496 - Biostatistics: Field Experience (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.

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 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 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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 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.

Biostatistics combines statistics, biomedical science, and computing to advance health research. Biostatisticians design, direct, and analyze clinical trials; develop new statistical methods; and analyze data from observational studies, laboratory experiments, and health surveys. This is an ideal field for students who have strong mathematical backgrounds and who enjoy working with computers, collaborating with investigators, and participating in health research. Students take courses in biostatistical methods, theory of statistics, clinical trials, statistical computing, categorical data, survival analysis, and health 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 3.10.

Other requirements to be completed before admission:
For the M.S., prospective applicants should have taken at least three semesters of calculus (including multivariable calculus) and one semester of linear algebra. Experience with a programming language (e.g., Java, C) 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 14 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

**Plan B:** Plan B requires 25 major credits and 11 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 to be taken after finals of spring semester in year 1.

The Plan B project demonstrates the student's familiarity with the tools of research or scholarship in the major, the capacity to work independently, and the ability to present the results of the investigation effectively. The master's project should involve a combined total of 120 hours of work.

The Plan A project requires students to complete a thesis project. The required courses for the MS Degree Plan B do not prepare a student to write a thesis, that is, to do original research in biostatistics methodology. That is why nearly all students choose to do a written project (Plan B) rather than a thesis. Only students with an advanced background in mathematics or theoretical statistics should consider Plan A.

**Biostatistics M.S. Coursework (Plan B)**

- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- PUBH 7450 - Survival Analysis (3.0 cr)
- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 7494 - Culminating Experience: Biostatistics (1.0 - 3.0 cr)
- STAT 5101 - Theory of Statistics I (4.0 cr)
- or STAT 8101 - Theory of Statistics I (3.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)
- or STAT 8102 - Theory of Statistics II (3.0 cr)
- 3 Biostatistics elective courses (at least 8 credits)
  - GEOG 5561 - Principles of Geographic Information Science (4.0 cr)
  - or GIS 5571 - ArcGIS I (3.0 cr)
  - or MATH 5615H - Honors: Introduction to Analysis I (4.0 cr)
  - or MATH 5616H - Honors: Introduction to Analysis II (4.0 cr)
  - or PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
  - or PUBH 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
  - or PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
  - or PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
  - or PUBH 7460 - Advanced Statistical Computing (3.0 cr)
  - or PUBH 7465 - Biostatistics Consulting (3.0 cr)
  - or PUBH 7470 - Statistics for Translational and Clinical Research (3.0 cr)
  - or PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
  - or PUBH 8422 - Modern Nonparametrics (3.0 cr)
  - or PUBH 8435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
  - or PUBH 8472 - Spatial Biostatistics (3.0 cr)
  - or PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)
  - or STAT 5401 - Applied Multivariate Methods (3.0 cr)
  - or STAT 5601 - Nonparametric Methods (3.0 cr)
  - or WRIT 5051 - Graduate Research Writing Practice for Non-native Speakers of English (3.0 cr)
  - or WRIT 5052 - Graduate Research Presentations and Conference Writing for Non-Native Speakers of English (3.0 cr)

Students must complete at least 3 credits of a health science elective.

- CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
- or PBIO 5301 - Plant Genomics (3.0 cr)
- or PSY 5137 - Introduction to Behavioral Genetics (3.0 cr)
or PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
or PUBH 6101 - Environmental Health (2.0 cr)
or PUBH 6102 - Issues in Environmental and Occupational Health (2.0 cr)
or PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
or PUBH 6341 - Epidemiologic Methods I (3.0 cr)
or PUBH 6381 - Genetics in Public Health (2.0 cr)
or 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.
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

Biostatistics combines statistics, biomedical science, and computing to advance health research. Biostatisticians design, direct, and analyze clinical trials, develop new statistical methods, and analyze data from observational studies, laboratory experiments, and health surveys. This is an ideal field for students who have strong mathematical backgrounds and who enjoy working with computers, collaborating with investigators, and participating in health research. Students take courses in biostatistical methods, theory of statistics, clinical trials, statistical computing, categorical data, survival analysis, and health sciences.

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 major program adviser about the advisability of a minor in biostatistics. Students will then need to contact the director of graduate studies (bstdgs@umn.edu). A biostatistics faculty member must be on the student's doctoral preliminary oral examination committee as well as masters 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.

12 credits required for doctoral minor for statistic students. 14 credits are required for doctoral minor for non-statistic students.

Minor Options

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)
• 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 7415 - Introduction to Clinical Trials (3.0 cr)
or PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

-OR-

Doctoral-level minor in Biostatistics for Non-Statistics Students
Students should take the required set of 2 core courses (either 7401 and 7402, or 7405 and 7406) 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
PUBH 7405 - Biostatistics: Regression (4.0 cr)
PUBH 7406 - Advanced Regression and Design (4.0 cr)
or PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
PUBH 7402 - Biostatistics Modeling and Methods (4.0 cr)

Take 2 or more course(s) totaling 6 or more credit(s) from the following:
• 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 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)
or PUBH 7415 - Introduction to Clinical Trials (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 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-oasr@umn.edu
Website: [http://www.sph.umn.edu](http://www.sph.umn.edu)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 62 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.

Biostatistics combines statistics, biomedical science, and computing to advance health research. Biostatisticians design, direct, and analyze clinical trials; develop new statistical methods; and analyze data from observational studies, laboratory experiments, and health surveys. This is an ideal field for students who have strong mathematical backgrounds and who enjoy working with computers, collaborating with investigators, and participating in health research. Students take courses in biostatistical methods, theory of statistics, clinical trials, statistical computing, categorical data, survival analysis, and health 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 3.70.

Other requirements to be completed before admission:
Prospective applicants should have taken at least three semesters of calculus (including multivariable calculus) and one semester of linear algebra. Experience with a programming language (e.g., Java, C) is helpful, but not required.

In addition to completing the SOPHAS application, students are also required to submit the following supporting documentation directly to SOPHAS:
- Statement of purpose and objectives (an essay describing past education, experience, and current professional career objectives)
- Résumé or curriculum vitae (C.V.)
- Official postsecondary transcripts from all institutions attended, including previous study at the University of Minnesota (transcripts must be sent directly from the institutions to SOPHAS)
- Three letters of recommendation from persons qualified to assess the student's academic work; clinical, public health, or professional experiences; 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.

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Information current as of September 19, 2014
- 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

27 to 35 credits are required in the major.
11 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 3.3 is required for students to remain in good standing.

At least 3 semesters must be completed before filing a Degree Program Form.

The Ph.D. program requires seven core courses (including mathematical statistics, linear models, probability models, and Bayesian methodology), one health science elective and three elective courses in biostatistical theory and methods, a preliminary written examination on the material from some of the required courses, a preliminary oral examination, a written dissertation, and dissertation defense in a final oral examination. This usually requires three years of full-time study after the M.S. degree. Students entering the PhD program without a previous MS degree in Math/Stat will be required to take 3 additional courses.

Curriculum

Schedule 1

For students admitted to the University of Minnesota with an M.S. in statistics or biostatistics.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBH 8401</td>
<td>Linear Models</td>
<td>4.0 cr</td>
</tr>
<tr>
<td>PUBH 8412</td>
<td>Advanced Statistical Inference</td>
<td>3.0 cr</td>
</tr>
<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>STAT 8101</td>
<td>Theory of Statistics 1</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>STAT 8102</td>
<td>Theory of Statistics 2</td>
<td>3.0 cr</td>
</tr>
<tr>
<td>Biostat Research Skills</td>
<td>1 credit</td>
<td></td>
</tr>
</tbody>
</table>

Take 3 or more course(s) totaling 9 or more credit(s) from the following:

- 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)
- PUBH 8446 - Advanced Statistical Genetics and Genomics (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 8475 - Statistical Learning and Data Mining (3.0 cr)
• PUBH 8482 - Sequential and Adaptive Methods for Clinical Trials (3.0 cr)
• PUBH 8492 - Theories of Hierarchical and Other Richly Parametrized Linear Models (3.0 cr)
• Any 8000-level course offered by the School of Statistics not included in the Core Curriculum

3 credits of public health electives from PUBH 6000, 7000, 8000 level courses offered by other divisions in the School of Public Health.

Students who have not taken a course equivalent to Survival Analysis (PubH 7450) should take the course as early as possible.

-OR-

Schedule 2
For students entering the Ph.D. program with an undergraduate degree in mathematics, statistics, or biostatistics. Student in this curriculum are required to complete 3 additional courses than those students entering the PhD already with an MS degree in Math/Stat.

- PUBH 7405 - Biostatistics: Regression (4.0 cr)
- PUBH 7406 - Advanced Regression and Design (4.0 cr)
- PUBH 8401 - Linear Models (4.0 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)
- Biostat Research Skills course (1 credit)

PUBH 8412 - Advanced Statistical Inference (3.0 cr)

Students without a prior course in real analysis are strongly recommended to take Advanced Calculus I (MATH 4603) in the fall of their first year. Students with a prior analysis course may choose to take the Real Analysis sequence (MATH 5615-16) as an elective, but are not required to do so.

- MATH 5615H - Honors: Introduction to Analysis I (4.0 cr)
  or MATH 4603 - Advanced Calculus I (4.0 cr)

Take 3 or more course(s) totaling 9 or more credit(s) from the following:

- PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
- PUBH 7455 - 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)
- PUBH 8446 - Advanced Statistical Genetics and Genomics (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 8475 - Statistical Learning and Data Mining (3.0 cr)
- PUBH 8482 - Sequential and Adaptive Methods for Clinical Trials (3.0 cr)
- PUBH 8492 - Theories of Hierarchical and Other Richly Parametrized Linear Models (3.0 cr)
• Any 8000-level course offered by the School of Statistics not included in the Core Curriculum

3 credits

3 credits of a Public Health elective from 6000, 7000, 8000 level courses offered by other divisions in the School of Public Health.

Survival Analysis Course
Students who have not taken a course equivalent to Survival Analysis (PubH 7450) should take the course as early as possible.

Students who have not taken a course equivalent to Survival Analysis (PubH 7450) should take the course as early as possible.
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-easr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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, creating a recognition and demand for formally trained clinical researchers. This program will prepare you to conduct patient-oriented research, directly interacting with human subjects to better understand disease; therapeutic interventions, clinical trials and more; conduct epidemiologic and behavioral studies; understand outcomes and health services 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.

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).
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 24 to 28 major credits and 10 to 14 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: There are two options for Capstone project: 1) Write a manuscript to be submitted to a peer-reviewed journal in the student's field; students need to be the first author, contribute to the design and analysis presented in the manuscript; manuscript cannot be a review article; however meta-analysis and formal systematic reviews are allowed. 2) Write a grant 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) or equivalent organization in student's field; student should be Principal Investigator (PI). The Clinical Research MS program requires 38 credits minimum: students have a choice about scope of the Capstone project. Project must warrant minimally six credits; may go up to 10 credits maximum, depending on scope. Advisor and faculty director will approve project and number of credits, depending on scope of project.

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 Plan A curriculum prepares the next generation of clinical researchers and principal investigators. The curriculum covers clinical trials, epidemiology, biostatistics, ethics, grant writing, and research methods. Students are trained to conduct patient-oriented research, epidemiological and behavioral research. There is a 10-credit thesis requirement where the thesis is (1) first, presented in a 30 minute public presentation, followed by a 90 minute closed exam with the thesis committee, and (2) is submitted to a peer-reviewed journal as a first-authored paper and describes original work accomplished during the graduate program.

The Plan B curriculum prepares the next generation of translational, clinical, and outcomes researchers. The curriculum is flexible with a core of required courses covering clinical trials, epidemiology, and biostatistics. Students can take elective courses in Translational Sciences, Outcomes Sciences, Health Services Research or other areas and fashion a personalized curriculum in consultation with their mentors and the program director.

Plan B has a 6 - 10 credit Capstone project requirement, typically either a first-authored paper describing original work accomplished during graduate program, or a grant submission written by the student as Principal Investigator during the program. There is a closed exam with the committee--the project does not have to be presented publicly. Students have choice about scope of Capstone project--minimally six, maximum ten credits, depending on scope. Advisor and DGS approve project and number of credits.

Required Coursework

The first set of courses are required for Plan A and Plan B students. Following those are courses that are only required for each specific plan. Also required for both plans: both sessions of the University of Minnesota Responsible Conduct of Research course, validated by ORTTA; and the NIH online training, Protection of Human Research Subjects, validated by the electronic certificate given at end of course.

PUBH 6341 - Epidemiologic Methods I (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 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)

Supporting Program Credits: Plan A students take 3 credits to complete 38 credits required. Plan B students take 10 - 14 credits to complete 38 credits required.

Plan A

Note: students must take a total of 10 thesis credits (PubH 8777).

PUBH 6301 - Fundamentals of Clinical Research (3.0 cr)
PUBH 6348 - Writing Research Grants (2.0 cr)
PUBH 6303 - Clinical Research Project Seminar (2.0 cr)
PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

or Plan B

Plan B students are required to take 6 - 10 credits, PubH 8394, Culminating Experience: Clinical Research.
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-eads@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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.

There is a growing need for health professionals who advance science discoveries to clinical applications through research on human beings; i.e., clinical research. This includes observational studies and clinical trials on individuals and in communities. It is increasingly recognized that many individuals seek formal training in clinical research, both in the U.S. and abroad, but cannot spend the time or do not have the resources to attend an on-campus program or do an original research project for a thesis. This certificate in clinical research includes the alternative of distance learning for health professionals in Minnesota, outside the state, and in other countries.

Of the 16 required credits, 14 are offered entirely online. The 2-credit PUBH 6303 Seminar will be offered as a hybrid with much of the didactic portions online and student presentations done either during an 8-week, on-campus period or via live video technology.

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 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:
Please visit www.sph.umn.edu for admission requirements and application instructions.

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)
Community Health Promotion M.P.H.

School of Public Health - Adm

Twin Cities Campus

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 2014
• 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 Ph.D. degree 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

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 34 to 48 major credits and 0 to 14 credits outside the major. The is no final exam. A capstone project is required.

**Capstone Project:** Culminating experience of either needs assessment, program development, program evaluation, or research project.

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:
Students must select one course from the following list:
Take 1 or more course(s) from the following:
• PUBH 6000 - Topics: Community Health Education (0.5 - 4.0 cr)
• PUBH 6010 - Public Health Approaches to HIV/AIDS (3.0 cr)
• PUBH 6055 - Social Inequalities in Health (2.0 cr)
• PUBH 6085 - Combating the Global Pandemic: Tobacco and Alcohol (2.0 cr)
• Intervention Approaches
  Students must select at least two courses from the following list:
  Take 2 or more course(s) from the following:
  • PUBH 6025 - e-Public Health: Online Intervention Design (3.0 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
  Take exactly 2 course(s) from the following:
  • PUBH 6034 - Program Evaluation for Public Health Practice (3.0 cr)
  • PUBH 6035 - Applied Research Methods (3.0 cr)

Additional Assessment Methods
  Students must select one course from the following list:
  PUBH 6600 - Topics: Maternal and Child Health (0.5 - 4.0 cr)
  or PUBH 6415 - Biostatistical Methods II (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)
  or PUBH 6617 - Practical Methods for Secondary Data Analysis (3.0 cr)

SPH Core Courses
  Environmental Health
  PUBH 6101 - Environmental Health (2.0 cr)
  or PUBH 6102 - Issues in Environmental and Occupational 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)
  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)

Field Experience and Culminating Experience
  PUBH 7096 - Field Experience: Community Health Promotion (1.0 - 6.0 cr)
  PUBH 7094 - Culminating 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)
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.

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 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](http://www.sph.umn.edu)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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.

**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](http://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
- MCAT
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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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.
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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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 - Exposure Assessment for Air Contaminants (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 (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)

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 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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 6080 - Seminar: Policy, Politics, and Ethics of Public Health Decision Making (2.0 cr)
  - PUBH 6634 - Advocacy and Children's Rights (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 and Technology Policy (3.0 cr)
  - PA 5722 - Environmental and Resource Economics 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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 - Molecular Epidemiology of Infectious Disease (3.0 cr)
- FSCN 4121 - Food Microbiology (3.0 cr)
- BIOL 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-

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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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.

-OR-

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 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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 - Research in Nursing (3.0 cr)
NURS 8600 - Advanced Public Health Nursing (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 - Program Evaluation for Public Health Practice (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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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.

Emphases: 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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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 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)
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.
- Mortality 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

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Information current as of September 19, 2014
- 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 2014
- 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
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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (2.0 cr)

**Specialty Program Course Requirements**

- CE 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:
• CBIO 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
• CE 4561 - Solid Hazardous Wastes (3.0 cr)
• CE 8503 - Environmental Mass Transport (4.0 cr)
• CE 8542 - Chemistry of Organic Pollutants in Environmental Systems (3.0 cr)
• CE 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 - Exposure to Environmental Hazards (2.0 cr)
  PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
  PUBH 6105 - Environmental and Occupational Health Policy (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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (2.0 cr)
- 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 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 - Politics, Policy, and Ethics of Public Health Decision Making (2.0 cr)
- PUBH 6420 - Introduction to SAS Programming (1.0 cr)
- PUBH 6634 - Advocacy and Children's Rights (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 and Technology Policy (3.0 cr)
- PA 5722 - Environmental and Resource Economics 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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (2.0 cr)
- PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
- 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 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
• VMED 8090 - Epidemiology of Zoonoses and Diseases Common to Animals and Humans (3.0 cr)
• VMED 5420 - Molecular Epidemiology of Infectious Disease (3.0 cr)
• FSCN 4121 - Food Microbiology (3.0 cr)
• FSCN 4122 - Food Fermentations and Biotechnology (2.0 cr)
• BIOL 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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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 (0.5 - 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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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)

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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 - Advanced Public Health Nursing (2.0 cr)
NURS 8170 - Research in Nursing (3.0 cr)

Recommended Electives
Select electives in consultation with adviser.
Take 3 or more credit(s) from the following:
• PUBH 6034 - Program Evaluation for Public Health Practice (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 6348 - Writing Research Grants (2.0 cr)
• NURS 8100 - The Discipline of Nursing (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 614 - Biostatistical Literacy (3.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
Division of Environmental Health Sciences Core Requirements
PUBH 6013 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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)
• CE 4561 - Solid Hazardous Wastes (3.0 cr)
• CE 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

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: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- Length of program in credits (Masters): 6
- 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 master's minor requires a minimum of 8 graduate credits; the doctoral minor requires a minimum of 14 graduate credits. Courses for the minor must be selected from those offered by the School of Public Health. In order to meet the minor requirements, students must successfully complete graduate coursework in each of the following disciplines: biostatistics, epidemiology, and environmental 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.

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.

Suggested courses include PUBH 6101 - Environmental Health or PUBH 6102 - Issues in Environmental Health; PUBH 6320 - Fundamentals of Epidemiology or PUBH 6341 - Epidemiologic Methods I; and PUBH 6414 - Biostatistical Methods I or PUBH 6450 - Biostatistics I.

Students completing a master's minor in environmental health must complete 8 credits in environmental health, including PUBH 6103, 6104, and 6105.

Students completing a doctoral minor are required to take a minimum of 14 credits in environmental health, including PUBH 6103, 6104, and 6105.

Students who have already taken comparable graduate-level courses in these disciplines may use other public health courses to complete the minor requirement with the approval of the public health adviser and the director of graduate studies. Since public health courses may have prerequisites or enrollment limitations, early planning with an adviser is suggested.
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 2014
- 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
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
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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (2.0 cr)

Concentration Program Courses
- CE 5541 - Environmental Water Chemistry (3.0 cr)
- CE 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:
- CBIO 8004 - Economic and Social Aspects of Conservation Biology (3.0 cr)
- CE 4561 - Solid Hazardous Wastes (3.0 cr)
- CE 8503 - Environmental Mass Transport (4.0 cr)
- CE 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
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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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 (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 7430 - Statistical Methods for Correlated Data (3.0 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 - Exposure to Environmental Hazards (2.0 cr)
PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
PUBH 6105 - Environmental and Occupational Health Policy (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 - Seminar: Policy, Politics, and Ethics of Public Health Decision Making (2.0 cr)
• PUBH 6420 - Introduction to SAS Programming (1.0 cr)
• PUBH 6634 - Advocacy and Children's Rights (2.0 cr)
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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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 (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 - Molecular Epidemiology of Infectious Disease (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)
-OR-

**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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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)
- NURS 8170 - Research in Nursing (3.0 cr)
- NURS 8171 - Qualitative Research Design and Methods (3.0 - 4.0 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 6325 - 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)

-OR-

**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)
- PHSL 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)
- BIOC 4332 - Biochemistry II: Molecular Mechanisms of Signal Transduction and Gene Expression (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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (2.0 cr)

**OIPRTT 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 - Occupational and Environmental Epidemiology (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)

**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 - Research Methods: Application for the Culminating Experience (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 (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 - Exposure to Environmental Hazards (2.0 cr)
- PUBH 6104 - Environmental Health Effects: Introduction to Toxicology (2.0 cr)
- PUBH 6105 - Environmental and Occupational Health Policy (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)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUBH 6103</td>
<td>Exposure to Environmental Hazards (2.0 cr)</td>
</tr>
<tr>
<td>PUBH 6104</td>
<td>Environmental Health Effects: Introduction to Toxicology (2.0 cr)</td>
</tr>
<tr>
<td>PUBH 6105</td>
<td>Environmental and Occupational Health Policy (2.0 cr)</td>
</tr>
<tr>
<td>PUBH 7194</td>
<td>Culminating Experience: Environmental Health (1.0 - 6.0 cr)</td>
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<tr>
<td>PUBH 7196</td>
<td>Field Experience: Environmental Health (1.0 - 5.0 cr)</td>
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</tbody>
</table>

**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 I (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)
- CE 4561 - Solid Hazardous Wastes (3.0 cr)
- CE 5551 - Environmental Microbiology (3.0 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 2014
- 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

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Information current as of September 19, 2014
• GMAT
• MCAT
  - Verbal Reasoning score: 10
  - Physical Science score: 10
  - Biological Reasoning score: 10
  - Writing Sample score: 10
• 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. 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 3.00 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)
- PUBH 6325 - Data Processing with PC-SAS (1.0 cr)
  or PUBH 6420 - Introduction to SAS Programming (1.0 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)
- PUBH 6387 - Cancer Epidemiology (2.0 cr)
- PUBH 6389 - Nutritional Epidemiology (2.0 cr)
- PUBH 6381 - Genetics in Public Health (2.0 cr)
  or 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)
  or PUBH 6101 - Environmental Health (2.0 cr)
- PUBH 6102 - Issues in Environmental and Occupational Health (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)
- 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 exempt.
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 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
Epidemiology 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 2014
- 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](http://www.sph.umn.edu) 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](http://www.sph.umn.edu) (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](http://www.sph.umn.edu) 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.
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 (M.P.H.) program through the School of Public Health (SPH). For more information on the M.P.H. degree, visit the SPH website.
Twin Cities Campus

Epidemiology 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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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.

Note: The minors in epidemiology are open to students in master's and doctoral programs that allow a minor, and who want to take some focused coursework in epidemiology. For the doctoral minor, there is the expectation that an aspect of epidemiology is incorporated into the student's doctoral thesis, and a requirement that an epidemiology faculty member represent the minor on the student's preliminary oral and final oral committees.

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 prior admission to a University of Minnesota master's or doctoral degree-granting program. Students should first consult with their major program adviser about the advisability of a minor in epidemiology. They will then need to contact the program level assistant, Andrea Kish, at kish@umn.edu for information about the minor and how to get approval to complete it.

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 at least 8 credits.

The doctoral minor requires 12 credits: 10 credits in epidemiology and biostatistics, and 2 credits in epidemiology or methods courses. The director of graduate studies must approve the student's selection of elective credits.

The doctoral minor offers two 12-credit options. Option 1, for students with prior epidemiology training, consists of PUBH 8341 (3 credits), PUBH 8342 (3 credits), PUBH 7401 (4 credits), and two credits of electives in an epidemiology- or biostatistics-related area, to be approved by the epidemiology DGS.

Option 2, for students without extensive epidemiology/biostatistics training, consists of PUBH 6341 (3 credits), PUBH 6342 (3 credits), PUBH 6450 (4 credits), and two credits of electives in an epidemiology- or biostatistics-related area, to be approved by the epidemiology DGS. For more detailed information, please contact Andrea Kish at kish@umn.edu.
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 Ph.D. 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 15.

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
37 to 39 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 Ph.D. program includes a minimum curriculum of 61 credits. Students must pass written and oral preliminary exams, serve as a TA for 1 semester, write and defend a dissertation, and prepare a first-authored manuscript for publication.

Coursework includes 14-16 credits in epidemiology, biostatistics, ethics, writing grants, and teaching core courses common to both tracks; 6 credits in advanced methodology/statistics that focus on track-specific courses; 4 credits of content-area courses; and 13 credits of supporting program or minor coursework. In addition, the University requires 24 doctoral thesis credits.

Required Coursework
14-16 credits plus 24 thesis credits
- PUBH 7401 - Fundamentals of Biostatistical Inference (4.0 cr)
- PUBH 7648 - Writing Research Grants (2.0 cr)
- PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
- PUBH 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)
- PUBH 8341 - Advanced Epidemiologic Methods: Concepts (3.0 cr)
- PUBH 8342 - Advanced Epidemiologic Methods: Applications (3.0 cr)

Epidemiology PhD students need to take one teaching course. They can take either Grad 8101 (3 cr) or Grad 8200 (1 cr, online) to fulfill the 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.

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
Clinical/Biological Track (22 credits minimum)
- Biological Methods/Statistics (6 credits minimum).
  - PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
  - or PUBH 6363 - Design and Analysis of Group-Randomized Trials in Epidemiology (3.0 cr)
Choose additional credits from the following courses:

- PUBH 7402 - Biostatistics Modeling and Methods (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 7407 - Analysis of Categorical Data (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 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 6355 - Pathophysiology of Human Disease (4.0 cr)

Content area courses (4 credits minimum)

- PUBH 6366 - 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 (2.0 cr)
- PUBH 6389 - Nutritional Epidemiology (2.0 cr)
- PUBH 6140 - Occupational and Environmental Epidemiology (2.0 cr)

Supporting Program/Minor Credits

13 credits minimum. Chosen in consultation with adviser. Potential supporting program courses include courses from the additional biological methods/statistics courses listed above not used to satisfy the biological methods/statistics requirement, or other appropriate courses. Other courses can be considered with adviser's approval.

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

Social/Behavioral Track (22 credits minimum)

Behavioral Methods/Statistics (6 credits minimum)

- PUBH 6363 - Design and Analysis of Group-Randomized Trials in Epidemiology (3.0 cr)
- or PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

Choose additional credits from the following courses

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 7435 - Latent Variable Measurement Models and Path Analysis (3.0 cr)
- PUBH 7407 - Analysis of Categorical Data (3.0 cr)
- EPSY 8268 - Hierarchical Linear Modeling in Educational Research (3.0 cr)
- EPSY 8282 - Statistical Analysis of Longitudinal Data (3.0 cr)
- PUBH 8140 - Validity Concepts in Epidemiologic Research (2.0 cr)
- PUBH 6915 - Nutrition Assessment (2.0 cr)
- EPSY 8264 - Advanced Multiple Regression Analysis (3.0 cr)
- EPSY 8267 - Applied Multivariate Analysis (3.0 cr)
- EPSY 8221 - Psychological Scaling (3.0 cr)

Content area courses (4 credits minimum)

- PUBH 6333 - Principles of Human Behavior I (2.0 cr)
- PUBH 6334 - Human Behavior II (2.0 cr)

Supporting Program/Minor Credits

13 credits minimum. Chosen in consultation with adviser. Potential supporting program courses include courses from the additional biological methods/statistics courses listed above not used to satisfy the biological methods/statistics requirement, or other appropriate courses. Other courses can be considered with adviser's approval.
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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 available to master's (M.A. and M.S.) and doctoral students. The minor provides a multidisciplinary foundation in gerontology for the master's minors and a more intensive preparation in aging for Ph.D. minors. Past students who have minored in gerontology have majored in many departments, including but not limited to: curriculum and instruction (adult education); communication disorders; dentistry; design, housing, and apparel; family medicine and community health; family social science; journalism and mass communication; kinesiology; nursing; psychology; social work; and sociology. The program of courses is tailored in advance, with consultation between the student and the director of graduate studies of the gerontology minor.

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:
Admission to the gerontology minor is contingent upon prior admission to a master's or doctoral degree-granting program. Students must have prepared a minor program of coursework approved by the director of graduate studies in gerontology.

Students should first consult with their major program adviser about the advisability of a minor in gerontology. They will then need to contact the director of graduate studies, Dr. Robert Kane at kanex001@umn.edu, for minor 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.

The master's and doctoral minors are developed in consultation with, and should be approved in advance by, the director of graduate studies for gerontology. The master's minor requires at least 8 credits, including GERO 5105 - Multidisciplinary Perspectives on Aging (3 cr), or an alternative course approved by the director of graduate studies. The doctoral minor requires at least 12 credits.

Courses are ordinarily taken from a designated course list provided by the Center on Aging and annually updated by the minor program. Students are welcome to identify and propose to the director of graduate studies additional courses on aging that might fulfill the minor requirements.
Graduate Program Requirements

Master's Minor
Take 8 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 5105 - Multidisciplinary Perspectives on Aging (3.0 cr)
- GERO 5110 - Biology of Aging (3.0 cr)
- GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
- GERO 5115 - Introduction to Geriatrics (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)
- PSY 5138 *(Inactive)* (3.0 cr)
- PUBH 6904 - Nutrition and Aging (2.0 cr)
- PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
- SW 5313 - Social Work with Older Adults (2.0 cr)
- SW 5810 - Seminar: Special Topics (1.0 - 4.0 cr)

-OR-

Doctoral Minor
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 5105 - Multidisciplinary Perspectives on Aging (3.0 cr)
- GERO 5110 - Biology of Aging (3.0 cr)
- GERO 5111 - Studying Aging and Chronic Illness (2.0 cr)
- GERO 5115 - Introduction to Geriatrics (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)
- PSY 5138 *(Inactive)* (3.0 cr)
- PUBH 6904 - Nutrition and Aging (2.0 cr)
- PUBH 8803 - Long-Term Care: Principles, Programs, and Policies (2.0 cr)
- SW 5313 - Social Work with Older Adults (2.0 cr)
- SW 5810 - Seminar: Special Topics (1.0 - 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 2014
- 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:
• GRE
  - General Test - Verbal Reasoning: 150
  - General Test - Quantitative Reasoning: 150
  - General Test - Analytical Writing: 3.5
• GMAT
  - Total score: 500

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 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 4 semesters must be completed before filing a Degree Program Form.

Required Courses
- PUBH 6560 - Operations Research and Quality in Health Care (2.0 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 6558 - Health Finance II (3.0 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)

Course Group 1

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 (1.0 - 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 (1.0 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 (2.0 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.

-OR-

Course List 2
Take exactly 0 course(s) totaling exactly 0 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.

Online

Saudi Arabia
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 32 to 52
- 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-HSPRA includes Plan A (Outcomes Research) and Plan B (Health Intelligence and Analytics).

Plan A (Outcomes Research) prepares students to conduct studies that examine the effects of health care treatments and organization on patients and societal outcomes. It provides evidence for what works best for whom under what conditions. The Plan A is an excellent fit for providers, such as physicians, who are seeking to conduct and publish research level studies examining health care treatments and interventions. The Plan A is 49-52 credits that can be completed in two years.

The Plan B (Health Intelligence and Analytics) prepares students to work closely with clinicians, executives and policy makers to translate data into organizational intelligence and evidence that can be used to improve organizational performance and patient outcomes. In contrast to the Plan A, the Plan B (Health Intelligence and Analytics) focuses on helping clinicians, managers, and policy makers frame and answer questions that require rapid response using readily available health care data. The Plan B has 32-34 credits that can be completed in 12 months by attending fall, spring and summer terms.

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, 2011, are: Verbal: 500, Quantitative 500, Analytical Writing: 3.5.

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 A: Plan A requires 33 to 36 major credits, 6 credits outside the major, and 10 thesis credits. The final exam is oral.

Plan B: Plan B requires 25 to 27 major credits and 7 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Students choose between either a capstone style Plan B project or a thesis style Plan B project. The capstone project is completed as part of a summer course, PUBH 6812, Applied Projects in HIA. Students are matched with a community research organization, given a problem from the organization to analyze and present findings. The Plan B thesis-style project is required to be relevant to the field of health service research, and should represent a minimum of 120 hours of work.

Program length is 32 cr for the Plan B.

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.

Focus Requirements

Plan A: Outcomes Research (49-52 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 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)
PUBH 6806 - Principles of Public Health Research (2.0 cr)
PUBH 6802 - Managing Electronic Health Information (3.0 cr)
PUBH 6724 - The Health Care System and Public Health (3.0 cr)
PUBH 6863 - Understanding Health Care Quality (2.0 cr)
PUBH 6864 - Conducting Health Outcomes Research (3.0 cr)
PUBH 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)
Electives (6 credits)

-OR-

Plan B: Health Intelligence and Analytics (33-34 credits)

Curriculum includes a required core of 26 credits, plus a specialty area of 7-8 credits.

Plan B Health Intelligence and Analytics

These are the courses that all Plan B students must take.

PUBH 6341 - Epidemiologic Methods I (3.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)
PUBH 6451 - Biostatistics II (4.0 cr)
PUBH 6806 - Principles of Public Health Research (2.0 cr)
PUBH 6802 - Managing Electronic Health Information (3.0 cr)
PUBH 6724 - The Health Care System and Public Health (3.0 cr)
PUBH 6808 - Professional Practice in HIA, 2 cr.
PUBH 6805 Introduction to Project Management for Health Professionals, 2cr.
PUBH 6742 - Ethics in Public Health: Research and Policy (1.0 cr)
PUBH 6808 Professional Practice in HIA, 2 cr.
PUBH 6812 Applied Projects in HIA, 2 cr

Plan B Project Options

Students have two options for fulfilling the Plan B Project. Students choose either a capstone-style project completed within a course, or write a traditional thesis-style project.
PUBH 7894 - MS in Health Services Research, Policy, and Administration Plan B Project (2.0 cr)

**Specialty Areas**
Choose one Specialty Area from the 5 listed below or students may propose their own specialty area of 7 credits or more with the assistance of their advisor.

**Cost Effectiveness**
Choose a minimum of 7 credits for this specialization.
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
- PUBH 6809 - Advanced Methods in Health Decision Science (3.0 cr)
- PUBH 6862

**or Health Care Quality Improvement/Operations Research**
Choose a minimum of 7 credits for this specialization.
- PUBH 6560 - Operations Research and Quality in Health Care (2.0 cr)
- PUBH 6561 - Quantitative Methods Applied to Health Administration Problems (2.0 cr)
- PUBH 6765 - Continuous Quality Improvement: Methods and Techniques (3.0 cr)

**or Health Services Research and Evaluation**
Choose a minimum of 7 credits for this specialization.
- PUBH 6863 - Understanding Health Care Quality (2.0 cr)
- PUBH 6717 - Decision Analysis for Health Care (2.0 cr)
- PUBH 6803 - Conducting a Systematic Literature Review (3.0 cr)
- PUBH 6810 - Survey Research Methods (3.0 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)

**or Research Methods**
Choose a minimum of 7 credits for this specialization.
- PUBH 6560 - Operations Research and Quality in Health Care (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)

**or Health Economics**
Choose a minimum of 7 credits for this specialization.
- PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- PUBH 6832 - Economics of the Health Care System (3.0 cr)
- PUBH 6555 - Topics in Health Economics (2.0 cr)

**or Student Proposed Specialty Area**
Students may design their own specialty area with a minimum of 7 credits, in consultation with their advisor.

**Joint- or Dual-degree Coursework**
Joint Degree Program with Law and M.S. in Health Services Research, Policy, and Administration (J.D./M.S.). 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: 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 2014
• 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 health services research, policy, and administration (HSRP&A) is available as a minor to other M.S. and Ph.D. students across the University. HSRP&A emphasizes a population health orientation research and policy perspective and analytic methods related to health policy and healthcare 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.

Required prerequisites
Course Group 1

Other requirements to be completed before admission:
Admission to the health services research, policy, and administration graduate minor is contingent upon prior admission to a master's or doctoral degree-granting program. Students enrolled in graduate programs throughout the University are eligible for this minor.

Students should first consult with their major program adviser about the advisability of a minor in health services research, policy, and administration. They will then need to contact the director of graduate studies, Dr. Kathleen Call at callx001@umn.edu or director of graduate studies assistant, Maureen Andrew at andre031@umn.edu for minor information.

Special Application Requirements:
The master's minor in health services research, policy, and administration is 6 credits and will be individually tailored via consultation with the HSRP&A program director.

The Ph.D. minor is 12 credits and has some specific course requirements. Both the master's and doctoral minor require approval by the HSRP&A program director.

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.

Ph.D. and M.S. Minor Required Coursework
The HSRP&A minor coursework must be chosen from within that major from the following course number sequences: PUBH 65xx, PUBH 67xx, PUBH 68xx, or PUBH 88xx.
The master's minor requires 6 credits and is individually tailored with the advice and approval of the HSRP&A program director. The Ph.D. minor requires 12 credits, of which 2 courses are prescribed below. The remaining credits can be selected from other HSRP&A courses.

- PUBH 6556 - Health and Health Systems (3.0 cr)
- or PUBH 6724 - The Health Care System and Public Health (3.0 cr)
- PUBH 8801 - Health Services Policy Analysis: Theory (3.0 cr)
- or PUBH 8802 - Health Services Policy Analysis: Applications (2.0 cr)
Health Services Research, Policy, and Administration Ph.D.

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: Doctorate
- Requirements for this program are current for Fall 2014
- 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.

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 Ph.D. 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**

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.

**Required Courses**

All doctoral students complete the Ph.D. core.

- **PUBH 7401** - Fundamentals of Biostatistical Inference (4.0 cr)
- **PUBH 7402** - Biostatistics Modeling and Methods (4.0 cr)
- **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)

**Concentration Areas**

**Multidisciplinary Social Science**

All doctoral students complete the Ph.D. core courses, and also choose an Area of Emphasis. The Area of Emphasis course work varies by area.

- **PUBH 8805** - Sociological Theory in Health Services Research (3.0 cr)
- **APEC 5151** - Applied Microeconomics: Firm and Household (3.0 cr)

Choose one additional theory course to be decided with your adviser.

- **PUBH 6862** - Cost-Effectiveness Analysis in Health Care (3.0 cr)
- **PUBH 8821** - Health Economics II (3.0 cr)
- **APEC 8203** - Applied Welfare Economics and Public Policy (3.0 cr)
- **SOC 8701** - Sociological Theory (4.0 cr)
- **SOC 8721** - Theories of Social Psychology (3.0 cr)
- **PUBH 8804** - Advanced Quantitative Methods Seminar (3.0 cr)

-OR-

**Health Organizations and Management Science**

All doctoral students complete the Ph.D. core.

Choose 6-8 credits from the list below for theoretical foundations.

Take 6 - 8 credit(s) from the following:
• IDSC 8711 - Cognitive Science (4.0 cr)
• MGMT 8301 - Seminar in Organizational Behavior (4.0 cr)
• MGMT 8302 - Seminar in Organizations Theory (4.0 cr)
• SCO 8745 - Research on Quality Management (3.0 cr)
• PUBH 8894 - Directed Research: Health Services Research, Policy, and Administration (1.0 - 8.0 cr)

Take 2-3 credits in the the methods foundations courses listed below.

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
Students are required to select a minimum of 12 credits for a supporting program with advice from adviser and area of emphasis faculty.

-OR-

Health Decision Science
All doctoral students complete the Ph.D. core and choose an area of Emphasis. The Health Decision Science courses are below.

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)

Supporting program must total a minimum of 12 credits, and must be approved by the area of emphasis faculty.

Take 12 or more credit(s) from the following:

• IE 5112 - Introduction to Operations Research (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
All doctoral students complete the Ph.D. core and complete the coursework in their chosen Area of Emphasis.

Supporting Program
Below is a sample list of courses for theoretical foundations.

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)
• Sociology of Knowledge (3 cr)
or Seminar in Organizations Theory (4cr)
or Race Relations Theory (3cr)

Students complete a minimum of 12 credits for the supporting program. Below are sample courses.

Take 12 or more credit(s) including 2 or more sub-requirement(s) from the following:

Area of Specialization (disparities, demography, social networks, family, etc.)
Take 8 or more credit(s) from the following:

• 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
Take 4 or more credit(s) from the following:

• 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
All doctoral students complete the Ph.D. core.

Area of Emphasis Required Courses

PUBH 6342 - Epidemiologic Methods II (3.0 cr)
PUBH 6343 - Epidemiologic Methods III (4.0 cr)
PUBH 6854 - Conducting Health Outcomes Research (3.0 cr)
PUBH 6863 - Understanding Health Care Quality (2.0 cr)  
PUBH 7450 - Survival Analysis (3.0 cr)

**Supporting Program**
Students complete a supporting program with a minimum of 12 credits. 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 6803 - Conducting a Systematic Literature Review (3.0 cr)
- PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
- PUBH 6810 - Survey Research Methods (3.0 cr)

-OR-

**Health Policy and Analysis**
All doctoral students complete the Ph.D. core.

**Prerequisites**
By the end of the first year, take, substitute, or test out of one of the following courses:
PUBH 6724 - The Health Care System and Public Health (3.0 cr)  
or  
PUBH 6556 - Health and Health Systems (3.0 cr)

**Supporting Program Required Coursework**
**Supporting Program (minimum 12 credits)**
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-

**Health Economics**
All doctoral students complete the Ph.D. core.

**Prerequisites**
Calculus, statistics and micro-economics

**Area of Emphasis Required Core**
PUBH 8821 - Health Economics II (3.0 cr)  
APEC 8001 - Applied Microeconomic Analysis of Consumer Choice and Consumer Demand (2.0 cr)  
APEC 8002 - Applied Microeconomic Analysis of Production 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)

Take 12 or more credit(s) including 1 or more sub-requirement(s) from the following:
Students who choose APEC 8211 must also take 8212
Students who choose to take ECON 8205, must also take 8206, 8207, and 8208.
Students who choose to take ECON 8117, must also take 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)
• Students may use these courses to reach the overall 12-credit requirement.
• Take 0 or more course(s) from the following:
  • ECON 8xxx
  • APEC 8xxx
  • PUBH 6862 - Cost-Effectiveness Analysis in Health Care (3.0 cr)
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 13
- 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.

The management fundamentals certificate is specifically designed for employed executives, physicians, and other healthcare professionals seeking to advance their management and leadership capabilities. Specific features of this design include a curriculum that parallels the first portion of the executive M.H.A. curriculum. Students in the certificate who decide to pursue the executive M.H.A. can apply to the program and, if admitted, complete the degree by finishing the executive M.H.A. curriculum.

The curriculum includes a focus on the management of complex, integrated health systems, including the expanded role of physicians as providers, managers, and leaders in those systems. Program faculty are actively involved in applied research with health systems with a focus on integrated health system performance. The on-campus session invites alumni and expert speakers to participate with students in symposia and other learning events.

Students complete the certificate in eight months. The program is designed to minimize interference with work and family: most of the coursework is online and asynchronous; students spend only eight days on campus at the outset of the program. The program builds on the practical application of learning to the participant's organization. The program is based on a learning cohort model in which all students start the program together and progress through the same curriculum providing myriad opportunities for students to learn and work together.

Accreditation
This program is accredited by Commission on Accreditation of Healthcare 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.

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 two 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

In addition, as noted in the SPH Catalog, applicants whose native language is not English or whose education was completed exclusively at an institution(s) whose language of instruction was not in English must prove English proficiency.

Because the coursework in Certificate 1 is the same as that of the executive M.H.A., some enrollees in the certificate may decide to
pursue the executive M.H.A. after completing the first or second semester of the certificate. 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

**Plan C:** Plan C requires 50 major credits and 10 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** The capstone project for the M.H.A. program builds upon the coursework throughout the program. Students integrate and synthesize the knowledge, attitudes and skills acquired in the curriculum and apply them to the resolution of a significant management problem in a healthcare organization. The capstone project also provides one of the last opportunities in the M.H.A. program for students to further develop and demonstrate their leadership and team competencies, and receive constructive feedback on these competencies, prior to graduation.

M.H.A. students have three options to choose from as they complete their capstone requirement: (1) the Advanced Problem Solving Course; (2) the Carlson Consulting Enterprise Experiential Learning Program; and (3) the New Product Development Course.

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**

- PUBH 6562 - Information Technology in Health Care (2.0 cr)
- PUBH 6556 - Health and Health Systems (3.0 cr)
- PUBH 6535 - Managerial Accounting for Health Services (3.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6557 - Health Finance I (3.0 cr)
- PUBH 6568 - Interprofessional Teamwork in Health Care (2.0 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, D305 Mayo Memorial Building, 420 Delaware Street S.E., Minneapolis, MN 55455 (612-626-3500; fax: 612-624-4498)
Email: sph-SSC@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 M.P.H. 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 non-profit 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)
- 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:
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.

Basic understanding of physiological and/or psychological human development as demonstrated by coursework, experience, and/or referenced readings.

Applicants to the online track must hold either an advanced degree (M.S., M.D., M.A., M.S.W., etc.) 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: 500
  - General Test - Quantitative Reasoning: 500
  - 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 B: Plan B requires 36 to 42 major credits and 10 to 22 credits outside the major. The final exam is oral. A capstone project is required.

Capstone Project: Students may choose from four options for the M.P.H. project. The choice of options should be decided in consultation with their adviser. The options are:
1. Research project
2. Technical report
3. Critical literature review project
4. Research proposal

Students with an M.C.H. epidemiology emphasis are encouraged to select the research report or the research proposal.

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.

Standard or Epidemiology Emphasis

Standard Curriculum
The standard curriculum is for students without advanced degrees or who have limited professional experience. Students complete a minimum of 48 credits in two years.

Scientific Basis courses (8 credits)
- PUBH 6600 - Topics: Maternal and Child Health (0.5 - 4.0 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 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
- PUBH 6903 - Child and Adolescent Nutrition (2.0 cr)
- PUBH 6906 - Global Nutrition (2.0 cr)

Methodological and Analytical Skills (7-14 credits)
- PUBH 6034 - Program Evaluation for Public Health Practice (3.0 cr)
Select 3 courses from the following list:
  - 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 6343 - Epidemiologic Methods III (4.0 cr)
  - PUBH 6344 - Research Methods: Application for the Culminating Experience (2.0 cr)
  - PUBH 6415 - Biostatistical Methods II (3.0 cr)
  - PUBH 6451 - Biostatistics II (4.0 cr)
  - PUBH 6451 - Biostatistics II (4.0 cr)
  - PUBH 6451 - Biostatistics II (4.0 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 6806 - Principles of Public Health Research (2.0 cr)
  - PUBH 6910 - Critical Review of Research in Public Health Nutrition (1.0 cr)

Management and Communication Skills (1 credit)
- PUBH 6673 - Grant Writing for Public Health (1.0 cr)

Policy & Advocacy Skills (2 credits)
PUBH 6630 - Foundations of Maternal and Child Health Leadership (3.0 cr)
Select one course from the following list:
  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 - Advocacy and Children's Rights (2.0 cr)
  PUBH 6272 - Management and Organization in Hospital and Health Care Systems (4.0 cr)
PUBH 6760 Healthcare Finance (2).
Public Health Core Courses (14-16 credits).
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
  PUBH 6101 - Environmental Health (2.0 cr)
or PUBH 6102 - Issues in Environmental and Occupational 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)
Master's Project and Field Experience (4 credits).
PUBH 7694 - Culminating Experience: Maternal and Child Health (1.0 - 4.0 cr)
PUBH 7696 - Field Experience: Maternal and Child Health (1.0 - 4.0 cr)
-OR-
Epidemiology Emphasis Curriculum
Students admitted into the two-year program also have the option of completing their M.P.H. in maternal and child health with an epidemiology emphasis. This emphasis was created to meet the increasing local, state, and national demands for MCH epidemiologists. It allows students to develop quantitative expertise in MCH content areas.

The MCH program is in our Division of Epidemiology and Community Health, consistently ranked as one of the top epidemiology departments in the United States.

Scientific Basis of MCH Epi Courses (6 credits)
Select one course from the following list:
  PUBH 6605 - Reproductive and Perinatal Health (2.0 cr)
or PUBH 6675 - Women's Health (2.0 cr)
or PUBH 6600 - Topics: Maternal and Child Health (0.5 - 4.0 cr)
Select one course from the following list:
  PUBH 6381 - Genetics in Public Health (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)
Select one course from the following list:
  PUBH 6606 - Children's Health: Issues, Programs, and Policies (2.0 cr)
or PUBH 6607 - Adolescent Health: Issues, Programs, and Policies (2.0 cr)
or PUBH 6613 - Children and Youth With Special Health Care Needs (2.0 cr)
or PUBH 6902 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
or PUBH 6903 - Child and Adolescent Nutrition (2.0 cr)
or PUBH 6906 - Global Nutrition (2.0 cr)
Methodological and Analytical Skills (13 credits)
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 6451 - Biostatistics II (4.0 cr)
Management and Communication Skills (1 credit)
PUBH 6673 - Grant Writing for Public Health (1.0 cr)
Policy and Advocacy Skills (5-6 credits)
PUBH 6630 - Foundations of Maternal and Child Health Leadership (3.0 cr)
Select one course from the following list:
  PUBH 6066 - Building Communities, Increasing Health: Preparing for Community Health Work (2.0 cr)
or PUBH 6074 - Mass Communication and Public Health (3.0 cr)
or PUBH 6078 - Public Health Policy as a Prevention Strategy (2.0 cr)
or PUBH 6634 - Advocacy and Children's Rights (2.0 cr)
Public Health Core Courses (15 credits)
Students may take 6102 instead of 6101 or 6741 instead of 6742.
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6101 - Environmental Health (2.0 cr)
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)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)

**Master's Project and Field Experience (4 credits)**
PUBH 7694 - Culminating Experience: Maternal and Child Health (1.0 - 4.0 cr)
PUBH 7696 - Field Experience: Maternal and Child Health (1.0 - 4.0 cr)

**Electives**
Electives to total 48 credits.

**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**

**Required Coursework**

**Scientific Basis of MCH (5 credits)**
Scientific Basis of MCH (5 credits).
PUBH 6000 - Topics: Maternal and Child Health (0.5 - 4.0 cr)
PUBH 6006 - 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 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
PUBH 6903 - Child and Adolescent Nutrition (2.0 cr)

**Methodological and Analytical Skills (5 credits)**
Methodological and Analytical Skills (5 credits). Select a minimum of three additional credits. These credits should be chosen with consultation of an advisor.
PUBH 6852 - Program Evaluation in Health and Mental Health Settings (2.0 cr)

**Management and Communication Skills (6 credits)**
Management and Communication Skills (6 credits). These credits should be chosen with consultation of an advisor.
NURS 5925 - Grant Writing and Critique (1.0 cr)
PUBH 6655 - Principles and Programs in Maternal and Child Health (2.0 cr)

**Public Health Core Courses**
Public Health Core Courses (14 credits).
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental and Occupational 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)

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)

**Master's Project and Field Experience**
Master's Project and Field Experience (4 credits).
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**
Electives to total 42 credits.

**Complementary and Alternative Medicine Interdisciplinary Concentration Area**
The Complementary and Alternative Medicine Interdisciplinary Concentration (CAMIC) offered through the School of Public Health is a unique opportunity for SPH students who are pursuing an MPH degree to acquire and cultivate professional skills in an emerging area of health care that is expanding and altering the field of public health.

The concentration includes coursework from the Center for Spirituality and Healing at the University of Minnesota, a nationally recognized leader in integrative medicine that brings together biomedical, complementary, cross-cultural, and spiritual care.

SPH graduate students must complete a formal program plan if they want the CAMIC to appear on their transcripts. For more information, contact Carol Francis, Interdisciplinary Concentrations Coordinator, at franc004@umn.edu or 612-624-6952.

**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 aboard.

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 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 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. For example, 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 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.
Public Health Administration and Policy M.P.H.

Twin Cities Campus

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: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 42 to 44
- 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 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
  - 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 44 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 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
- 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 and Occupational 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)

PHAP Core Courses
- PUBH 6700 - Foundations of Public Health (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 7796 - Field Experience: Public Health Administration and 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 6780 - Topics: Public Health Administration and Policy (1.0 - 3.0 cr)

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)
  - OR-
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 - Foundations of Public Health (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 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
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 U of M 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 and Occupational 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 - Foundations of Public Health (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 U of MN 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 U of MN that have been approved by the advisor and program coordinator.
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-oasr@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 2014
- Length of program in credits: 14
- 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.

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, the centralized online application service:
- Completed SOPHAS application and application fee, designating the University of Minnesota School of Public Health
- Personal essay describing the applicant's reason for applying, career goals, and how the certificate will help them achieve their goals
- Three letters of recommendation
- Official transcripts of record from each college/university attended
- Resume or C.V.

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 M.P.H. degree programs. All six 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 (3.0 cr)
PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
PUBH 6102 - Issues in Environmental and Occupational 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)
or PUBH 6742 - Ethics in Public Health: Research 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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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 certificate in food protection is part of the public health practice major. It provides formal training in public health. This training will help prepare public health workers and others to respond to incidences of bio-terrorism, infectious disease outbreaks, and other emerging public health issues. Students typically complete the curriculum by attending at least two Public Health Institutes (PHI), held in May/June of each year.

Many students will use their public health knowledge and skills to enhance effectiveness and opportunities in their current work or career paths. Population science is an increasingly valued area of expertise in many health and human service organizations.

**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:**

Please visit www.sph.umn.edu for admission requirements and application information.

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 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 7231 - Surveillance of Foodborne Diseases in Humans (1.0 cr)
- PUBH 6711 - Public Health Law (2.0 cr)
  or PUBH 6182 - Emerging Infectious Disease: Current Issues, Policies, and Controversies (3.0 cr)

Elective Courses
Students select 5-6 additional credits from an approved list to complete the required 14 certificate credits. Courses at the Public Health Institute are topical and will change from year to year. Please 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 2014
• Length of program in credits: 43
• This program does not require summer semesters for timely completion.
• Courses are available both on campus and online.
• 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)
• 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:
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 U.S. 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. There 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.

MPH-PHI Required Courses

MPH Core (15 credits)

Students must satisfy competency requirements in the six core areas of public health - administration, behavioral science, biostatistics, environmental health, epidemiology, and ethics.

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 and Occupational 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)

PHI Core (20 credits)

Students are required to complete the following PHI core courses to fulfill the MPH-PHI program requirements.

PUBH 6802 - Managing Electronic Health Information (3.0 cr)

PUBH 6806 - Principles of Public Health Research (2.0 cr)

HINF 5430 - Health Informatics I (3.0 cr)

PUBH 6876 - Public Health Systems Analysis and Development (2.0 cr)

PUBH 6877 - Public Health Systems Analysis and Development Practicum (2.0 cr)
PUBH 6880 - Introduction to Public Health Informatics (2.0 cr)
HINF 5560 - Advanced Public Health Informatics (2.0 cr)
PUBH 6890 - Public Health Systems Development Project I (2.0 cr)
PUBH 6891 - Public Health Systems Development Project II (2.0 cr)

**Electives (8 credits)**
Students select the remaining 8 credits from other 5xxx, 6xxx, 7xxx, and 8xxx level courses. Courses can be taken outside of SPH as long as they begin with 5xxx or above, and with prior approval from program director. Students are strongly encouraged to take the following elective course as most related to PHI are projects:
- PUBH 6805 - Project Management for Health Professionals (2.0 cr)

Other suggested electives:
- PUBH 6705 - Community Health Assessment (3.0 cr)
- PUBH 6025 - e-Public Health: Online Intervention Design (3.0 cr)
- PUBH 6727 - Health Leadership and Effecting Change (2.0 cr)
- NURS 7108 - Population Health Informatics (2.0 cr)
- HINF 5431 - Health Informatics II (3.0 cr)
- HINF 5520 - Clinical Informatics 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.

**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 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 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

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Information current as of September 19, 2014
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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Courses are available both on campus and online.
- 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.

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:
- 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.

Baccalaureate degree or higher

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 are projects. PUBH 6805 - Project Management for Health Professionals (2.0 cr).

**Required Cert-PHI Courses**
- PUBH 6876 - Public Health Systems Analysis and Development (2.0 cr)
- PUBH 6877 - Public Health Systems Analysis and Development Practicum (2.0 cr)
- HINF 5430 - Health Informatics I (3.0 cr)
- PUBH 6802 - Managing Electronic Health Information (3.0 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-oasr@umn.edu
Website: http://www.sph.umn.edu

- Program Type: Graduate free-standing minor
- Requirements for this program are current for Fall 2014
- 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.

Note: The minor in public health is available only to students enrolled in master's and doctoral programs outside of the School of Public Health. Students enrolled in master's and doctoral programs within the School of Public Health are not eligible for this minor because the requirements of the public health minor are part of their major field of study.

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 prior admission to 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.

Students should first consult with their major program adviser about the advisability of a minor in public health. They will then need to contact the director of graduate studies, Kristin Anderson, Ph.D., M.P.H. (ander116@umn.edu or 612-624-1818) or plan level coordinator, Carol Francis (franc004@umn.edu or 612-624-6952), for minor 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.

The minor program is designed to suit the particular needs and interests of the students with the provision that a graduate-level course in environmental health, epidemiology, and biostatistics be included in that requirement. These courses must at least meet the content level of the school's basic courses in those three subjects.

The master's minor requires a minimum of 8 graduate credits; the doctoral minor requires a minimum of 14 graduate credits. Courses for the minor must be selected from those offered by the School of Public Health. In order to meet the minor requirements, students must successfully complete graduate coursework in each of the following disciplines: biostatistics, epidemiology, and environmental health.

Suggested courses include PUBH 6101 - Environmental Health or PUBH 6102 - Issues in Environmental Health; PUBH 6320 - Fundamentals of Epidemiology or PUBH 6341 - Epidemiologic Methods I; and PUBH 6414 - Biostatistical Methods I or PUBH 6450 - Biostatistics I.
If students have already taken comparable graduate-level courses in these disciplines, other public health courses can be used to complete the minor requirement with the approval of the public health adviser and the director of graduate studies. Since public health courses may have prerequisites or enrollment limitations, early planning with an adviser is suggested.
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 2014
- 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 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
• PUBH 6903 - Child and Adolescent Nutrition (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)

Research Methods
PUBH 6910 - Critical Review of Research in Public Health Nutrition (1.0 cr)

Research Methods Options
Take 3 or more credit(s) from the following:
• PUBH 6034 - Program Evaluation for Public Health Practice (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 and Occupational 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 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
• PUBH 6903 - Child and Adolescent Nutrition (2.0 cr)
• PUBH 6904 - Nutrition and Aging (2.0 cr)
• PUBH 6906 - Global Nutrition (2.0 cr)

Research Methods
PUBH 6910 - Critical Review of Research in Public Health Nutrition (1.0 cr)

Research Methods Options
Take 3 or more credit(s) from the following:
• PUBH 6034 - Program Evaluation for Public Health Practice (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 and Occupational 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 - Maternal, Infant, and Preschool Nutrition (2.0 cr)
or PUBH 6903 - Child and Adolescent Nutrition (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 and Occupational 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 dietetic 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 MN 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

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: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2014
- 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.

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.

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:
Please visit www.sph.umn.edu for admission requirements and application information.

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 two 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 2014
- 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
  - Final score: 7
- MELAB
  - 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.
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 or CMU 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 (1.0 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 and Occupational 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 - 6.0 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 which 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.

-OR-
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 the 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.

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
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 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
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, D.V., PharmD, PhD, MS, or public health professional with significant work experience who have completed a Public Health Core Concept Certificate. Students must complete the core curriculum, M.P.H. culminating experience, field experience, and elective courses chosen to meet their academic and career interests.

- PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (1.0 cr)
- PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
- PUBH 6102 - Issues in Environmental and Occupational 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 7294 - Master's Project: Public Health Practice (0.5 - 4.0 cr)
- PUBH 7296 - Field Experience: Public Health Practice (0.5 - 6.0 cr)

Students may choose up to 24 credits of elective classes.

Public Health Dentistry

This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

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.

- 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 and Occupational Health (2.0 cr)
- PUBH 6414 - Biostatistical Literacy (3.0 cr)
- PUBH 6320 - Fundamentals of Epidemiology (3.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 6299 - Public Health Is a Team Sport: The Power of Collaboration (1.0 cr)
- PUBH 7296 - Field Experience: Public Health Practice (0.5 - 6.0 cr)

Student 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 (1.0 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 and Occupational 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 Public Policy**

This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

This sub-plan is limited to students completing the program under Plan C.

The Public Policy/Public Health (MPP/MPH) dual degree program provide you with 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 MPH, 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 and Occupational 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 (1.0 cr)
- PUBH 6751 - Principles of Management in Health Services Organizations (2.0 cr)
- PUBH 7296 - Field Experience: Public Health Practice (0.5 - 6.0 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 optional and does not fulfill the sub-plan requirement for this program.

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 programs provide you with training in planning, public policy, and in the public health arenas.

As a graduate student pursing 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) dual degree programs provide you with 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 (1.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental and Occupational 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 - 6.0 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 dual degree in Veterinary Public Health D.V.M./M.P.H. 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 (1.0 cr)
PUBH 6020 - Fundamentals of Social and Behavioral Science (3.0 cr)
PUBH 6102 - Issues in Environmental and Occupational 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 7294 - Master's Project: Public Health Practice (0.5 - 4.0 cr)
PUBH 7296 - Field Experience: Public Health Practice (0.5 - 6.0 cr)

Student may choose up to 25 credits of electives and may also transfer up to 14 credits from a school of veterinary medicine upon approval of the program director.

Global One Health-CMU
This sub-plan is optional and does not fulfill the sub-plan requirement for this program.

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.

- 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)
- PUBH 6102 - Issues in Environmental and Occupational Health (2.0 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 6806 - Principles of Public Health Research (2.0 cr)
- PUBH 6904 - Nutrition and Aging (2.0 cr)

Students may transfer up to 17 credits from Chiang Mai University with approval of the program director.

**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

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- 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-oasr@umn.edu
Website: http://www.sph.umn.edu

• Program Type: Post-baccalaureate credit certificate/licensure/endorsement
• Requirements for this program are current for Fall 2014
• 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 section of the catalog website for requirements that apply to all major fields.

The Public Health Certificate in Preparedness, Response, and Recovery (PHCert-PRR) is a program in the public health practice major. This training will help prepare public health workers and others to respond to incidences of bio-terrorism, infectious disease outbreaks, and other emerging public health issues. Students typically complete the curriculum by attending at least two Public Health Institutes (PHI), held in May/June of each 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.

Special Application Requirements:
Please visit www.sph.umn.edu for admission requirements and application instructions.

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 7223 - Concepts of Disaster Behavioral Health (1.0 cr)
PUBH 7227 - Incident Management Systems: The Public Health Role (1.0 cr)
PUBH 7221 - Planning for Urgent Threats (1.0 cr)
PUBH 7214 - Principles of Risk Communication (1.0 cr)
PUBH 7225 - Communication and Information Technology Tools for Public Health Emergency Response (1.0 cr)

Students must take at least one course from each of the following groups:

PUBH 7231 - Surveillance of Foodborne Diseases in Humans (1.0 cr)

or
PUBH 7230 - Topics in Infectious Disease (0.5 - 4.0 cr)

or
PUBH 7217 - Advances in Molecular Epidemiological Analysis (1.0 cr)

PUBH 7200 - Topics: Public Health Practice (0.5 - 4.0 cr)

or
PUBH 6711 - Public Health Law (2.0 cr)

Students select 4-5 additional credits from an approved list to complete the required 12 certificate credits. Courses at the Public Health Institute are topical and will change from year to year. Please consult the program staff for appropriate courses.
Biochemistry, Molecular Biology and Biophysics M.S.

Graduate School

Twin Cities Campus

Biochemistry, Molecular Biology, & Biophysics TCBS

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://www.cbs.umn.edu/BMBB/graduate

* Program Type: Master's
* Requirements for this program are current for Fall 2014
* 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&BG) graduate programs. After the first year, students select either BMBB or MCDB&BG to complete their degree.

***Note: Pursuit of a Master's degree in BMBB is not an option at the point of admission. Students are only admitted to the BMBB PhD program. If you are interested in a Master's-only program, however, the Master of Biological Science (MBS) program is available for working professionals, including scientific staff working at the University of Minnesota. This program is offered through the College of Continuing Education (CCE) and is flexible with respect to time and focus of study. Please visit the program website for more information (http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html).

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 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: Pursuit of a Master's degree in BMBB is not an option at the point of admission. Students are only admitted to the BMBB PhD program. If you are interested in a Master's-only program, however, the Master of Biological Science (MBS) program is available for working professionals, including scientific staff working at the University of Minnesota. This program is offered through the College of Continuing Education (CCE) and is flexible with respect to time and focus of study. Please visit the program website for more information (http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html).

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.

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.

Requirements for the Masters degree include core coursework, thesis credits, and laboratory experiences taken by all students as well as coursework in one of the four BMBB emphases: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, or chemical and structural biology. Additionally, all students are expected to participate in the seminars involving student reports on current literature and research. A thesis based on original laboratory research is required.
Twin Cities Campus
Biochemistry, Molecular Biology and Biophysics Minor
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: bmbbpg@umn.edu
Website: http://www.cbs.umn.edu/bmbb/graduate

• Program Type: Graduate minor related to major
• Requirements for this program are current for Fall 2014
• 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.

A master's minor requires 6 credits of general graduate level coursework which may be selected (with approval by the director of graduate studies) from the 5xxx and 8xxx courses offered by the program.

A doctoral minor requires BioC 8001 (3 cr) and BIOC 8002 (3 cr) plus additional BioC 5000 level and above courses (6 cr), approved by the director of graduate studies, to meet the minimum requirement of 12 credits total.

In extenuating cases, students may petition the director of graduate studies for substitution of a required course.
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://www.cbs.umn.edu/bmbb/graduate

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 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: Pursuit of a master's degree in BMBB is not an option at the point of admission. Students are only admitted to the BMBB PhD program. However, the Master of Biological Science (MBS) program is available for working professionals, including scientific staff working at the University of Minnesota. This program is offered through the College of Continuing Education (CCE) and is flexible with respect to time and focus of study. Please visit the program website for more information (http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html).

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 familiarity with 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, 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.

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: Pursuit of a master’s degree in BMBB is not an option at the point of admission. Students are only admitted to the BMBB PhD program. However, the Master of Biological Science (MBS) program is available for working professionals, including scientific staff working at the University of Minnesota. This program is offered through the College of Continuing Education (CCE) and is flexible with respect to time and focus of study. Please visit the program website for more information (http://www.cce.umn.edu/Master-of-Biological-Sciences/index.html).

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
9 credits are required in the major.
15 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 for the doctoral degree include core coursework, thesis credits, and laboratory experiences taken by all students as well as coursework in one of the four BMBB emphases listed below. To obtain a PhD degree, students must register for a minimum of 24 thesis credits (BioC 8888). Upon completion of the 24 thesis-credit requirement, students are required to register every fall and spring, up through the term they are awarded the Ph.D., for 1 credit of advanced doctoral credits (BioC 8444) in order to maintain full-time,
active student status.

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. Students must attend at least 50% of weekly meetings for BioC 8084 and BioC 8184 which is a Departmental seminar involving prominent national and international scientists. Three examinations for the PhD degree include a written preliminary proposal (4th semester), preliminary oral exam (4th semester), and a final oral exam with thesis defense (typically year 5). Examinations will be conducted by the student's preliminary and graduate committees. Students are also required to complete two semesters of teaching, typically between years 2-4.

Biochemistry Core
To obtain a PhD in BMBB, all students must complete the biochemistry core coursework.
- BioC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
- BioC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- BioC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)

Laboratory and Field Course
In August of the first year, all PhD BMBB students must register for this hands-on, intensive lab course which takes place at the Itasca Biological Station and Laboratories. This course will provide first-year students with exposure to a range of modern methods and model systems.
- MCDG 8920 - Special Topics (1.0 - 4.0 cr)

Electives for Emphases
All students must 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. 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 student's advisor.
- BioC 5352 - Biotechnology and Bioengineering for Biochemists (3.0 cr)
or BioC 5361 - Microbial Genomics and Bioinformatics (3.0 cr)
or MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
or GCD 8151 - Cell Structure and Function (3.0 cr)
or MICA 8003 - Immunity and Immunopathology (4.0 cr)
or MICA 8004 - Cellular and Cancer Biology (4.0 cr)
or GCD 8131 - Advanced Genetics and Genomics (3.0 cr)
or GCD 8008 - Mammalian Gene Transfer and Expression (2.0 cr)
or PUBH 6450 - Biostatistics I (4.0 cr)
or SGB 8181 - Stem Cell Biology (3.0 cr)
or STAT 5021 - Statistical Analysis (4.0 cr)
or MICA 8010 - Microbial Pathogenesis (3.0 cr)
or BioC 5216 - Current Topics in Signal Transduction (3.0 cr)
or BioC 5527 - Introduction to Modern Structural Biology (4.0 cr)
or BioC 5528 - Spectroscopy and Kinetics (4.0 cr)
or CHEN 8754 - Systems Analysis of Biological Processes (3.0 cr)
or BioC 5213 - Selected Topics in Molecular Biology (3.0 cr)
or BioC 5444 - Muscle (3.0 cr)
or BioC 5531 - Macromolecular Crystallography I: Fundamentals and Techniques (1.0 cr)
or BioC 5532 - Macromolecular Crystallography II: Techniques and Applications (1.0 cr)
or CHEM 8011 - Mechanisms of Chemical Reactions (4.0 cr)
or CHEM 8021 - Computational Chemistry (4.0 cr)
or CHEM 8411 - Introduction to Chemical Biology (4.0 cr)
or CHEM 8412 - Chemical Biology of Enzymes (4.0 cr)
or CHEM 8735 - Bioinorganic Chemistry (4.0 cr)
or PHCL 5111 - Pharmacogenomics (3.0 cr)
or PUBH 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
or MICA 8013 - Translational Cancer Research (2.0 cr)
or GRAD 8101 - Teaching in Higher Education (3.0 cr)
Twin Cities Campus
Bioethics M.A.
Bioethics, Center for
Graduate School

Link to a list of faculty for this program.

Contact Information:
Center for Bioethics, University of Minnesota, Suite N504 Boynton, 410 Church Street S.E., Minneapolis, MN 55455 (612-624-9440; fax: 612-624-9108)
Email: bthxed@umn.edu
Website: http://www.bioethics.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 Center for Bioethics offers a Master of Arts (M.A., Plan A) degree with a major in Bioethics. The curriculum for this program includes a set of required core courses, the opportunity for study of electives in bioethics, as well as a requirement for coursework in other fields that are related to bioethics. Students will be required to write a master's thesis. Given the fundamentally interdisciplinary nature of bioethics, professional opportunities in the field are greatly enhanced for trainees with a graduate degree in bioethics as well as a terminal graduate or professional degree in another field - for example, degree combinations of an MA degree in Bioethics with another degree such as a JD, PhD, MD or others. This model prompts students to acquire a firm disciplinary grounding as well as interdisciplinary bioethics expertise, a practice which best prepares students for bioethics related career placement.

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. While the application deadline is April 30, applications are accepted as early as the fall semester prior to the proposed start of the student's M.A. program. Admissions decisions are made on a rolling basis, and preference is given to early applicants.

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.

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.

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 in this Plan A (thesis-based) master's degree program are required to take at least 20 credits of courses: 9 credits of required courses including one course fulfilling an area requirement, 5 credits of bioethics electives, and 6 credits of electives from a related field. Details about curriculum can be found at www.ahc.umn.edu/bioethics/education/gradprogram/dregreq/home.html. Elective courses must be chosen in consultation with the DGS or student's adviser to ensure their appropriateness for the student's course of study. Students may elect a graduate minor to fulfill their elective credits in a related field. However, students may also elect to take courses from different programs, for example, a health policy course from the School of Public Health and a health law course from the Law School.

Of the 20 total course credits required, at least one BTHX course and at least two courses total are to be taken at the 8xxx level. Thesis credits do not count toward this requirement.

Course Group 0

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, Suite N504 Boynton, 410 Church Street S.E., Minneapolis, MN 55455 (612-624-9440; fax: 612-624-9108)
Email: bthxed@umn.edu
Website: http://www.bioethics.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 Bioethics is designed for University of Minnesota students interested in deepening their knowledge of the ethical issues surrounding health and the life sciences. Students can explore their interests in bioethics while also earning a degree in their home discipline. Created by the Center for Bioethics in cooperation with the Department of Philosophy, the Graduate Minor program is administered by the Center for Bioethics and is open to students in many of the University’s Master’s or Doctoral degree programs.

Some professional degree-seeking students may elect a minor as well. The University’s policy states that MEd, MPH, MBA, MHA, MN, DNP, MOT, MPSE, MDH, MDT, MPS students may be eligible to pursue a minor. 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 in the Graduate Minor in Bioethics 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
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 student must complete a minimum of 14 graduate credits in bioethics offered outside the major field: 8 credits of required courses and 6 credits of electives. A master’s student must complete a minimum of 8 graduate credits in bioethics offered outside the major field: 6 credits of required courses and 2 credits of electives. All students must take BTHX 5010 - Bioethics Proseminar and one moral theory course, preferably BTHX 5300 - Foundations of Bioethics. Courses should be chosen in consultation with the bioethics director of graduate studies. Courses that satisfy requirements and serve as electives can be found at http://www.ahc.umn.edu/bioethics/education/graduate/home.html.
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: bicbgrad@umn.edu
Website: [http://www.r.umn.edu/academics-research/bicb](http://www.r.umn.edu/academics-research/bicb)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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

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: bicbgrad@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 2014
- 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.
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: bicbgrad@umn.edu
Website: http://www.r.umn.edu/academics-research/bicb

Along with the 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.

Rochester
Twin Cities Campus
Biophysical Sciences and Medical Physics M.S.
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: Master's
- Requirements for this program are current for Fall 2014
- 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 2014
- 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](http://www.med.umn.edu/radiology/research/physics/home.html)

- Program Type: Doctorate  
- Requirements for this program are current for Fall 2014  
- 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.
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 Street S.E., 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 2014
- 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.
The certificate has four required courses, taken from the School of Nursing, the College of Design, and the Center for Spirituality and Healing:

1. Health Innovation and Leadership, which integrates whole systems thinking, relevant theories and generative leadership to enhance the student's ability to advance innovation and achieve sustainable change in contemporary health care settings.

2. Optimal Healing Environments, which focuses on the development and implementation of Optimal Healing Environments (OHE) and examines the evidence base supporting design of human and care processes, and begins to explore how OHEs are created.

3. The Design of Health Care Processes, which provides a foundation for the thinking required to design processes in health care to reduce/eliminate medical errors and examines the use of design principles and the role of human factors in reducing human error.

4. Evidence-based Design in Health Care, which emphasizes the evidence-based processes used in the design of health care environments by interdisciplinary teams of designers, health care practitioners, administrators, and other users.
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: 505 Essex St. SE, 330 Diehl Hall, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://www.bmhi.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30
- 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 is an interdisciplinary field of scholarship that applies computer, information, and cognitive sciences to promote the effective and efficient use and analysis of information, ultimately improving the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics 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.

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.

Required prerequisites
Health or Biological Sciences
6-semester credits or 9 quarter-credits of health or biological coursework at the undergraduate or graduate level. HINF 5501 may be used to help meet this requirement.

Programming Language
Documented work or educational experience working with a programming language such as C, C++, Java, Visual Basic, PASCAL, etc. or HINF 5502 - Programming Essentials Python 3 (1.0 cr)
or Department Consent

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 153
  - General Test - Quantitative Reasoning: 152
  - 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

**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.

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**Program Requirements**

**Plan C:** Plan C requires 18 to 24 major credits and 6 to 12 credits outside the major. There is no final exam. A capstone project is required.

**Capstone Project:** The capstone project is a 3-credit course in which students will have a final opportunity to apply their newly acquired knowledge and skills to a project involving a practical problem in health informatics. Students will learn how to design these projects properly, reviewing past exemplary projects as guides. Then, with the help of their advisers and the capstone course director, students will 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 will submit a written project report in lieu of a final examination. The capstone project instructor and the student's adviser grade the report.

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 semester must be completed before filing a Degree Program Form.

**HINF Courses**

- HINF 5430 - Health Informatics I (3.0 cr)
- HINF 5431 - 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 - Clinical Informatics and Patient Safety (2.0 cr)
- HINF 5531 - Health Data Analytics and Data Science (2.0 cr)
- HINF 5499 - Capstone Project for the Masters of Health Informatics (3.0 cr)

**Other Required Courses**

- NURS 5116 - Consumer Health Informatics (1.0 cr)
- NURS 7113 - Clinical Decision Support: Theory (2.0 cr)

**Biostatistics**

- PUBH 6414 - Biostatistical Literacy (3.0 cr)
  or PUBH 6450 - Biostatistics I (4.0 cr)

**Electives**

Graduate-level electives of your choice; see student handbook for a list of recommended electives.

**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

Contact Information:
Physical Address: 505 Essex St. SE, 330 Diehl Hall, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://www.bmhi.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 is an interdisciplinary field of scholarship that applies computer, information, and cognitive sciences to promote the effective and efficient use and analysis of information, ultimately improving the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics 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 MS is a 36 credit degree that may be completed in as little as two years or up to five years. It 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.

There are two kinds of MS degrees: MS Plan A and MS Plan B. The Plan A culminates in a substantial, 10-credit master's thesis. The Plan B culminates in a smaller, 4-credit, Plan B project. Electives comprise the additional six credits in the Plan B degree.

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
6-semester credits or 9 quarter-credits of health or biological coursework at the undergraduate or graduate level. HINF 5501 may be used to help meet this requirement.

or Department Consent

Programming Language
Documented work or educational experience working with a programming language such as C, C++, Java, Visual Basic, PASCAL, etc.

or HINF 5502 - Programming Essentials Python 3 (1.0 cr)

or Department Consent

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 152
  - General Test - Quantitative Reasoning: 159
- 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
- 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 15 to 17 major credits, 9 to 11 credits outside the major, and 10 thesis credits. The final exam is written and oral.

Plan B: Plan B requires 19 to 27 major credits and 9 to 17 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

N.b. All students must take AHC Informatics Grand Rounds (HINF 5436) twice for a total of two credits.

HINF 5430 - Health Informatics I (3.0 cr)
HINF 5431 - 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 - Clinical Informatics and Patient Safety (2.0 cr)
HINF 5531 - Health Data Analytics and Data Science (2.0 cr)

Other Required Courses

NURS 5116 - Consumer Health Informatics (1.0 cr)
NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
PUBH 6450 - Biostatistics I (4.0 cr)

Final Project/Thesis

Plan A students will take 10 credits of 8777 and Plan B students will take 4 credits of 8770.

HINF 8770 - Plan B Project (4.0 cr)
or HINF 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

Electives

Graduate-level electives of your choice; see student handbook for a list of recommended electives. Plan A students will need 4 credits of electives, and Plan B students will need 10 credits of electives.
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: 505 Essex St. SE, 330 Diehl Hall, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://www.bmhi.umn.edu

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 is an interdisciplinary field of scholarship that applies computer, information, and cognitive sciences to promote the effective and efficient use and analysis of information, ultimately improving the health, well-being, and economic functioning of society. The minor provides an opportunity for the student 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)
- 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:
Applicants are required to have taken 6 semester credits or 9 quarter credits in medical, life, or biological sciences from a recognized institution of higher learning. This a broadly defined requirement and most courses with a health or biology emphasis will be accepted including biostatistics, health services research, and public health, as well as the more traditional biology or life science courses.

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 toward program requirements is permitted under certain conditions with adviser approval.

Master’s students must take the introductory sequence in health informatics (HINF 5430 and HINF 5431). Ph.D. students must take a total of 12 credits in health informatics including the introductory sequence and at least 6 additional credits including one 8xxx course.
Twin Cities Campus
Health Informatics Ph.D.
Health Informatics, AHC Inst
Graduate School

Link to a list of faculty for this program.

Contact Information:
Physical Address: 505 Essex St. SE, 330 Diehl Hall, Minneapolis, MN 55455
Mailing Address: MMC 912, 420 Delaware St. SE, Minneapolis, MN 55455
Email: ihi@umn.edu
Website: http://www.bmhi.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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 is an interdisciplinary field of scholarship that applies computer, information, and cognitive sciences to promote the effective and efficient use and analysis of information, ultimately improving the health, well-being, and economic functioning of society. Students take a sequence of core courses in health informatics 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.

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 3.50.

Applicants must have at least a master's degree or equivalent in a science, technology, engineering, or math field (or another field related to informatics) from a regionally accredited university.

Required prerequisites
Health or Biological Sciences
6-semester credits or 9 quarter-credits of health or biological coursework at the undergraduate or graduate level. HINF 5501 may be used to help meet this requirement.

or Department Consent

Programming Language
Documented work or educational experience working with a programming language such as C, C++, Java, Visual Basic, PASCAL, etc.

or HINF 5502 - Programming Essentials Python 3 (1.0 cr)

or Department Consent

Applicants must submit their test score(s) from the following:
- GRE
  - General Test - Verbal Reasoning: 152
  - General Test - Quantitative Reasoning: 159
  - 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

• 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 to 35 credits are required in the major.
11 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 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Required HINF Courses
- HINF 5430 - Health Informatics I (3.0 cr)
- HINF 5431 - 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 - Clinical Informatics and Patient Safety (2.0 cr)
- HINF 5531 - Health Data Analytics and Data Science (2.0 cr)
- HINF 8525 - Health Informatics Teaching (2.0 cr)
- HINF 8535 - Advanced Health Informatics Research Methods (1.0 - 3.0 cr)
- HINF 8888 - Thesis Credit: Doctoral (1.0 - 24.0 cr)

Other Required Courses
- NURS 5116 - Consumer Health Informatics (1.0 cr)
- NURS 7113 - Clinical Decision Support: Theory (2.0 cr)
- PUBH 6450 - Biostatistics I (4.0 cr)
- PUBH 6451 - Biostatistics II (4.0 cr)

Electives
Graduate-level electives of your choice; see student handbook for a list of recommended electives.
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

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 catalog website.
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

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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, 108 Pillsbury Hall, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-7069; fax: 612-625-3819)
Email: hstm@umn.edu
Website: http://www.hstm.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 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 should 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.

Special Application Requirements:
All application materials are submitted online to the University. Check the HSTM website (www.hstm.umn.edu) for more information. Although it is not required for admission, it's strongly recommended that applicants submit a GRE score.

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 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.

Language Requirement: Reading proficiency in one foreign language.

A minimum GPA of 3.30 is required for students to remain in good standing.

The M.A. is offered under Plan A and Plan B. Following the guidelines in the Graduate Student Handbook for the program (www.hstm.umn.edu), M.A. 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. In addition, each student must take one of the two courses in the two-semester sequence of historiography and research methods (HSCI/HMED 8112 and HSCI/HMED 8113). All of the courses selected for the requirements must be passed with a grade 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.

**History of Medicine**

**History of Science and Technology**
Twin Cities Campus

History of Science, Technology, and Medicine Minor

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, 108 Pillsbury Hall, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-7069; fax: 612-625-3819)
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 2014
- 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.

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 have a bachelor's degree with a preferred grade average of B or better and should 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.
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, 108 Pillsbury Hall, 310 Pillsbury Drive S.E., Minneapolis, MN 55455 (612-624-7069; fax: 612-625-3819)
Email: hstm@umn.edu
Website: http://www.hstm.umn.edu

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 57
- 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 should 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.

Special Application Requirements:
All application materials are submitted online to the University. Check the HSTM website (www.hstm.umn.edu) for more information. Although it is not required for admission, it's strongly recommended that applicants submit a GRE score.

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
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.

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 area and period. In addition, each student must take the two-semester sequence of historiography and research preparation (HSCI/HMED 8112 and HSCI/HMED 8113). All of the courses selected for the requirements must be passed with a grade 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.

History of Medicine

History of Science and Technology
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 2014
• 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](http://www.d.umn.edu/ibs)

- Program Type: Doctorate
- Requirements for this program are current for Fall 2014
- 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, 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.

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Information current as of September 19, 2014
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.

Health Sciences-Adm

Graduate School

Link to a list of faculty for this program.

Contact Information:
Center for Spirituality & Healing
C592 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 2014
• Length of program in credits: 38
• This program requires summer semesters for timely completion.
• No
• 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 proposed Master of Arts degree is designed for individuals with a bachelor's degree in a health-related field, or in a health field. Professionals without healthcare backgrounds, but with extensive interest in working with individuals and groups to optimize wellbeing, and who have a desire for a full graduate degree, would also be excellent candidates assuming completion of required prerequisites. This Master's 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. This Plan B Master's Degree Program is understood to be a terminal degree, and is thus not recommended for students who intend to pursue the PhD degree. The degree consists of a minimum of thirty-eight (38) credits of coursework, including 6 credits of electives, and a minimum 2-semester, 2-credit project that is presented in both verbal and written format prior to graduation.

This degree 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. All students must be able to demonstrate the following competencies (through review of transcripts and course work completed) 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 can arrange with the program director to do additional outside coursework during the first year of the program. If a significant gap in knowledge has been identified by the program director upon admission, supplemental coursework may be judiciously required during the first year of study. Six credits of electives are required to be chosen from one of four CSH areas of concentration, or students may design their own concentration or complete a minor from other departments, based on interests, if approved by their academic adviser. In all cases, the student's faculty adviser will work with the student in designing a program plan that accommodates the student's unique learning objectives. Upon successful completion of this Plan B program, the student will receive a Masters of Arts Degree in Integrative Health and Wellbeing Coaching.

Accreditation
This program is accredited by n/a

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
Course Group 0
- Previous coursework in psychology, physiology, and statistics must have been completed.

Other requirements to be completed before admission:
In addition to the University's online application, applicants must submit a letter describing their goals for the program and their professional qualifications. This three to five page personal 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. Be as specific as possible. Three letters of recommendation, transcripts and a current C.V. or resume are also required. All items can be uploaded to the University's online application. An applicant interview is required prior to admission.

Special Application Requirements:
This M.A. is designed for individuals with a bachelor¹s degree in a health-related field, or in a health field. Professionals without healthcare backgrounds, but with extensive interest in working with individuals and groups to optimize wellbeing, and who have a desire for a full graduate degree, would also be excellent candidates assuming completion of required prerequisites. Although the instruction is based on research in the field, the Plan B degree is not intended to provide intensive research training. It is understood to be a terminal degree, and is thus not recommended for students who intend to pursue the PhD degree. All students must be able to demonstrate certain competencies and knowledge in healthcare (through review of transcripts and course work completed) prior to being admitted into the Advanced Health Coaching Seminar. Students whose previous coursework does not enable them to meet these competencies can arrange with the program director to do additional outside coursework during the first year of 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

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: 2 credits (120 hrs.) Optimally spread over 2 semesters, this service-learning opportunity builds upon the core tenets from all preceding course work, including the Health and Wellness Coaching for Groups course. Students will be matched with a community partner to design, develop, and deliver a program that contains some component of both individual coaching and group-coaching, with an identified population in need. Additionally, the project must be placed within, or utilized through an interdisciplinary team. The 2-semester coursework will culminate with students submitting a formal 20-page paper, as well as presenting their projects to faculty and their classmates.

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 semester must be completed before filing a Degree Program Form.

Required Coursework

- 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)
- KIN 5133 - Motivational Interventions in Physical Activity (3.0 cr)
- 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)

Required Coursework

- CSPH 5000 Introduction to Lifestyle Medicine (2 cr);
- CSPH 5000 Coaching People with Chronic Clinical Conditions (2 cr);
- CSPH 5000 Health and Wellness Coaching for Groups (2 cr);
- CSPH 5000 Mind-Body Science and the Art of Transformation (1 cr);
- CSPH 8000 Master's Capstone project (2 cr)

Take 5 or more courses from the following:

Electives A. Cultural Healing Approaches

- CSPH 5111 Ways of Thinking about Health (2 cr)
- CSPH 5115 Cultural Awareness, Knowledge, and Health (3 cr)
- CSPH 5311 Introduction to Traditional Chinese Medicine (2 cr)
- CSPH 5331 Foundations of Shamanism & Shamanic Healing (2 cr)
- CSPH 5341 Overview of Indigenous Hawaiian Healing (2 cr)
- CSPH 5342 Overview of Traditional Tibetan Medicine: Ethics, Spirituality, & Healing (2 cr)
- CSPH 5315 Traditional Tibetan Medicine: Ethics, Spirituality, & Healing (2 cr)

Take 0 - 6 credit(s) from the following:

Electives B. Expanding Healing Practices

- CSPH 5503 Aromatherapy Fundamentals (1 cr)
- CSPH 5535 Reiki Healing (1 cr)
- CSPH 5536 Advanced Reiki Healing: Level II (1 cr)
- CSPH 5631 Healing Imagery I (2 cr)
- CSPH 5313 Acupressure (1 cr)
- CSPH 5545 Mind-Body Healing Therapies (2 cr)
- CSPH 5421 Botanical Medicines in Complementary Healthcare (3 cr)
- CSPH 5423 Botanical Medicines: Foundations and Practical Applications (1 cr)

Take 0 - 6 credit(s) from the following:

Electives C. Mind-Body Integration

- CSPH 5545 Mind-Body Healing Therapies (2 cr)
- CSPH 5225 Meditation: Integrating Body and Mind (2 cr)
- CSPH 5226 Advanced Meditation: Body, Brain, Mind, and Universe (1 cr)
- CSPH 5541 Emotional Healing and Happiness: Eastern and Western Approaches to Transforming the Mind (2 cr)
- CSPH 5201 Spirituality and Resilience (2 cr)
- CSPH 5212 Peace-building Through Mindfulness: Transformative Dialogue in the Global Community (3 cr)

Take 0 - 6 credit(s) from the following:

Electives D. Creative Expressions for Health

- CSPH 5555 Introduction to Body and Movement-based Therapies (2 cr)
- CSPH 5561 Overview of the Creative Arts in Health and Healing (2 cr)
- CSPH 5601 Music, Health and Healing (2 cr)
- CSPH 5605 Movement and Music for Well-being and Healing (2 cr)
- CSPH 5631 Healing Imagery I (2 cr); CSPH 5611 Healthy Humor (1 cr)
- CSPH 5641 Animals in Health Care: The Healing Dimensions of Human/Animal Relationships (3 cr)

Take 0 - 6 credit(s) from the following:
Twin Cities Campus

Integrative Therapies and Healing Practices Minor
Health Sciences-Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Center for Spirituality & Healing, Mayo Memorial Building, 5th floor, MMC 505, 420 Delaware Street S.E., 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 2014
- 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 Graduate Minor in Integrative Therapies and Healing Practices is an interdisciplinary program designed to expose students to the global range of integrative, complementary, cross-cultural, and spiritual healing practices. It enhances 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 Minor includes a set of core courses that provide the theoretical foundation for the program. Students may elect to take additional courses offered by the Center for Spirituality & Healing in clinical applications, spirituality, or cross-cultural health and healing. A number of other University courses also satisfy the course requirements of the minor; contact the Minor program office for more information.

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
Health professional students, practitioners and lifelong learners seeking to deepen their understanding of integrative therapeutic topics.

Full and part-time 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.

Master's and doctoral students are required to take CSPH 5101 (3 cr). Master's students take an additional 5 credits for a total 8 credits; Doctoral students take an additional 9 credits for a total of 12 credits. Note that students cannot use course credits to satisfy requirements for both a major and the minor.
Twin Cities Campus

Integrative Therapies and Healing Practices Postbaccalaureate Certificate
Health Sciences-Adm
Graduate School

Link to a list of faculty for this program.

Contact Information:
Center for Spirituality & Healing, Mayo Memorial Building, 5th floor, MMC 505, 420 Delaware Street S.E., 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 2014
- Length of program in credits: 12 to 19
- 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 Certificate in Integrative Therapies and Healing Practices is an interdisciplinary program designed to expose students to the global range of integrative, complementary, cross-cultural, and spiritual healing practices. It enhances the preparation of health science practitioners 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 12-credit Certificate includes a set of core courses that provide the theoretical foundation for the program. Students who choose the Certificate's Health Coaching track must complete a total of 19 credits. Students may elect to take additional courses offered by the Center for Spirituality and Healing in clinical applications, spirituality, and cross-cultural health and healing.

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.

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 life/work experience in health related areas. Such fields include nursing, social work, psychology, medicine, nutrition, pharmacy, chiropractic, naturopathy, and licensed acupuncturist.

The Health Coaching track of the Certificate requires an applicant interview prior to admission.

Special Application Requirements:
In addition to the University's online application, applicants must submit a letter describing their goals for obtaining the Certificate and their professional qualifications. The statement should address the question, "What are your short- and long-term professional goals after you complete the Postbaccalaureate Certificate program in Integrative Therapies and Healing Practices?" Be as specific as possible. Two letters of support are required if the individual is not currently enrolled in a graduate program at the University of Minnesota, one from an academic source and one from an employer/supervisor. A current C.V. is also requested. All items can be uploaded to the University's online application.

Applicants to the Health Coaching track will need three recommendations 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. Students should also include a current C.V. or resume. All items can be uploaded to the University's online application.
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 (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.

At least 1 semester must be completed before filing a Degree Program Form.

A total of 12 credits are required to complete the Certificate. Required courses: CSPH 5101 - Introduction to Integrative Therapies and Healing Practices (3 cr), and CSPH 5102 - Art of Healing: Self as Healer (1 cr). Students are encouraged to choose the remaining 8 credits from courses consistent with their academic training and professional goals. The student's faculty adviser works with the student in designing a program plan that accommodates the student's unique learning objectives. Students pursuing the Health Coaching Track within the Certificate must complete 19 credits. In addition to the two courses required for the Certificate, Health Coaching students complete a required course sequence of CSPH 5701, CSPH 5702, CSPH 5703, CSPH 5704 and CSPH 5705. To earn a Certificate, the preferred GPA for all courses is 2.80.

**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**

A total of 19 credits are required to complete this track within the Certificate. The track requires four semesters of coursework, which can be spread over a variable amount of time up to a maximum of four years. Certain courses must be taken sequentially, leading to skill sets and a knowledge base which grows and matures over time. In addition to the two required courses for the Certificate, Health Coaching students must take CSPH 5701 - Fundamentals of Health Coaching I (4 cr), CSPH 5702 - Fundamentals of Health Coaching II (4 cr), CSPH 5703 - Advanced Health Coaching Practicum (3 cr), CSPH 5704 - Business of Health Coaching (2 cr), and a professional internship in health coaching (2 cr). To earn a Certificate, the preferred GPA for all courses is 2.80.

- CSPH 5101 - Introduction to Integrative Healing Practices (3 cr)
- CSPH 5102 - Art of Healing: Self as Healer (1 cr)
- CSPH 5701 - Fundamentals of Health Coaching I, with Laboratory (4 cr)
- CSPH 5702 - Fundamentals of Health Coaching II, with Laboratory (4 cr)
- CSPH 5703 - Advanced Health Coaching Practicum (3 cr)
- CSPH 5704 - Business of Health Coaching (2 cr)
- CSPH 5705 - Professional Internship in Health Coaching (2 cr)
Twin Cities Campus
Molecular, Cellular, Developmental Biology and Genetics M.S.
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 S.E., University of Minnesota, Minneapolis, MN 55455 (612-624-7470, fax: 612-626-6140)
Email: mcdbg@umn.edu
Website: http://mcdbg.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30 to 50
- This program requires summer semesters for timely completion.
- The clinical component of the program involves work in multiple clinical settings throughout the Twin Cities, Mayo Clinic in Rochester, and clinics in St. Cloud and 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.

Genetic Counseling Focus: The master of science in MCDB&G is offered with a focus of study in genetic counseling. It is offered for full-time study, and 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 multiple clinical genetics settings with patients and families. The program 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 sit for board certification.

Joint Degree Program: MCDB&G also offers a master of science that is part of the Joint Degree Program in Law, Science, and Technology. This program 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.

MS Research Degree: Eligible students who were admitted to the MCDB&G doctoral program, but who leave before they have completed their PhD, may be offered the option to complete the MS degree. Eligibility is determined by the student's adviser and the MCDB&G DGS.

Accreditation
This program is accredited by The Accreditation Council for Genetic Counseling

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 undergraduate or master's degree in the biological, chemical, or physical sciences is preferred.

Other requirements to be completed before admission:
Applicants to the MCDB&G with the genetic counseling focus are required to have completed courses in organic chemistry, biochemistry, general genetics, statistics and probability, and psychology. In addition, all applicants to the genetic counseling focus must have some type of client advocacy experience such as volunteer or paid work with troubled teens, working in a shelter for battered women, or a suicide prevention hotline, etc. The best experiences afford the applicant the opportunity to work in a helping profession.

Successful applicants to the JD/MS 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. Recommended academic preparation includes coursework in molecular biology,
genetics, biology, and biochemistry.

**Special Application Requirements:**
Applications to the genetic counseling focus of study are stronger if the applicant has spent some time with a practicing genetic counselor either in the clinical setting or in some capacity such as personal interviews that affords the applicant a real life understanding of the profession.

Applicants to the JD/MS program 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. The GRE Subject Test in biochemistry, cell and molecular biology, biology, or chemistry is strongly recommended, but not required. The recommended date for receipt of completed applications is December 1. Graduate studies begin fall semester. Entry into the JD/MS program requires separate admittance to both the Law 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
- **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 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 to 40 major credits and 6 to 10 credits outside the major. The final exam is written and oral. A capstone project is required.

**Capstone Project:** All Plan B students must complete a research or capstone project that is scholarly in quality, and present their results at their final oral examination. Projects that qualify for the genetic counseling focus 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. Other Plan B students are expected to produce a report approximately 15 pages in length that thoughtfully discusses an important scientific topic that the student and adviser agree upon. The report should include an introduction that explains the significance of the topic, a review of the literature or an analysis of a specific aspect of the area and a discussion regarding current or future endeavors.

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 2 semesters must be completed before filing a Degree Program Form.

The genetic counseling focus of study is offered under Plan B and is designed to be completed in 4 semesters and the interim summer. Most of the coursework takes place in the first year, leaving more open time during the second year for clinical experience. Students must complete a minimum of 40 graduate credits with at least 30 credits in the major area of study, a plan B project paper, and a final oral exam. Students will be placed in laboratory and clinical observation experiences during the first year and five clinical genetic counseling internships during the second year. Students 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 final oral exam. 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.

Students in the JD/MS program or PhD to MS students may complete the MS under Plan A or Plan B. Plan A requires a minimum of 24 course credits and 10 thesis credits; Plan B requires a minimum of 24 course credits and the completion of a Plan B paper. Students take a core curriculum, which is multidisciplinary and contributes to both the major and minor or related field requirements. Students may choose a concentration or specialization within the program such as cell biology, developmental biology, genetics, or human genetics.

Degree Focuses

Genetic Counseling

Year 1
Students will take courses that focus on medical, human, and behavioral genetics and genetic counseling practice. Students will have the option to choose between several electives from law and ethics, public health, and counseling psychology. In addition, students will observe in a clinical setting one day per week and gain experience in the clinical laboratories one day per week.

Summer
During the summer between the first and second year of the program, students will begin their first clinical internship rotation where the student will have patient responsibilities. This rotation will be a full 10 weeks long with the expectation that students will spend between 2-3 days per week in the clinic. The minimum time in the clinic will be 20 hours per week but will ultimately be set by the clinical supervisor and may exceed the minimum.

Year 2
Students will complete course work in counseling skills, psychosocial issues in genetic counseling, and ethical issues in genetic counseling. In addition students will spend 2-3 days per week in the clinic seeing patients and families under the supervision of a board certified genetic counselor.

-OR-

Academic Focus

Joint- or Dual-degree Coursework: Joint Degree Program in Law, Science and Technology. Student may take a total of 12 credits in common among the academic programs.
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 S.E., 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 2014
- 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 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 toward program requirements is permitted under certain conditions with adviser approval.

A master's minor requires 6 credits. A doctoral minor typically includes the genetics core (GCD 8131 and BIOC 8002 or GCD 4034), cell biology (GCD 8151 or 5036), and developmental biology (GCD 8161, 4151, or 4161), as appropriate to the student's field of specialization.
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 S.E., 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 2014
- 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.

Ph.D. 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 Ph.D. is also part of two joint degree programs: The Joint Degree Program in Law, Health and Life Sciences; and the M.D./Ph.D. program.

The Joint Degree Program in Law, Health and Life Sciences is unique in the nation and enables students to combine a J.D. degree with a Ph.D. or M.S. degree. Students entering this program must be admitted to both the MCDB&G program and the Law School. Admission qualifications for M.S. and Ph.D. students are identical; only the student's career objectives distinguish the degree that they pursue.

The M.D./Ph.D. 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**
12 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.

A minimum GPA of 3.0 is required for students to remain in good standing.

The Ph.D. program is designed by the student and the adviser to meet individual interests and goals. Advanced courses in genetics, molecular biology, cell biology, developmental biology, and biochemistry are required, in addition to special courses, topical seminar courses, laboratory research rotations, thesis research, student research seminars, departmental seminars, and journal clubs. The student's core curriculum is multidisciplinary and contributes to both major and minor field requirements. Ph.D. students serve as TAs for two semesters during their graduate career. Students in one of the joint degree programs serve as a TA for one semester.

This program is part of Joint Degree Program in Law, Health and the Life Sciences offering a J.D./Ph.D. and a J.D./M.S. track. Selected courses must be approved by the DGS. Students pursuing the J.D./Ph.D. start by completing the first year of Law School, then enter the Ph.D. portion of the program and complete this degree before returning to finish Law School.

This program also offers a joint M.D./Ph.D. degree program; 12 credits of Medical School courses can be used to fulfill credit requirements for the Ph.D. program with approval of the DGS. Students pursuing the M.D./Ph.D. start the program by completing the first two years of Medical School during which time they do laboratory rotations. After selecting a laboratory, they then enter the Ph.D. portion of the program and complete this degree before returning to finish Medical School.

**First Year**
To obtain a PhD in MCDB&G, all students must complete the following courses.
- BIOC 8001 - Biochemistry: Structure, Catalysis, and Metabolism (3.0 cr)
- BIOC 8002 - Molecular Biology and Regulation of Biological Processes (3.0 cr)
- MCDG 8920 - Special Topics (1.0 - 4.0 cr)
- MCDG 8900 - Student Research Seminar (1.0 cr)
GCD 8151 - Cell Structure and Function (3.0 cr)
BIOC 8401 - Ethics, Public Policy, and Careers in Molecular and Cellular Biology (1.0 cr)
GCD 8131 - Advanced Genetics and Genomics (3.0 cr)
GCD 8171 - Literature Analysis (2.0 cr)

Joint- or Dual-degree Coursework: The Joint Degree Program in Law, Health and the Life Sciences; and the M.D./Ph.D. program. 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; fax: 612-625-1263)
Email: wrs@umn.edu
Website: http://wrs.umn.edu

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- Length of program in credits: 30
- 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 emphasis at the M.S. level: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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 adviser are important criteria for admission to the 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 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 instruction can be found on the program website: wrs.umn.edu/prospectivestudents/apply/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
  - 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 oral. A capstone project is required.

Capstone Project: The Plan B project is defined by the faculty adviser. 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.

Students may choose Plan A, which requires a thesis, or Plan B, which requires additional coursework and a major project. Both plans incorporate courses offered on the Twin Cities and Duluth campuses.

Students must complete courses in four core areas: 1) hydrology (surface and/or hydrogeology); 2) environmental/water chemistry; 3) limnology; and 4) water resources policy and economics, and two electives in such areas of emphasis: aquatic biology, hydrologic science, watershed science and management, water quality, environmental chemistry, limnology, water policy and economics, or water management technology. One elective must be from an approved list of technical courses dealing with water quality science/management. A minimum of two related field courses (at least 6 credits) outside of aquatic science are required. Registration for the WRS Seminar during the first semester in residence and training in responsible conduct of research and ethics are also required.

Approved core and area of emphasis courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/index.htm.

A minimum of 20 course credits (plus 10 thesis credits) are required for Plan A and a minimum of 30 credits are required for Plan B (up to 3 credits may be used for the Plan B project). Students who had classes equivalent to those in the WRS core as undergraduates
may substitute other classes to meet minimum credit 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.

**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. Such interdisciplinary fields in the modern research university require mechanisms to insure 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 may choose Plan A, which requires a thesis, or Plan B, which requires additional coursework and a major project. Specific curriculum for the limnology and oceanography track follows WRS course requirements. Both plans incorporate courses offered on the Twin Cities and Duluth campuses.

Students must complete courses in four limnology and oceanography track core areas: 1) hydrology (surface and/or hydrogeology); 2) environmental/water chemistry; 3) limnology; and 4) water resources policy, economics, and management; and one elective must be from an approved list of technical courses dealing with water quality science/management. An additional one or two electives in limnology and oceanography are also required. A minimum of two related field courses (at least 6 credits) outside of aquatic science are required. Registration for the WRS Seminar during the first semester in residence and training in responsible conduct of research and ethics are also required.

A minimum of 20 course credits (plus 10 thesis credits) are required for Plan A and a minimum of 30 credits are required for Plan B (up to 3 credits may be used for the Plan B project). Students who had classes equivalent to those in the WRS core as undergraduates may substitute other classes to meet minimum credit requirements.

The faculty adviser must be a member of the limnology and oceanography track faculty.

Approved limnology and oceanography track core and elective courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/landotrack/index.htm.
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 2014
- 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 emphasis at the M.S. and Ph.D. levels: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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 towards program requirements is not permitted.

A master's minor requires 9 credits, including WRS 5101 (3 credits) and two of the other core courses described under M.S. degree requirements. Doctoral students must complete 12 credits, including WRS 5101 (3 credits), a core course described under the M.S. degree requirements, and two electives from one of the areas of emphasis.
Twin Cities Campus

Water Resources Science Ph.D.

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: Doctorate
- Requirements for this program are current for Fall 2014
- Length of program in credits: 64
- This program does not require summer semesters for timely completion.
- The Water Resources Science 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 Water Resources Science 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.

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 emphasis at the Ph.D. level: aquatic biology, environmental chemistry, hydrologic science, limnology, water management technology, water policy, water quality, and watershed science and management. 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 adviser are important criteria for admission to the Ph.D. 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/prospectivestudents/apply/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
  - 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 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

Coursework is tailored to student interests, and many areas of emphasis are possible. Core courses are offered on both the Twin Cities and Duluth campuses.

Students complete coursework equivalent to that of an M.S. in water resources science, with additional coursework in an area of emphasis. There are no specific credit requirements in the major, but Ph.D. programs normally include at least 40 course credits beyond the B.S. level, including relevant coursework taken for a master’s degree and a required minimum of 12 credits in a supporting or minor program.

Approved core and area of emphasis courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/index.htm.

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. WRS limnology and oceanography faculty list: http://wrs.umn.edu/faculty/landotracklist/index.htm.

Specific curriculum for the limnology and oceanography track follows WRS course requirements. Core courses are offered on both the Twin Cities and Duluth campuses.

Students must complete coursework equivalent to that of an M.S. in the water resources science limnology and oceanography track, with additional coursework in an area of limnology and oceanography. There are no specific credit requirements in the major, but Ph.D. programs normally include at least 40 course credits beyond the B.S. level, including relevant coursework taken for a master's degree and a required minimum of 12 credits in a supporting or minor program.

Ph.D. students pursuing this track must have at least two members of the limnology and oceanography track faculty on their committee including the adviser.

Approved limnology and oceanography track core and elective courses as well as a list of faculty are listed on the program website: wrs.umn.edu/degreesandcourses/landotrack/index.htm.
**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](http://www.cvm.umn.edu/cmb)

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 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 CMB program focuses on health that spans a wide range of species, from laboratory animal, companion animal, and livestock species to humans, and is unique within the University of Minnesota.

Note: The primary emphasis of the CMB program is the training of doctoral students; however, a small number of individuals complete a master's degree. 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 15 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
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 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.S. requires a core curriculum of fundamental coursework and laboratory experiences. Students complete a minimum of 20 course credits and 10 thesis credits; the thesis is based on original laboratory research.

Required Courses

- 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

- CMB 5200 - Statistical Genetics and Genomics (4.0 cr)
- PUBH 6450 - Biostatistics I (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)
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 2014
- 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 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 CMB program focuses on health that spans a wide range of species, from laboratory animal, companion animal, and livestock species to humans, and is unique within 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 3.25.

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 15 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
- MELAB
  - Final score: 80

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Information current as of September 19, 2014
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.

The Ph.D. requires a core curriculum of fundamental coursework and laboratory experiences. Considerable flexibility is available for students in selecting their courses to construct a program around their own interests and research. In addition, all students are required to complete a teaching experience.

CMB program courses

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 8550 - Comparative and Molecular Biosciences Seminar (1.0 cr)
CMB 8560 - Research and Literature Reports (1.0 cr)

Ethics

CMB 8134 - Ethical Conduct of Animal Research (3.0 cr)

Statistics

CMB 5200 - Statistical Genetics and Genomics (4.0 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 5301 - 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)
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.cvm.umn.edu/vmed

- Program Type: Master's
- Requirements for this program are current for Fall 2014
- 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 Veterinary Medicine graduate program is to promote science-based research and provide high-quality education to develop scientists working to improve the health and well-being of animals and humans.

Program Goals:
- Prepare independent basic and applied scientists for successful careers in academia, industry, government, or veterinary practice
- Foster development of specific skills including leadership, communication, independent and critical thinking, teaching, interdisciplinary research in collaborative environments, scientific and grant writing, experimental and analytical methods
- Contribute to the body of knowledge in basic, translational, and applied sciences in animal health and well-being, and emerging and zoonotic threats

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.

D.V.M. or equivalent; students with a B.A. or B.S. in biological sciences may be considered. Previous laboratory experience is 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 15 is required to ensure consideration for 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
- 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.

Formal coursework for the M.S. degree varies according to the field of study, interests, and career goals of the individual student. Courses may be taken in disciplines other than veterinary medicine.

Ethics

VMED 8134 - Ethical Conduct of Animal Research (3.0 cr)

Seminar

VMED 8550 - Veterinary Medicine Seminar (1.0 cr)

Statistics

At least one course, but two are recommended.

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

At least one additional 8000 level course for the major field

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
Veterinary Medicine Minor
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/vmed

- Program Type: Graduate minor related to major
- Requirements for this program are current for Fall 2014
- 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 mission of the Veterinary Medicine graduate program is to promote science-based research and provide high-quality education to develop scientists working to improve the health and well-being of animals and people.

Program Goals:
- Prepare independent basic and applied scientists for successful careers in academia, industry, government, or veterinary practice
- Foster development of specific skills including leadership, communication, independent and critical thinking, teaching, interdisciplinary research in collaborative environments, scientific and grant writing, experimental and analytical methods
- Contribute to the body of knowledge in basic, translational, and applied sciences in animal health and well-being, and emerging and zoonotic threats.

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
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: cvmmsphd@umn.edu
Website: http://www.cvm.umn.edu/vmed

• Program Type: Doctorate
• Requirements for this program are current for Fall 2014
• 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 Veterinary Medicine (VMED) graduate program is to promote science-based research and provide high quality education to develop scientists working to improve the health and well being of animals and humans.

Program Goals:
- Prepare independent basic and applied scientists for successful careers in academia, industry, government, or veterinary practice
- Foster development of specific skills including leadership, communication, independent and critical thinking, teaching, interdisciplinary research in collaborative environments, scientific and grant writing, experimental and analytical methods
- Contribute to the body of knowledge in basic, translational, and applied sciences in animal health and well-being, and emerging and zoonotic threats

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.

D.V.M. or equivalent; students with a B.A. or B.S. in biological sciences may be considered. Previous laboratory experience is 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 15 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
• 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.

Formal coursework for the Ph.D. degree varies according to the field of study, interests, and career goals of the individual student. Courses for the Ph.D. degree may be taken in areas other than VMED

Ethics
VMED 8134 - Ethical Conduct of Animal Research (3.0 cr)

Seminar
VMED 8550 - Veterinary Medicine Seminar (1.0 cr)

Statistics
At least one course, but two courses are recommended.
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
At least three additional 8000 level courses for the major field